Sri
SAI RAM
ENGINEERING COLLEGE
An Autonomous Institution
West Tambaram, Chennai - 44
www.sairam.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University



DEPARTMENT OF
ELECTRONICS & INSTRUMENTATION ENGINEERING

AUTONOMOUS
CURRICULUM AND
SYLLABUS
I - V
SEMESTERS

REGULATIONS 2024
Academic Year 2024-25 onwards

SRI SAIRAM ENGINEERING COLLEGE

VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.

MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.

Educational Organization Management System (EOMS) Policy

We at Sri Sai Ram Engineering College are committed to empower our students not only to excel academically but also imbibe essential values, enabling them to become exemplary global citizens. We build a better nation by fostering excellence and innovative practices in Engineering, Technology and Management Education. We are dedicated to consistently enhancing our systems, infrastructure and services to meet the needs and expectations of all our stakeholders for sustainable growth

DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING

VISION

To Impart technical Education and to develop competent Electronics and Instrumentation Engineers with exemplary personality who will be technically proficient and ethically strong leading to the growth of society and nation.

MISSION

To provide a platform in acquiring knowledge in the field of Electronics and Instrumentation Engineering with highest quality in technical education and services to the society. To fulfill the needs:

1. Provide quality education in both theoretical and applied foundations of Electronics and Instrumentation Engineering.
2. Create competent Electronics and Instrumentation engineers to develop solutions for the betterment of the nation.
3. Inculcate professional and ethical values among students.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	T	P	CONTACT PERIODS	CREDITS
		THEORY					
1	24BSMA101	Matrices and Calculus	3	1	0	4	4
2	24HSEN101	Communicative English	3	0	0	3	3
3	24BSPH101	Engineering Physics	3	0	0	3	3
4	24BSCY101	Engineering Chemistry	3	0	0	3	3
5	24ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	24ESGE101	Engineering Graphics	1	2	0	3	3
7	24HSTA101	Heritage of Tamils	1	0	0	1	1
		PRACTICALS					
1	24BSPL101	Physics and Chemistry Laboratory	0	0	4	4	2
2	24ESPL101	Programming in C Laboratory	0	0	2	2	1
		VALUE ADDITIONS - I					
1	24ENTP101	Functional Life Skills	1	0	1	2	1
2	24ESID101	Idea Engineering Lab - I	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
		Recommended by BoS					
				Total		**30**	**25**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	T	P	CONTACT PERIODS	CREDITS
		THEORY					
1	24BSMA202	Differential Equations, Complex Variables and Transforms	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH206	Physics for Instrumentation Engineering	3	0	0	3	3
4	24BSCY201	Chemistry for Environment and Sustainability	3	0	0	3	3
5	24EEPC201	Circuit Theory	2	1	0	3	3
6	24HSTA201	Tamils and Technology	1	0	0	1	1
7	24HSNC201	NCC Course Level 1*	2*	0	0	2*	0
		PRACTICALS					
1	24ESGE102	Engineering Practices Laboratory	0	0	4	4	2
		VALUE ADDITIONS - II					
1	24ENTP201	Digital Dynamics	1	0	1	2	0
2	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
		*only for NCC cadets		**Total**		**24**	**19**

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	T	P	CONTACT PERIODS	CREDITS
		THEORY					
1	24BSMA302	Linear Algebra and Partial Differential Equations	3	1	0	4	4
2	24EIPC301	Electrical Measurements and Sensors	3	0	0	3	3
3	24EIPC302	Analog Electronic circuits	3	0	0	3	3
4	24EIPC303	Digital System Design and Applications	3	0	0	3	3
5	24ESIT301	Data Structures	3	0	0	3	3
6	24HSMC301	Universal Human Values - II Understanding Harmony	2	1	0	3	3
7	24HSNC301	NCC course Level 2*	3	0	0	3*	0
		PRACTICALS					
1	24EIPL301	Sensors and Transducers Laboratory	0	0	4	4	2
		VALUE ADDITIONS - III					
1	24EITP301	Aptitude Skills - I	0	0	2	2	1
2	24EIID301	Innovative Design Lab - I	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
1	24ESMC301	Joy of Computing using Python (Mandatory - NC)	0	2	0	2	0
		*only for NCC cadets		**Total**		**29**	**23**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	T	P	CONTACT PERIODS	CREDITS
		THEORY					
1	24BSMA403	Statistics and Numerical Methods	3	1	0	4	4
2	24EIPC401	Electrical Machines and Drives	3	0	0	3	3
3	24EIPC402	Industrial Instrumentation	3	0	0	3	3
4	24EIPC403	Principles of Communication Engineering	3	0	0	3	3
5	24EIPC404	Control Systems	3	0	0	3	3
6	24MGOExxx	Open Elective - II#	3	0	0	3	3
7	24HSNC401	NCC course Level 3*	3	0	0	3	0
		PRACTICALS					
1	24EIPL401	Industrial Instrumentation Laboratory	0	0	4	4	2
2	24EIPT402	Microcontrollers and Embedded Systems Laboratory with Theory	1	0	4	5	3
		VALUE ADDITIONS - IV					
1	24EITP401	Aptitude Skills - II	0	0	2	2	0
2	24EIID401	Innovative Design Lab - II	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
1	24ESMC401	Data Analytics with Python	2	0	0	2	-
		*only for NCC cadets		**Total**		**34**	**25**

tals of Supply Chain and nagement

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24EIPC501	Process Dynamics and Control	3	0	0	3	3
2	24EIEL5XX	Professional Elective – I	3	0	0	3	3
3	24EIEL5YY	Professional Elective – II	3	0	0	3	3
4	24XXOEXXX	Open Elective – II	3	0	0	3	3
5	24HSMG501	Principles of Engineering Management	3	0	0	3	3
6	24MGMC501	Constitution of India	2	0	0	2	0
PRACTICALS							
1	24EIPL501	Process Control and Simulation Laboratory	0	0	4	4	2
2	24EIPT501	Smart Systems and IoT Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - V							
1	24EITP501	Skill Enhancement	0	0	2	2	1
2	24EIID501	Prototype Development Lab – 1	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As Recommended by BOS		**Total**		**30**	**22**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24EIPC601	Signal and Image Processing	3	0	0	3	3
2	24EIPC602	Logic and Distributed Control Systems	3	0	0	3	3
3	24EIEL6vv	Professional Elective - III	3	0	0	3	3
4	24EIEL6xx	Professional Elective - IV	3	0	0	3	3
5	24EIEL6yy	Professional Elective - V	3	0	0	3	3
6	24xxOEXXX	Open Elective - III	3	0	0	3	3
PRACTICALS							
1	24EIPL601	Industrial Automation Systems Laboratory	0	0	4	4	2
VALUE ADDITIONS - VI							
1	24EITP601	Technical Skill	0	0	2	2	0
2	24EIID601	Prototype Development Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		Recommended by BOS		**Total**		**26**	**21**

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24EIPC701	Data Communication and Industrial Networks	3	0	0	3	3
2	24EIPC702	Industrial Robotics and Automation	3	0	0	3	3
3	24EIEL7xx	Professional Elective - VI	3	0	0	3	3
4	24xxOE9xx	Open Elective - IV	3	0	0	3	3
5	24MGEL703	Creative Innovation and Entrepreneurship	2	0	0	2	2
PRACTICALS							
1	24EIPL701	Industrial Robotics Laboratory	0	0	4	4	2
2	24EIPJ701	Project work - Phase I	0	0	8	8	4
VALUE ADDITIONS - VII							
1	24EITP701	Company Specific Skills	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		Recommended by BOS					
					Total	**29**	**21**

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
4	24EIEL8yy	Professional Elective - VII	3	0	0	3	3
PRACTICALS							
1	24EIPJ801	Project Work - Phase II	0	0	12	12	6
VALUE ADDITIONS - VIII							
1	24EIIN801	Internship	0	0	9	9	3
					Total	**24**	**12**

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN	PREREQUISITE COURSES
1	24EIEL501	Instrumentation Standards	3	Applied Instrumentation	24EXPC401
2	24EIEL502	Sensors for Air Pollution Monitoring Systems	3	Applied Instrumentation	24EXPC301, 24EXPC302
3	24EIEL503	Biomedical Instrumentation	3	Applied Instrumentation	24EXPC301, 24EXPC302, 24EXPC304
4	24EIEL507	Analytical Instrumentation	3	Applied Instrumentation	24EIPC301, 24EIPC402
5	24EIEL508	Fiber Optics and Laser Instrumentation	3	Applied Instrumentation	24EIPC402, 24EIPC403
6	24EIEL509	Smart and Wireless Instrumentation	3	Applied Instrumentation	24EIPC301, 24EIPC403

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN	PREREQUISITE COURSES
1	24EIEL504	Process Modelling And Simulation	3	Advanced Control And Automation	24BSMA302, 24EIPC404
2	24EIEL505	IoT for Industrial Automation	3	Advanced Control And Automation	24EIPC301, 24EIPT402
3	24EIEL506	Unit Operations and Control	3	Advanced Control And Automation	24EIPC404
4	24EIEL510	Industry 4.0 and Industrial Internet of Things	3	Advanced Control And Automation	24EIPC404, 24EIPT402
5	24EIEL511	Introduction to Process Data Analytics	3	Advanced Control And Automation	24BSMA403, 24EIPC404
6	24EIEL512	Control Valves	3	Advanced Control And Automation	24EIPC402, 24EIPC404

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
L&T BASKET

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24ECIE501	Cloud Adoption and Management Techniques	3	Cloud Computing
2	24ECIE502	Industrial Applications of Microcontrollers - A Practice based approach	3	Applied Microelectronics
3	24ECIE503	Applied Industrial IoT	3	Artificial Intelligence and Data Science
4	24ECIE504	Cyber Physical Systems for Industrial Applications	3	Applied Microelectronics
5	24ECIE505	Chip based VLSI Design for Industrial Applications	3	Applied Microelectronics
6	24ECIE601	AI and Edge Computing	3	Artificial Intelligence and Data Science
7	24ECIE602	Renewable Energy & Power Evacuation	3	Smart Grid Technology
8	24ECIE603	Digital Technologies for Industry 4.0	3	Applied Microelectronics
9	24ECIE604	Integrated Approach to Building Services	3	Interdisciplinary
10	24ECIE701	Project Management for Professionals	3	Interdisciplinary

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
HCL BASKET

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIIE611	Embedded System For Connected Devices	3	Embedded
2	24CSIE612	C++ For Embedded Systems	3	Embedded
3	24ITIE711	Advanced C++ For Embedded Programming	3	Embedded
4	24EIIE712	Product Development Process	3	Embedded
5	24ECIE712	Project Phase-I	4	Embedded
6	24ECIE811	Internship	3	Embedded
7	24ECIE812	Project Phase-II	6	Embedded

Approved by
Academic Council Meeting
No. 08 Dated: 03.09.2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Graduates will have solid and sound basics in Mathematics, Electronic and Instrumentation fundamentals and advancements to solve technical problems.

PEO2 Graduates will have the capability to work productively as Electronics and Instrumentation Engineers, including supportive and leadership roles in multidisciplinary domain.

PEO3 Graduates will have the potential to participate in life-long learning through the successful completion of advanced degrees, continuing education, certifications and/or other professional developments.

PEO4 Graduates will have the ability to apply the gained knowledge to improve the society ensuring ethical and moral values.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Innovative System Development – Graduates will be proficient in designing electronic circuits using modern tools and emerging technologies.

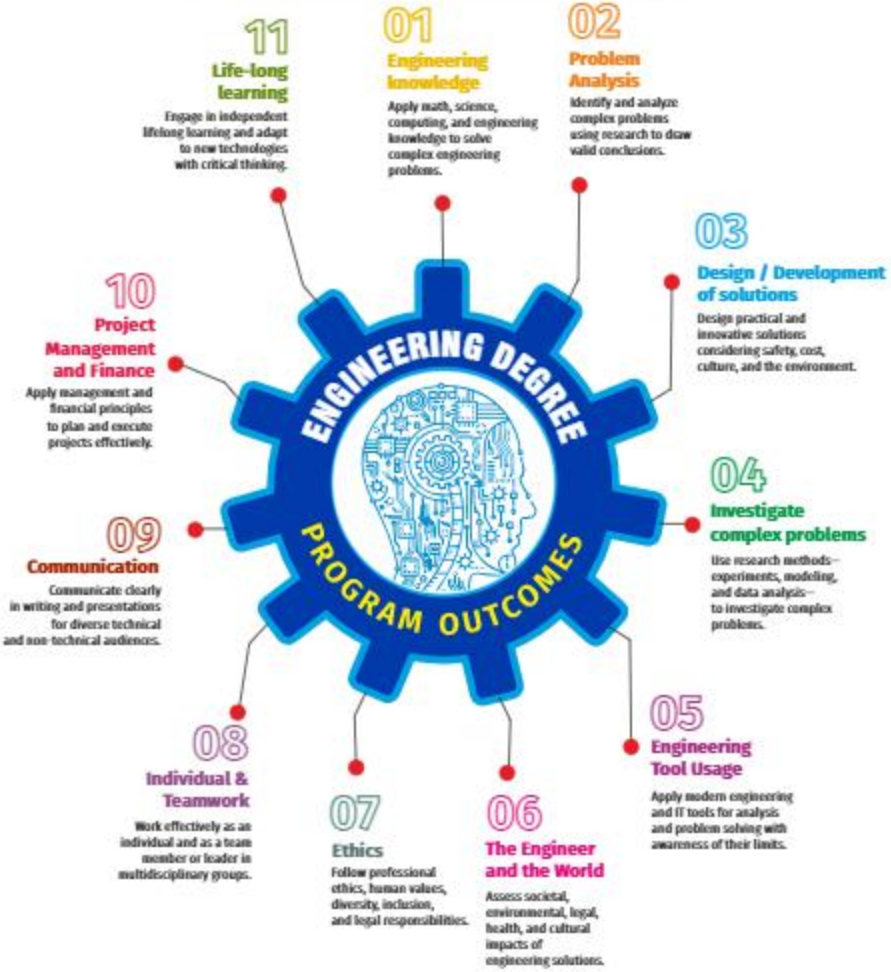
PSO2: Technical Problem-Solving – Graduates will apply analytical and critical thinking skills to address industry challenges, ensuring efficiency, sustainability, and compliance with Industrial standards for Automation applications.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences (BS)	18	32	30
Engineering Sciences (ES)	7	15	12
Humanities and Social Sciences (HS)	8	13	13
Professional Electives (EL)	14	23	23
Program Core + Program Lab (PC+PL)	30	59	49
Program theory with Lab (PW) / Program Lab With Theory (PT)	2	10	6
Open Elective (OE)	7	12	12
Training & Placement (TP)	2	14	4
Innovation & Development (ID) / Project (PJ)	10	32	16
Internships (IN)	2	9	3
Mandatory Courses (MC)	NA	4	NA
Total		**223**	**168**

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



SEMESTER - I

24BSMA101 - SDG NO. 4	MATRICES AND CALCULUS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To develop a strong foundation in matrix algebra and its applications.
- To introduce the concepts of limits, continuity, differentiation, and optimization for functions of several variables.
- To familiarize students with the principles of vector calculus relevant to engineering problems.
- To provide an understanding of double and triple integrals along with their practical applications.
- To impart knowledge of Fourier series and its significance in engineering analysis.

MODULE I MATRICES **12**

Eigenvalues and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem (excluding proof) – Symmetric and orthogonal matrices - Reduce the quadratic to canonical form using orthogonal transformation - Nature of quadratic forms.

MODULE II FUNCTIONS OF SEVERAL VARIABLES **12**

Limits, Continuity - Definitions - Partial derivatives - Taylor's series - Jacobians, Maxima and Minima - Method of Lagrange multipliers.

MODULE III VECTOR DIFFERENTIATION **4**

Scalar and vector valued functions - Gradient and directional derivatives – Tangent plane - Divergence and curl - Irrotational and solenoidal vector fields - Scalar and vector potentials - Vector identities (without proof).

MODULE IV VECTOR INTEGRATION **8**

Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Greens, Gauss divergence and Stoke's theorems - Verification and application in evaluating line, surface and volume integrals. (Cube and Cuboids).

MODULE V MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from cartesian to polar coordinates - Triple integrals – Volume of solids (Spherical and Cylindrical polar coordinates).

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/08/2024

S. Ramachandran
CHAIRMAN
Board of Studies
Humanities & Science

MODULE VI FOURIER SERIES **12**

Fourier series – Convergence of Fourier series - Half range sine and cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
2. Engineering Mathematics for first year, T. Veerarajan, Tata McGraw-Hill, New Delhi, 2008.
3. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, 9th Edition, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

WEB REFERENCES:

1. https://testbook.com/maths/cayley-hamilton-theorem
2. https://www.iitg.ac.in/rafik/Tutorials/MA-102/2013/lect-10.pdf
3. https://ms.unimelb.edu.au/__data/assets/pdf_file/0007/2516596/functions_sev_var.pdf
4. https://www.mecmath.net/VectorCalculus.pdf
5. https://egyankosh.ac.in/bitstream/123456789/64855/1/Unit4.pdf
6. https://williamsgj.people.charleston.edu/Fourier%20Series.pdf

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=oJDlt_Xv-mM
2. https://www.youtube.com/watch?v=8h3yY0im5XU
3. https://www.youtube.com/watch?v=LGxE_yZYigI
4. https://www.youtube.com/watch?v=ma1QmE1SH3I
5. https://www.youtube.com/watch?v=QPw4GYz5Unc
6. https://www.youtube.com/watch?v=1mMYaPkXcNI

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S Narasimhan
CHAIRMAN
Board of Studies
Humanities & Science

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values for functions of several variables. (K3)
3. Compute the derivatives of scalar and vector point functions. (K3)
4. Use the vector point function to establish the relation between line, surface and volume integrals. (K3)
5. Apply double and triple integrals to find the area and the volume of a region. (K3)
6. Compute Fourier series expansion of a function. (K3)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-

SEMESTER - I

24HSEN101 - SDG NO. 4	COMMUNICATIVE ENGLISH	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Develop the basic LSRW skills
- Acquire enhanced knowledge of English grammar
- Improve modern and technical vocabulary
- Enhance the communicative and cognitive skills
- Interpret the texts and write reviews critically

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

MODULE - I COMMUNICATION PROCESS **8**

Listening – informal conversations - Speaking – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - Reading comprehension – skimming/ scanning/ predicting – question & answers – objective and descriptive answers - Writing – paragraph writing, personal notes - Language Development – parts of speech, prefix, suffix, word formation

MODULE - II LANGUAGE BARRIERS, LEVELS AND CHANNELS **8**

Listening –interviews - Speaking – describing a simple process – asking and answering questions - Reading – critical reading – finding key information in a given text – ideation, mind mapping - Writing - dialogue,, instructions – Language Development – regular, irregular verbs, tenses, framing questions,

MODULE - III NARRATION AND SUMMATION **8**

Listening - long texts - TED talks - extensive speech on current affairs - Speaking – role plays – asking about routine actions and expressing opinions - Reading- longer texts & making a critical analysis of the given text - Writing – essay (comparative / analytical), jumbled sentences, recommendations - Language Development – writing single sentence definitions, sequence words

MODULE - IV WRITING MECHANICS **7**

Listening -debates and discussions – practicing multiple tasks –Speaking - self introduction about friends/ places/ hobbies - Reading -Making inference from the reading passage – Predicting the content of the reading passage - Writing – informal letters, e-mails - accuracy, coherence, brevity – Language Development- single word substitutes, compound words- conditionals

MODULE - V INTERPRETATION SKILLS **7**

Listening- popular speeches and presentations - Speaking - impromptu speeches -Reading - articles – magazines - Writing – review writing, channel conversion – bar diagram/ table, poster/ picture interpretation - Language Development – modal verbs, collocations, 21st century vocabulary

MODULE - VI COGENT EXPOSITIONS **7**

Listening - Motivational speeches - Speaking - Debates and discussion - Reading - analytical reading - newspapers - Writing - process description - Language Development - voices, sentences expressing purpose, synonyms & antonyms

TOTAL: 45 PERIODS

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. A Course in Technical English, D. Praveen Sam and K.N. Shoba, Cambridge University Press, 2020

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

ONLINE RESOURCES:

1. https://wwPearson.com/english/catalogue/business-english/technical-english.html
2. https://ww.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Improve understanding and application of listening, speaking, reading, and writing skills (K2)
2. Demonstrate the ability to write personal notes, clear and coherent paragraphs (K2)
3. Apply analytical skills to write essays, rearrange jumbled sentences, and formulate recommendations (K3)
4. Apply skills to develop email etiquette and construct professional emails and informal letters (K3)
5. Analyze and interpret data to write comprehensive and effective reviews (K3)
6. Enhance vocabulary, improve grammatical accuracy, and confidently engage in debates (K2)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Narasimhaiah
CHAIRMAN
Board of Studies
Humanities & Science

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	-	-	-	-	-	-	-	-	3	-	2	-	-
CO4	-	-	-	-	-	-	-	-	3	-	2	-	-
CO5	-	-	-	-	-	-	-	-	3	-	2	-	-
CO6	-	-	-	-	-	-	-	-	3	-	2	-	-

SEMESTER - I

24BSPH101 - SDG NO. 4,7,9,11	ENGINEERING PHYSICS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the basic concepts of mechanics and its use in engineering applications.
- To understand the concept of waves and lasers and its applications.
- To illustrate the various laws of electromagnetic waves and its applications.
- To apply the concepts of quantum mechanics to engineering studies.
- To understand the basics of crystal for engineering applications.
- To identify the basic principles involved in thermal physics and its applications.

MODULE - I PROPERTIES OF MATTER 8

Elasticity – Hooke's law- Poisson's ratio - Stress - strain diagram and its uses - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders.

MODULE - II MECHANICAL WAVES AND LASERS 7

Waves on a string – standing waves – traveling waves – Energy transfer of a wave – Reflection and refraction of light waves – interference –Theory of air wedge and experiment - Theory of laser – characteristics – Spontaneous and stimulated emission – Einstein's coefficients – population inversion – Nd-YAG laser, CO2 laser – Basic applications of lasers in industry.

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

CHAIRMAN Board of Studies Humanities & Science

MODULE - III ELECTROMAGNETIC WAVES 8

The Maxwell's equations – wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field – properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter – polarization – Producing electromagnetic waves – Energy and momentum in EM - Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

MODULE - IV BASIC AND APPLIED QUANTUM MECHANICS 7

Black body radiation – Planck's derivation – Electrons and matter waves –The Schrodinger equation (Time dependent and time independent forms) – significance of wave function – Normalization –Free particle – particle in a infinite potential well: 1D, 2D and 3D Boxes; - Barrier penetration and quantum tunneling (qualitative) – Scanning Tunneling Microscope.

MODULE - V CRYSTAL PHYSICS 8

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - X-Ray diffraction - Calculation of number of atoms per unit cell - Atomic radius - Coordination number – packing. factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy. Crystal Growth: Chochralski technique - Molecular beam epitaxy.

MODULE - VI THERMAL PHYSICS 7

Transfer of heat energy - Conduction, Convection and Radiation - Thermal conductivity, Forbe's method and Lee's disc method - Conduction through compound media - series and parallel methods - Heat exchangers - Refrigerators and Solar water heaters.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattacharya & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu And P.G. Kshirsagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2019

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

REFERENCES:

1. D. Halliday, Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma," Physics for Engineers", PHI Learning Private Limited, 2014.
4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.
7. Arthur Beiser. "Concepts of Modern Physics", McGraw-Hill, 6th Edition. 2003.
8. Charles Kittel, "Introduction to Solid State Physics". John Wiely & Sons. 8th Edition, 2005.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Recall the fundamental knowledge on elasticity and its applications relevant to the field of engineering. (K3)
2. Infer the nature of waves, interaction with medium and to discuss about lasers and its applications (K3)
3. Recognize the properties of electromagnetic waves and its propagation in different medium (K2)
4. Illustrate the black body radiation, dual nature of matter and radiation and application of one dimensional Schrodinger's wave equations to a matter wave system (K3)
5. Explicate the basics of crystal, its structure determination and different growth techniques. (K2)
6. Discuss the heat transfer in different media and its applications. (K3)

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-
CO6	3	3	3	-	-	-	-	-	-	-	-

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - I

24BSCY101 - SDG NO. 4,7,8,9,11,12,17	ENGINEERING CHEMISTRY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To enumerate the importance, synthesis, and applications of polymers.
- To impart basic knowledge of chemistry and the principles involved in electrochemistry, energy storage devices, and their commercial applications.
- To familiarize the fundamental laws and concepts of important photophysical and photochemical processes, as well as spectroscopy.
- To explore the fundamental concepts, laws, and principles of thermodynamics, and apply its derivations to optimize and innovate engineering processes across various disciplines.
- To comprehend the chemistry of fuels and combustion, and their applications across various engineering and industrial processes.
- To gain an understanding of the emergence and challenges of nanomaterials and nanotechnology across various scientific and technological disciplines.

MODULE - I POLYMER CHEMISTRY **8**

Polymers: Definition, Degree of polymerization, Functionality of monomer, Classification of polymer with examples, Types of polymerization, Mechanism of addition polymerization (Free radical mechanism).

Plastics: Definition and Characteristics - Thermoplastics & Thermosets. Preparation, properties and engineering applications of plastics -PVC, Teflon, Kevlar and Bakelite.

Fibers: Characteristics fibers - Preparation, properties and applications of Nylon and Dacron. Biodegradable polymers & Conducting Polymers: Characteristics, Classification and their applications.

MODULE - II ELECTROCHEMISTRY AND BATTERY TECHNOLOGY **7**

Electrochemistry: Types of Cells (Electrochemical and Electrolytic cell) – Redox reaction – Single and Standard electrode potential, Reference electrodes - SHE, Calomel electrode, Measurement of Single Electrode Potential, Nerns't equation (Derivation & Problems), Electrochemical series and its significance.

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

S. Namasivayam
CHAIRMAN
Board of Studies
Humanities & Science

Batteries: Evolution of batteries – Primary and Secondary battery (Lead acid battery), Next Generation Battery Technology (NGBT) - Solid-state batteries (Lithium-ion), Sodium-ion batteries.

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY 7

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination- Photo processes - Jablonski diagram (Internal Conversion, Intersystem crossing, Fluorescence, Phosphorescence), Chemiluminescence and Photo-sensitization.

Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and Rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only).

MODULE - IV CHEMICAL THERMODYNAMICS 8

Terminology of Thermodynamics - Laws of Thermodynamics – I law – Significance – Mathematical formulation and its applications. II law – Need for the II law. Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes, entropy of phase transitions; Clausius inequality. Helmholtz and Gibbs free energy functions, Criteria of spontaneity, Maxwell relations, Gibbs-Helmholtz equation, Van't Hoff Isotherm and Isochore.

MODULE - V FUELS 8

Fuels: Introduction –Classification of fuels – Coal – Analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – Octane number and Cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gas (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of fuels: Introduction – Calorific value – Higher and Lower Calorific values- Theoretical calculation of Calorific value(Dulong formula) – Flue gas analysis (ORSAT Method).

MODULE - VI NANOCHEMISTRY 7

Introduction - Types of nanomaterials - Emergence and challenges in nanotechnology- Synthesis routes for nanomaterials: Bottom-up and top-down approaches - Sol-gel, precipitation, Thermolysis, Laser ablation, Chemical Vapour Deposition (CVD), Electro deposition - Properties of nanomaterials- Mechanical properties, Chemical, Optical, Electrical and Magnetic properties-applications of nanomaterials (Gold nanoparticles as an example). Quantum Dots - concept, properties and applications.

TOTAL: 45 PERIODS

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2019

S. Narasimhan
CHAIRMAN
Board of Studies
Humanities & Science

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand &CompanyLTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P)LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD,New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2024.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi,2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.
4. Chemistry of Nanomaterials Vol.1 S.S.R Kumar Challa (Ed).
5. Advanced chemistry by Phillip Matthews Vol.1 and Vol.2.
6. Chemistry in Engineering and Technology Vol. 1 & 2, J.C. Kuriacose and J. Rajaram.
7. Applied chemistry - A textbook for Engineers and Technologists by H.D. Gesser.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Explain the importance of polymers in science and technology, describe their roles in different applications and discuss their impacts on modern advancements. (K3)
2. Recognize the basic principles of electrochemistry and describe their application in battery technologies. (K3)
3. Apply the concepts of key photophysical and photochemical processes, as well as spectroscopy, to develop and optimize various applications. (K3)
4. Describe the principles of the second law of thermodynamics and its derivations to analyze engineering applications across all disciplines. (K3)
5. Categorize the chemistry of fuels and combustion and their applications at various levels. (K3)
6. Demonstrate the knowledge of nanomaterials, including their properties, behavior, interactions and applications across various disciplines of science and technology. (K3)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

CO-PO, MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	-	-	2	-	-	-	-	-
CO2	3	3	3	-	-	2	-	-	-	-	-
CO3	3	2	3	-	2	-	-	-	-	-	-
CO4	3	2	3	-	-	1	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-
CO6	2	1	2	-	-	-	-	-	-	-	-

SEMESTER - I

24ESPL101 - SDG NO. 4 & 9	PROGRAMMING IN CLABORATORY	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To develop programs in C using basic Programming Constructs.
- To develop applications in C using Arrays and Strings.
- To design and implement applications in C using Functions, Structures.
- To develop applications in C using Files.

LIST OF EXPERIMENTS

1. 1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is a leap year or not? (Hint: not every century is a leap. For example 1700, 1800 and 1900 is not a leap year).
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is an Armstrong number or not.
6. Write a program to check whether a given number is odd or even.
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to print half pyramid of *.

Recommended by
Board of Studies of CSE dept.
Meeting No. 7 Dated: 30-5-24

CHAIRMAN
Board of Studies
Department of Computer Science and Engineering
Sri Sairam Engineering College

10. Write a program to display array elements using two dimensional arrays.
11. Write a program to perform swapping using a function.
12. Write a program to display all prime numbers between two intervals using functions.
13. Write a program to solve towers of Hanoi using recursion.
14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.
19. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:

(a) Total marks obtained by each student.

(b) The highest marks in each subject and the marks of the student who secured it.

(c) The student who obtained the highest total marks.

20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Stand alone desktops with C compiler 30 Nos. (Or)
   Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Apply basic constructs,arrays,strings,functions and recursion for executing C programming applications.(K3)
2. Analyze C programs involving pointers and structures.(K4)
3. Evaluate applications using sequential and random access files.(K5)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	2	-	-	-	-	-	-	1	1
CO2	-	-	3	-	-	-	-	-	-	-	-	1	2
CO3	-	-	3	-	-	-	-	-	-	-	-	2	2

Recommended by
Board of Studies of CSE dept.
Meeting No. 7 Dated: 30-5-24

CHAIRMAN
Board of Studies
Department of Computer Science and Engineering
Sri Sairam Engineering College

SEMESTER - I

24ESGE101 - SDG NO. 4,6,7,9,12, 14 & 15	ENGINEERING GRAPHICS	L	T	P	CP	C
		1	2	0	3	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To visualize the job in three dimensions.
- To have a clear conception and appreciation of the shape, size, proportion and design.
- To expose the student community to existing national standards related to technical drawings.

MODULE - I PLANE CURVES **6+4**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – Drawing of tangents and normal to the above curves.

MODULE - II PROJECTION OF POINTS, LINES AND PLANES **6+4**

Projection of Points (Concept only). Projection (Elevation and Plan) of straight lines, inclined to both reference planes by rotating line method. Projection of plane surfaces, inclined to one of the reference planes by rotating object method.

MODULE - III PROJECTION OF SOLIDS **6+4**

Projection of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes.

MODULE - IV ORTHOGRAPHIC PROJECTION **6+4**

Orthographic Projection - Principles of orthographic projections, Orthographic projection of objects from pictorial view.

MODULE - V SECTION AND DEVELOPMENT OF LATERAL SURFACE 6+4

Projection of sectioned solids (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to HP alone and cutting plane inclined to HP only. Development of lateral surfaces of sectioned regular vertical solids (Prisms, Pyramids, Cylinder and Cone) with cutting plane inclined to HP only.

Recommended by
Board of Studies of Mech. Engg dept.
Meeting No. 8 Dated: 1/6/2024

CHAIRMAN
Board of Studies
Mechanical Engineering

MODULE - VI ISOMETRIC PROJECTIONS **6+4**

Isometric projection – Principle, isometric scale, Isometric views and Isometric projections of truncated solids - Prisms, Pyramids, Cylinder and Cone in simple vertical positions only.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

WEB REFERENCES:

1. https://archive.nptel.ac.in/courses/112/102/112102304/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104148/
2. https://nptel.ac.in/courses/112/103/112103019/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Perform free hand drawing of conical sections and cycloids. (K3)
2. Sketch the orthographic projection of lines and plane surfaces of rectangle, square, pentagon and Hexagon. (K3)
3. Draw the orthographic projection of regular solids like prism, pyramids, cylinder and cone using change of position method. (K3)
4. Draw plan, elevation and side views for the 3dimensional isometric drawing by using the concepts of orthographic projection. (K3)
5. Draw the section and development of lateral surfaces for the regular solids like Prism, Pyramid, Cylinder and Cone for the axis perpendicular to HP. (K3)

Recommended by Board of Studies of Mech. Engg dept. Meeting No. 8 Dated: 1/6/2024

CHAIRMAN
Board of Studies
Mechanical Engineering

6. Draw the isometric view, projection for regular and truncated solids like Prism, Pyramid, Cylinder and Cone. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	-	-	-	3
CO2	3	-	-	-	-	-	-	-	2	-	-	-	3
CO3	3	-	-	-	-	-	-	-	2	-	-	-	3
CO4	3	-	-	-	-	-	-	-	3	-	-	-	3
CO5	3	-	-	-	-	-	-	-	2	-	-	-	3
CO6	3	-	-	-	-	-	-	-	3	-	-	-	3

SEMESTER - I

24HSTA101 - SDG NO. 4	HERITAGE OF TAMILS	L	T	P	CP	C
		1	0	0	1	1

OBJECTIVES:

- Develop interest for classical language and literature to promote Tamil heritage
- Understand the ancient Tamil sculptures, folk and martial arts and contribution of Tamil to the freedom of India

அலகு ஐ மொழி மற்றும் இலக்கியம்

இந்திய மொழிக் குடும்பங்கள் — திராவிட மொழிகள் — தமிழ் ஒரு செம்மொழி — தமிழ் செவ்விலக்கியங்கள் — சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை — சங்க இலக்கியத்தில் பகிர்தல் அறம் — திருக்குறளில் மேலாண்மைக் கருத்துகள்

UNIT I LANGUAGE AND LITERATURE 5

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

அலகு II இடைகால மற்றும் நவீன இலக்கியங்கள்

தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம் — ஆழ்வார்கள் மற்றும் நாயன்மார்கள் — சிற்றிலக்கியங்கள் — தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி — தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramachandran
CHAIRMAN
Board of Studies
Humanities & Science

Unit II MEDIEVAL AND MODERN LITERATURE 5

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.

அலகு III மரபு ஓ பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை

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

UNIT III HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 5

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.

அலகு IV நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

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

UNIT IV FOLK AND MARTIAL ARTS 5

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

அலகு V தமிழர்களின் திணைக் கோட்பாடுகள்

தமிழகத்தின் தாவரங்களும், விலங்குகளும் — தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் — தமிழர்கள் போற்றிய அறக்கோட்பாடு — சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் — சங்ககால நகரங்களும் துறைமுகங்களும் — சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி — கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT V THINAI CONCEPT OF TAMILS 5

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.

அலகு VI இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு — இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் — சுயமரியாதை இயக்கம் —

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2019

CHAIRMAN
Board of Studies
Humanities & Science

இந்தியமருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு — கல்வெட்டுகள், கையெழுத்துப்படிகள் — தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

UNIT VI CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **5**

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.

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் 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. Tnirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

Upon completion of the course, the learners will be able to:

1. மொழிக் குடும்பங்களின் வரலாறு மற்றும் தமிழ் இலக்கியங்களை மதிப்பிடுகிறார்கள் Students evaluate the history of language families and Tamil literatures (K3)
2. பக்தி மரபுகளின் தாக்கம் பெற்ற தமிழ் இலக்கியங்களைப் புரிந்துகொள்கிறார்கள் Students understand Tamil literatures influenced by Philosophical and religious traditions (K3)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

CHAIRMAN
Board of Studies
Humanities & Science

3. தமிழகத்தின் பாறை, சிற்பம், ஓவியம்- கலை மரபுகளைப் பகுப்பாய்வு செய்கிறார்கள் Students analyze the artistic traditions of Tamil Nadu such as rock art, sculpture, and painting (K3)
4. தமிழக நாட்டுப்புறக் கலைகள் மற்றும் தற்காப்புக் கலைகளின் மாண்புகளை உணர்ந்து கொள்கிறார்கள் Students realize the significance of Tamil Nadu's folk arts and martial arts (K3)
5. பழந்தமிழரின் திணையியல் வாழ்வியலை மீளாய்வு செய்கிறார்கள் Students re-examine the ecological lifestyle (Thinai-based life) of the ancient Tamils (K3)
6. தேசிய இயக்கம் மற்றும் இந்தியப் பண்பாட்டில் தமிழர்களின் பங்களிப்பினை நினைவுகூர்கிறார்கள் Students recall the contribution of Tamils to the National Movement and Indian culture (K3)

CO-PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	-	-	-	-	-	-	2	2	2
CO3	2	3	3	-	-	-	-	-	-	-	2	2	2
CO4	2	3	3	-	-	-	-	-	-	-	2	2	2
CO5	2	3	3	-	-	-	-	-	-	-	2	2	2
CO6	2	3	3	-	-	-	-	-	-	-	2	2	2

SEMESTER - I

24BSPL101 - SDG NO. 6,11,12,17	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	CP	C
		0	0	4	4	2

PHYSICS LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

- Demonstrate the wave nature of light using diffraction and interference properties.
- Study the thermal conductivity of a bad conductor.
- Verify experimentally the elastic properties of materials.

Sl.No. **Name of the Experiment**

1 (a) Determination of wavelength of Laser

(b) Determination of numerical aperture and acceptance angle in an optical fiber.

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 21/08/2024

S. Ramesh
CHAIRMAN
Board of Studies
Humanities & Science

(c) Determination of particle size using laser source.

2 Determination of thermal conductivity of a bad conductor – Lee's Disc method.

3 Determination of Young's modulus by non-uniform bending method.

4 Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.

5 Find out the thickness of the given wire by air wedge method.

6 Calculation of lattice cell parameter – X-ray diffraction method.

7 Determination of Planck's constant.

8 Determination of wavelength of mercury spectrum – spectrometer grating.

9 Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.

10 Determination of band gap of a semiconductor.

11 Determination of Hall coefficient by Hall Effect experiment.

12 Determination of solar cell characteristics.

CHEMISTRY LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

- To acquaint students with practical knowledge of the basic concepts of chemistry that they will encounter during their studies and in the industry and engineering fields.
- To acquaint students with the determination of the molecular weight of a polymer by viscometry.
- To develop and understand the basic concepts of acidic and basic nature using pH.

Sl.No.	Name of the Experiment
1	Conductometric titration of strong acid vs strong base.
2	Determination of chloride content of water sample by Argentometric method.
3	Determination of strength of acids in a mixture of acids using conductivity meter.
4	Determination of total, temporary & permanent hardness of water by EDTA method.
5	Estimation of iron content of the given solution using potentiometer.

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Narasakrishnaiah
CHAIRMAN
Board of Studies
Humanities & Science

6	Determination of DO content of water sample by Winkler's method.
7	Determination of strength of given hydrochloric acid using pH meter.
8	Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method).
9	Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.
10	Determination of molecular weights of polymer samples using Ostwald's Viscometer.
11	Synthesis of nano-CdS by precipitation. (Demonstration only)
12	Corrosion experiment-weight loss method.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Engineering Physics Lab, Dr. G. SenthilKumar, VRB publishers. (2019)
2. Engineering Physics Practical, Dr. P. Mani, Dhanam Publications. (2020)

TEXTBOOK:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition,2014).
2. Practical Physical chemistry by B. Viswanathan, P. S. Raghavan (Vivabooks), 2009.
3. Foundation of Experimental Chemistry by Jubaraj B. Baruah, Parikshit Gogoi, 2010.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Apply the principles of elasticity and thermal physics to evaluate the various modulus of elasticity and conductivity of a bad conductor. (K3)
2. Explicate the properties of semi conductors by evaluating the band gap, I-V characteristics of solar cell and Hall effect of the materials. (K3)
3. Describe multiple measurement techniques, including volumetric titrations, conductivity, pH, redox potential and optical density measurements, used to estimate the amount of substance present in a solution. (K3)
4. Apply spectroscopic techniques, viscometry, synthesize nano particles, analyze the corrosion behaviour of materials in different environments. (K3)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

CHAIRMAN
Board of Studies
Humanities & Science

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	2	-	-	-	-	-	2
CO2	3	3	-	-	2	-	-	-	-	-	2
CO3	3	3	-	-	2	-	-	-	-	-	2
Co4	3	3	-	-	2	-	-	-	-	-	2

SEMESTER - I

24ESPL101 - SDG NO. 4 & 9	PROGRAMMING IN CLABORATORY	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To develop programs in C using basic Programming Constructs.
- To develop applications in C using Arrays and Strings.
- To design and implement applications in C using Functions, Structures.
- To develop applications in C using Files.

LIST OF EXPERIMENTS

1. 1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is a leap year or not? (Hint: not every century is a leap. For example 1700, 1800 and 1900 is not a leap year).
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is an Armstrong number or not.
6. Write a program to check whether a given number is odd or even.
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to print half pyramid of *.
10. Write a program to display array elements using two dimensional arrays.
11. Write a program to perform swapping using a function.
12. Write a program to display all prime numbers between two intervals using functions.

Recommended by
Board of Studies of CSE dept.
Meeting No. 7 Dated: 30-5-24

CHAIRMAN
Board of Studies
Department of Computer Science and Engineering
Sri Sairam Engineering College

13. Write a program to solve towers of Hanoi using recursion.
14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.
19. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:

(a) Total marks obtained by each student.

(b) The highest marks in each subject and the marks of the student who secured it.

(c) The student who obtained the highest total marks.

20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Stand alone desktops with C compiler 30 Nos. (Or)
   Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Apply basic constructs,arrays,strings,functions and recursion for executing C programming applications.(K3)
2. Analyze C programs involving pointers and structures.(K4)
3. Evaluate applications using sequential and random access files.(K5)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	2	-	-	-	-	-	-	1	1
CO2	-	-	3	-	-	-	-	-	-	-	-	1	2
Co3	-	-	3	-	-	-	-	-	-	-	-	2	2

Recommended by
Board of Studies of CSE dept.
Meeting No. 7 Dated: 30-5-24

CHAIRMAN
Board of Studies
Department of Computer Science and Engineering
Sri Sairam Engineering College

SEMESTER - I

24ESID101 - SDG NO. 1-17	IDEA ENGINEERING LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To understand the significance of Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) of the United Nations
- To familiarize with SDG targets and indicators
- To identify the Constitutional implementation pertaining to SDGs in Panchayat Raj
- To acquire knowledge of the State and the Central government welfare schemes
- To recognize the role of educational Institutions in community development
- To develop critical thinking skills to address complex societal challenges through an immersion program

MODULE - 1 United Nations Sustainability and the Sustainable Development Agenda 3

- Introduction to Sustainability
- Indian Rural Environment: Necessity and Sustainability
- Millennium Development Goals (MDGs)
- United Nations Sustainable Development Goals (SDGs) & the Agenda
- Overview of the Sustainable Development Goals (SDGs)

MODULE - 2 Universal SDG Targets 4

- SDG Framework
- Key Components
- Pillars of the SDGs
- Targets of the Goals
- Indicators of the Targets

MODULE-3 SDG and Indian Gram Panchayat 3

- Gram Panchayat
- Salient Features of Constitutional Amendments
- Transition from SDGs to LSDGs (Localizing Sustainable Development Goals)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 21/12/24.

CHAIRMAN
Board of Studies
Humanities & Sciences

MODULE-4 Government Schemes 4

- Introduction to State and Central Government Schemes
- Overview of Government Schemes
- Localization and Implementation at the Regional Level
- Impact on Local Communities

MODULE-5 Community Engagement 4

- Key Recommendations of the National Education Policy
- Guidelines for Fostering Social Responsibility
- Awareness
- Participation
- Collaboration

MODULE-6 Idea Generation 12

- Immersion Program
- Focus Areas
- Channelizing Ideas
- Forming Working Teams for SDGs (Sustainable Development Goals)

TOTAL: 30 PERIODS

REFERENCES:

1. Joy Elamon and Ms. Mariamma Sanu George,"The Handbook on Sustainable Development Goals and Gram Panchayats" , State Institute for Rural Development (SIRD).
2. Dr.C.R.Rene Robin, Dr.PA.Shanthi , Dr.B.Thanuja & Dr.V.Yuvaraj ,"Sairam SDG Idea Engineering Lab I", Sri Sairam Engineering College.

WEB REFERENCES

1. UN Sustainable Development Goals
2. https://srmuniv.digimat.in/nptel/courses/video/109106200/L30.html
3. https://avcce.digimat.in/nptel/courses/video/109106200/L26.html

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Analyse and apply the concepts of sustainability,Rural environment,Gram panchayat and various government schemes to design innovative practical solutions that address real life rural challenges. (K2)
2. Compare MDG's,SDG's and LSDG's to analyse village topology and identify specific development targets to propose innovative rural solutions. (K4)

Recommended by
Board of Studies of MBA dept.
Meeting No. 6 Dated: 9/5/2024

CHAIRMAN
Board of Studies
Humanities & Science

3. Analyse the attainment levels of SDG's and write a reflective report on local community.(K4)
4. Formulate problem statement based on local community needs and propose innovative ideas for community development. (K4)
5. Perform an individual presentation of field observation by mapping them with relevant SDG's and justify their significance for rural development. (K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	1	-	-	-	2	-	-	1	-	2
CO4	-	2	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	-	3	2	3	1

Recommended by

Board of Studies of H&S dept.

Meeting No. 6 Dated: 31/5/2024

S. Narasimhan

CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - I

24ENTP101 - SDG NO.4	FUNCTIONAL LIFE SKILLS	L	T	P	CP	C
		1	0	1	2	1

OBJECTIVES:

- Resolve common communication problems
- Observe the effectiveness of nonverbal messages
- Communicate precisely through the digital media
- Understand the importance of empathetic listening
- Explore reading and speaking processes

MODULE - I LISTENING 5

Techniques of effective listening
Listening and comprehending
Probing questions
Barriers to listening
Reflection from listening

MODULE - II SPEECH MECHANICS 5

Pronunciation
Enunciation
Vocabulary
Fluency
Common errors

MODULE - III READING SKILLS 5

Techniques of effective reading
Kinds of reading
Gathering ideas and information from the text
Evaluating the ideas and information
Interpreting the text from multiple angles

MODULE - IV WRITING ASPECTS 5

Writing process
Effective writing strategies
Different modes of writing
Optimizing the use of resources
Editing

Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

CHAIRMAN
Board of Studies
Humanities & Science

MODULE - V PRESENTATION SKILLS **5**

Types of presentations
Nonverbal communication
Understanding the purpose and the audience
Beginning and closure of presentations
Presentation tools and strategies

MODULE - VI ARTICULATION ASPECTS **5**

Perform exercises
Slow speeches
Long speeches
Monologues, Dialogues and Conversation
Feedback necessity

TOTAL : 30 PERIODS

REFERENCES:

1. Sen, Madhuchanda.2010, An Introduction to Critical Thinking, Delhi, Pearson.
2. Effective Communication Skills Strategies for Success. Edited by Nitin Bhatnager and Mamta Bhatnager. 2023, Pearson
3. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma. Oxford University Press, 2015

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Employ reading, writing, and listening skills to communicate clearly in academic and professional contexts.
2. Demonstrate confident oral communication and presentation skills using appropriate tools and techniques.
3. Interpret ethical, inclusive, and culturally aware communication in team and societal settings

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Narasimhan
CHAIRMAN
Board of Studies
Humanities & Science

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	-	-	-	-	-	-	-	3	2	-	2	-	-

Recommended by
Board of Studies of H&S dept,
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - II

24BSMA202 - SDG NO. 4	DIFFERENTIAL EQUATIONS, COMPLEX VARIABLES AND TRANSFORMS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- The objective of this course is to familiarize the prospective engineers with techniques in Ordinary differential equations, Complex variables, Z - Transforms, Fourier Transforms and Laplace transforms. It aims to equip the students to deal with advanced levels of mathematics and applications that would be essential for their disciplines.

MODULE - I ORDINARY DIFFERENTIAL EQUATIONS **12**

Second and Higher order linear differential equations with constant coefficients - Method of variation of Parameters -Homogeneous equation of Euler's and Legendre's type - System of simultaneous first order linear differential equations with constant coefficients.

MODULE- II COMPLEX VARIABLES **9**

Analytic functions – Necessary and sufficient conditions for analyticity in cartesian and polar coordinates (without proof)- Properties- Harmonic Conjugate-Construction of analytic functions-Conformal mapping -Bilinear transformation ($w = 1/z$).

MODULE - III COMPLEX INTEGRATION **9**

Cauchy- Goursat theorem (without proof) - Cauchy Integral formula (without proof) - Zeroes of Analytic functions - Singularities - Laurent's Series - Residues – Cauchy Residue theorem (without proof).

MODULE - IV LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of Unit step function and Unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives – Transform of Periodic functions - Inverse Laplace Transforms - Initial and Final value theorems – Convolution theorem (excluding proof) –- Application of solution of linear second order ordinary differential equations with constant coefficients.

MODULE - V FOURIER TRANSFORMS **9**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Convolution theorem – Parseval's identity.

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

CHAIRMAN Board of Studies Humanities & Science

MODULE - VI Z-TRANSFORMS **9**

Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kresizg, 9th Edition, John Wiley & Sons, 2006.
2. Advanced Modern Engineering Mathematics, Glyn James, 3rd Edition, Pearson Education, 2010.

REFERENCES:

1. Higher Engineering Mathematics, Dass, H.K., and Er. Rajnish Verma, Reprint, S. Chand Private Ltd., 2011.
2. Higher Engineering Mathematics, B.S. Grewal, 44th Edition, Khanna Publishers, 2023.
3. Advanced Engineering Mathematics, Peter V. O'Neil, 7th Edition, Cengage learning, 2012.
4. An Introduction to Ordinary Differential Equations, E. A. Coddinton, 1st Edition, Prentice Hall, 1961.
5. Higher Engineering Mathematics, Ramana. B.V., 11th Reprint, Tata McGraw-Hill, New Delhi, 2010.
6. A Text Book of Engineering Mathematics, N. P. Bali and Manish Goyal, Reprint, Laxmi Publications, 2008.

WEB COURSES:

1. http://archive.nptel.ac.in/courses/111/106/111106100/
2. https://nptel.ac.in/courses/111105134/ (Week-3 Complex Differentiation)
3. https://nptel.ac.in/courses/111105134 (Week 4 Complex Integration)
4. https://archive.nptel.ac.in/courses/111/106/111106111/
5. http://www.nptelvideos.com/course.php?id=90

ONLINE RESOURSES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/lecture-1-introduction/
2. https://ocw.mit.edu/courses/18-04-complex-variables-with-applications-spring-2018/

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

CHAIRMAN
Board of Studies
Humanities & Science

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

1. Solve ordinary differential equations of second and higher order with constant coefficients, variable coefficients and simultaneous linear differential equations. (K3)
2. Construct an analytic function and apply the properties of analytic functions to check for harmonic and orthogonal functions and find the images of circle and straight lines under the standard transformations. (K3)
3. Use Cauchy's integral theorem, formula and Cauchy's Residue theorem to evaluate complex and real integrals, find the Taylor's and Laurent's series expansion. (K3)
4. Apply Laplace and inverse Laplace Transforms to solve the linear ordinary differential equations with constant coefficients. (K3)
5. Find Fourier transforms and Fourier sine and cosine transforms of simple functions. (K3)
6. Solve difference equations using Z-transforms. (K3)

CO-PO, MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	3	3
CO6	3	-	-	-	-	-	-	-	-	-	-	3	3

SEMESTER - II

24HSEN201 - SDG NO.4	PROFESSIONAL ENGLISH	L	T	P	CP	C
		2	0	0	2	2

OBJECTIVES:

- Acquire techniques for comprehending and critically analyzing passages
- Improve the communicative competence
- Enhance learners' ability to read and write complex texts, summaries, definitions and reports
- Write effective formal letters and reports

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/08/2024

S. Narasimhan CHAIRMAN Board of Studies Humanities & Science

- Develop skills for preparing effective job application

MODULE - I EFFECTIVE COMMUNICATION **6**

Listening – Listening to conversations – Speaking – making conversations in real life occurrences – Reading - short stories, happenings - Writing – autobiographical writing, preparation of checklist – communication and types of communication – Language Development –- subject - verb agreement, commonly confused words – spellings

MODULE - II BASICS OF TECHNICAL WRITING **5**

Listening – listening to advertisements and products – Speaking - creating greetings/wishes/excuses and thanks – Reading – articles/novels - Writing - summary of articles, writing modes, formats, compositions - Language Development - reported speech, numerical adjectives

MODULE - III REPORT WRITING **4**

Listening – listening to podcasts – Speaking - practicing telephonic conversations – observing and responding. Reading – regular columns of newspapers/magazines - Writing – reports – feasibility, accident, preparation of agenda and minutes – Language Development - cause & effect expressions, discourse markers

MODULE - IV DIVERSE WRITING SKILLS **5**

Listening – documentaries, anecdotes and short stories - Speaking – expressing opinions using verbal and non-verbal communication – Reading biographies/autobiographies, travelog, – Writing – formal letters – inviting guests – acceptance/declining letters - Language Development- degrees of comparison – embedded sentences - acronyms and abbreviations

MODULE - V CAREER COMPETENCIES **6**

Listening – expert talks – recommending suggestions & solutions – Speaking – Debate- participating in a group discussion – learning GD strategies – Reading – innovations, ideations - Writing – Job application, resume, – proposals – Language Development – verbal analogies – phrasal verbs

MODULE - VI LEXICAL ENHANCEMENT **4**

Listening - technical and general talks - Speaking - oral presentation with visual aids - Reading - successful stories/autobiographies - Writing - writing blogs - Language Development - common errors in English, idiomatic expressions

TOTAL: 30 PERIODS

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan CHAIRMAN Board of Studies Humanities & Science

TEXT BOOKS:

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Raman, Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford University Press.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi, Sharma, Sangeeta. Technical Communication. Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan & Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamil Nadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Vesilind Aarne P., Public Speaking and Writing Skills for Engineering Students (2nd Ed), Lakeshore press, 2007
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://takelessons.com/en-in/search?service=English&sort=1&utm_

ONLINE RESOURCES:

1. https://www.coursera.org/specializations/improve-english?
2. https://www.fluentu.com/blog/educator-english/business-english-conversation-topics/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Demonstrate an understanding of various types of communication and prepare effective checklists.(K2)
2. Summarize articles/ write ups (K2)
3. Construct feasibility reports, accident reports, survey reports and meeting minutes (K3)
4. Apply skills to compose official letters with emphasis and clarity (K3)
5. Compose job applications and technical proposals (K3)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Lavanya
CHAIRMAN
Board of Studies
Humanities & Science

6. Demonstrate the ability to express opinions in both oral and written forms of communication (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	1	3	-	3	-	-
CO6	-	-	-	-	-	-	-	1	3	-	3	-	-

SEMESTER - II

24BSPH206 - SDG NO. 4, 7, 9	PHYSICS FOR INSTRUMENTATION ENGINEERING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To acquaint the electrical properties of materials.
- To enlighten the basic principles of semiconductor physics.
- To become proficient in magnetic materials.
- To acquaint the basics of optical materials and their applications
- To acquire the fundamentals of dielectric materials
- To understand the basics of nanoelectronic devices and quantum computing.

MODULE - I ELECTRICAL PROPERTIES OF CONDUCTING MATERIALS 8

Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, expression – Quantum free electron theory:– Fermi-Dirac statistics –Variation of Fermi energy with temperature-Density of energy states-Carrier concentration– Electron in periodic potential – Energy bands in solids – Electron effective mass – Concept of hole.

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

MODULE - II SEMICONDUCTORS AND TRANSPORT PHYSICS **7**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode (qualitative).

MODULE - III MAGNETIC PROPERTIES OF MATERIALS **8**

Magnetic materials: Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro & Ferri) – Domain Theory of Hysteresis– Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – applications – Magnetic principle in computer data storage - Magnetic hard disc - GMR sensor.

MODULE - IV OPTICAL PROPERTIES OF MATERIALS **7**

Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode – laser diode –Modulators (Optical Modulator) and switching devices (Coupler) (qualitative) – plasmonics. Organic LED - Optical data storage techniques and devices.

MODULE - V DIELECTRIC PROPERTIES OF MATERIALS **7**

Dielectric Polarization and Mechanism (qualitative) – Internal or local Field Clausius Mossotti relation – Dielectric loss Temperature and frequency dependence of dielectric constant – Dielectric breakdown – Measurement of Dielectric constant and loss using Schering bridge – Elementary ideas of Piezoelectric, Ferroelectrics and Pyroelectric materials and its Applications.

MODULE - VI NANODEVICES AND QUANTUM COMPUTING **8**

Introduction to nanomaterials – quantum confinement – quantum structures: quantum wells, wires and dots - band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade – single electron transistor– Quantum system for information processing- Quantum states- classical bits- Quantum bits or qubits-CNOT gate –multiple qubits - Bloch sphere - Quantum sphere- Quantum gate –advantage of quantum computing over classical computing.

TOTAL = 45 PERIODS

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Narayanan
CHAIRMAN
Board of Studies
Humanities & Science

TEXT BOOKS:

1. S.O.Pillai "Solid State Physics", New Age International Publishers, 5th Edition, New Delhi.2018.
2. S.O.Kasap, "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2017.
3. P.K.Palanisamy, "Physics for Electronics Engineering", Scitech Publication, 2018.
4. S. Salivahanan, A. Rajalakshmi, S. Karthie, N.P.Rajesh, "Physics for Electronics Engineering and Information", McGraw Hill Education, 2018.
5. G.W.Hanson, "Fundamentals of Nanoelectronics". Pearson Education, 2011.

REFERENCES:

1. C.Kittel, "Introduction to Solid State Physics", Wiley, 2018.
2. B. Rogers, J. Adams & S.Pennathur, "Nanotechnology: Understanding Small Systems", CRC Press, third edition, 2017.
3. N.K.Verma, "Physics for Engineers", PHI Learning Private Limited, 2017.
4. H.C.Marcel Van de Voorde, Robert Puers, LivioBaldi, Abstiaan Evan Nooten, "Nanoelectronics: Materials, devices and application", Wiley VCH, 2017.
5. MoriakiWakaki, "Optical materials and Applications" CRC Press, 2018.
6. Umesh K Mishra &Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2014.
7. W.D.Callister., "Materials Science and Engineering: An introduction", John Wiley & Sons Inc., New York, 6th Edition, 2002.
8. V. Raghavan. "Materials Science and Engineering – A first course", Prentice Hall, New Delhi.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Explore the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K3)
2. Analyze the band structures and carrier concentrations of semiconductors, study their variations with temperature, and examine carrier transport mechanisms (K4)
3. Have an insight into the different types of magnetic materials and magnetic data storage device (K3)
4. Examine the optical processes in materials and analyze the operation of optoelectronic devices (K4)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

5. Elucidate the different types of polarization mechanisms, measurement of dielectric loss and the applications of piezo, pyro, ferroelectric materials (K3)
6. Analyze quantum confinement, quantum structures and quantum computing concepts to examine the working principles of quantum devices and explore operation of quantum gates (K4)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-
CO6	-	3	-	-	-	-	-	-	-	-	-

SEMESTER - II

24BSCY201 - SDG NO. 4	CHEMISTRY FOR ENVIRONMENT AND SUSTAINABILITY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To gain a comprehensive understanding of environmental science, the intricate relationships within ecosystems, and the crucial role of biodiversity conservation..
- To introduce the structure and components of the atmosphere, and provide an overview of the photochemical reactions involved.
- To foster a sound understanding of water quality parameters and water treatment techniques.
- To explore the various components of soil and understand the steps involved in Solid Waste Management (SWM).
- To advocate the benefits of renewable energy and promote awareness of sustainable energy practices. .
- To implement the principles of Green Chemistry in alignment with the Sustainable Development Goals (SDGs).

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

S. Lavakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

MODULE - I INTRODUCTION TO ENVIRONMENTAL SCIENCE 8

Environment: Definition, concept of environment and its components - scope and importance of environment – need for public awareness.

Ecosystem: Structure and functions: Structures - Biotic and Abiotic components. Functions - Energy flow in ecosystems, food chains and food webs. Biogeochemical cycles(C,N&P), Ecological succession.

Biodiversity and its conservation: Definition, types, importance of biodiversity, values and threats to biodiversity. Endangered and endemic species - concept and basis of identification of 'Hotspots'; hotspots in India. Strategies for biodiversity conservation: in situ, ex situ and in vitro conservation.

MODULE - II ATMOSPHERIC CHEMISTRY 7

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect - role of greenhouse gases (CO_2, CH_4, N_2O, CFCs) on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures).

MODULE - III WATER CHEMISTRY 8

Importance and scope of water chemistry - Sources and impurities in water - Water Quality Parameters - Specifications as per WHO/BIS standards. Hardness of water, types, numerical problems on hardness of water. Softening of water - Internal treatment (Lime-soda, Phosphate, Calgon, Sodium Aluminate and Colloidal conditioning). External treatments: Ion exchange and Zeolite processes. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water by Reverse osmosis. Sustainable water management practices (water recycling and rainwater harvesting)

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT 7

Soil Chemistry: Chemical composition of soil, Acid-Base and Ion-Exchange Reactions in Soil, Soil acidity and salinity. Importance of NPK in Soil Fertility. Modern agriculture - Impacts of both excessive and insufficient fertilizer use, alongside the effects of pesticides on soil chemistry and the environment. Sustainable agriculture - Approaches to improve soil salinity (leaching, soil amendments, crop rotation), Design and use of green pesticides for sustainable farming.

Solid Waste Management System: Sources and types of solid waste, Elements of solid waste management, Methods of residential and commercial

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

CHAIRMAN
Board of Studies
Humanities & Science

waste collection, Treatment / processing - Incineration, Composting, Landfill - Dumpsite rehabilitation.

MODULE - V ENERGY AND ENVIRONMENT **8**

Energy sources – Renewable and non-renewable energy sources. Principle and generation of solar energy (solar collectors, photo-voltaic modules, solar ponds), wind energy, geothermal energy; tidal energy, OTEC energy from biomass, biofuels, Nuclear energy - fission and fusion, Nuclear fuels, Nuclear reactor – principles and types. Need for energy efficiency, Energy conservation and sustainability - action strategies for sustainable energy management from a future perspective.

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY **7**

Green Chemistry: Introduction to green chemistry, Principles of Green Chemistry (12-principles), the concept of atom economy and chemical synthesis, Important techniques used in green chemistry. Application of green chemistry, viz. replacement of ozone depleting substances including CFCs, manufacture of biodegradable polymers, use of H2O2 as benign bleaching agents in the paper industry.

Sustainable Development: Definition and concepts of sustainable development, Need for sustainable development; Sustainable development goals – 17 SDG goals.

Sustainable practices: Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment and Environmental Impact Assessment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.
4. Vogel's Textbook of Quantitative Chemical Analysis (8th edition,2014).

REFERENCES:

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press (I) PVT. LTD, Hyderabad, 2015.

Recommended by Board of Studies of EIE Meeting No. 6 Dated: 31/08/2024

S. Narasakkumaran
CHAIRMAN
Board of Studies
Humanities & Science

3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Chemistry for Environmental Engineering, Clair N. Sawyer, Perry L. Mc Carty, Gene F. Parkin, 4th Edition, McGraw-Hill.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Develop a foundational understanding of environmental science, the interactions within ecosystems, the significance of biodiversity, and the importance of conservation strategies for maintaining ecological balance. (K3)
2. Identify the primary components of the atmosphere, explain the causes of atmospheric pollution, and propose basic strategies to promote a sustainable and clean atmosphere. (K3)
3. Demonstrate complex water quality parameters, and develop innovative methods for producing cost-effective soft water suitable for both industrial use and potable consumption. (K3)
4. Describe the composition and functions of soil components, analyze the sources and characteristics of solid wastes, and evaluate the methods and strategies employed in solid waste management (SWM). (K3)
5. Explain renewable and non-renewable resources, describe various methods for harnessing energy from different sources and explain their applications in various contexts. (K3)
6. Illustrate a comprehensive understanding of green chemistry principles and their alignment with sustainable development goals, preparing them to contribute to environmentally friendly and sustainable practices in their future careers.(K3)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	3	2	1	-	-	-	-	-	-

Recommended by -
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - II

24EEPC201 108105159 SDG NO. 4 & 9	CIRCUIT THEORY	L	T	P	CP	C
		2	1	0	3	3

OBJECTIVES:

- To utilize the concepts of basic laws for solving DC circuits.
- To apply the fundamentals of AC circuits to solve mesh current and node voltage method.
- To apply Network theorems to simplify for both DC and AC circuits
- To solve the Transient response of circuits for RL, RC and RLC circuits with DC and AC input.
- To develop the Frequency response for resonance circuits, single tuned circuits.
- To develop the performance parameters of three phas ystems and power measurement.

MODULE - I BASIC DC CIRCUITS ANALYSIS 7

Resistive elements - Ohm's law Resistors in series and parallel circuits – Kirchoff's law- Network reduction-Voltage and current division, source transformation – Star Delta conversion - Mesh current and node voltage methods for DC circuits.

MODULE - II FUNDAMENTALS OF AC CIRCUITS ANALYSIS 7

AC Fundamentals- Average and RMS value - Phasor diagram – Power, Power factor and energy – Mesh current and node voltage methods for AC circuits.

MODULE - III NETWORK THEOREMS FOR DC AND AC CIRCUITS 7

Superposition theorem - Thevenin's and Norton's theorems – Maximum power transfer theorem.

MODULE - IV TRANSIENT RESPONSE ANALYSIS 8

R, L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and AC sinusoidal input.

MODULE - V RESONANCE AND COUPLED CIRCUITS 8

Series and parallel resonance–Frequency response – Quality factor and bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

Recommended by Board of Studies of EEE dept. Meeting No. 6 Dated: 30.5.2024

CHAIRMAN Board of Studies Electrical and Electronics Engineering

MODULE - VI THREE PHASE CIRCUITS 8

Three phase 3-wire and 4-wire circuits - Star and delta connection for balanced and un balanced loads– Phasor diagram of voltages and currents – Power and power factor measurement in three phase circuits.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, Fifth Edition, 2015.
2. Charles K.Alexander, Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Sixth Edition, McGraw Hill, 2022.
3. Joseph A.Edminister, Mahmood Nahri, "Electric circuits", (Schaum's outline series), Mc Graw- Hill, New Delhi, Fifth edition, 2010.

REFERENCES:

1. Chakrabarti A, "Circuits Theory Analysis and Synthesis", Dhanpath Rai & Sons, New Delhi, Seventh edition, 2023.
2. A Nagoor kani, "Circuit Analysis," McGraw Hill, First edition, 2018
3. William H. Hayt, Jack Kemmerly, Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill, ninth edition, 2020.
4. Mahadevan K ,Chitra C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, Second edition, 2018.
5. Richard C. Dorf and James A.Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc., 9th edition, 2015.

WEB RESOURCES:

1. https://www.edx.org/learn/circuits/massachusetts-institute-of-technology-circuits-and- electronics-1-basic-circuit-analysis
2. https://www.circuit-magic.com/
3. https://www.khanacademy.org/science/electrical-engineering/ee-circuit-analysis-topic

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/108/102/108102097/
2. https://archive.nptel.ac.in/courses/108/105/108105159/
3. https://onlinecourses.nptel.ac.in/noc22_ee90/preview

Recommended by
Board of Studies of EEE dept.
Meeting No. 6 Dated: 30.5.2024

CHAIRMAN
Board of Studies
Electrical and Electronics Engineering

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Apply Ohm's law, Kirchhoff's laws, star-delta conversion, mesh current and node voltage methods in DC circuits. (K3)
2. Apply basic AC fundamentals and mesh and nodal techniques in AC circuits. (K3)
3. Make use of Superposition, Thevenin's, Norton's and Maximum power transfer theorems for network reduction of DC and AC circuits. (K3)
4. Solve the transient response of RL, RC, RLC circuits using Laplace transforms for DC and AC inputs. (K3)
5. Develop the frequency response of series and parallel resonance circuits and single tuned circuits. (K3)
6. Develop the performance parameters of three phase three wire and four wire circuits for various conditions. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2	2
CO3	3	3	2	-	-	-	-	-	-	-	-	2	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2	2
CO6	3	3	2	-	-	-	-	-	-	-	-	2	2

SEMESTER - II

24HSTA201 - SDG NO. 4	TAMILS AND TECHNOLOGY	L	T	P	CP	C
		1	0	0	1	1

OBJECTIVES:

- Understand the techniques that help for a better livelihood
- Identify the methods used for scientific Tamil computing

அலகு-I நெசவு மற்றும் பானைத் தொழில்நுட்பம்

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

Recommended by
Board of Studies of EEE dept.
Meeting No. 6 Dated: 30.5.2024.

UNIT-I WEAVING AND POTTERY (CERAMIC) TECHNOLOGY 5

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

அலகு -II சங்ககாலவடிவமைப்புகள்

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள்ரூசங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும்நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்.

UNIT-II SANGAM AGE DESIGNS 5

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

அலகு -III பழங்காலகட்டிடத் தொழில்நுட்பம்

மாமல்லபுரச்சிற்பங்களும், கோவில்களும் - சோழர்காலத்துப்பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டுவீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக்கட்டிடக் கலை.

UNIT-III ANCIENT CONSTRUCTION TECHNOLOGY 5

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.

அலகு- IV உற்பத்தித் தொழில்நுட்பம்

கப்பல் கட்டும் கலை -உலோகவியல் -இரும்புத் தொழிற்ச..லை இரும்பை உருக்குதல், எஃகு - வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்ை நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் சங்கு மணிகள் -எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT-IV MANUFACTURING TECHNOLOGY 5

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 beads - Archaeological evidences - Gem stone types described in Silappathikaram.

அலகு - V வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்குமுழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள்- கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

UNIT-V AGRICULTURE AND IRRIGATION TECHNOLOGY 5

Dam, Tank, Ponds, Sluice, Significance of KumizhiThoompu of Chola Period> Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conch diving -Ancient Knowledge of Ocean - Knowledge Specific Society.

அலகு-VI அறிவியல்தமிழ்மற்றும்கணித்தமிழ்

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

UNIT-VI SCIENTIFIC TAMIL & TAMIL COMPUTING 5

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.

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

OUTCOMES:

Upon completion of the course, the learners will be able to:

1. சங்ககால நெசவு மற்றும் பானைத்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்
   To learn about the weaving and pottery (ceramic) technologies during the Sangam Age.(K2)
2. சங்ககாலவடிவமைப்புகள் மற்றும் கட்டுமானக்கலையைப் புரிந்து கொள்ளுதல்
   To understand the designs and structural constructions during the Sangam period.(K2)
3. பண்டைய கால கட்டிடக்கலையின்நுட்பங்கள் மற்றும் கட்டிடவடிவமைப்புகளை ஆராய்தல்.
   To explore the techniques and architectural patterns of ancient Tamil structures.(K2)
4. உற்பத்தி மற்றும் உலோகவியல்தொழில்நுட்பங்களைப் பற்றி அறிதல்.
   To gain knowledge on manufacturing and metallurgical technologies of ancient Tamils.(K3)
5. வேளாண்மை, நீர்ப்பாசனம் மற்றும் கடல்சார்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்.
   To understand agricultural> irrigation> and marine technologie. ancient Tamil society.(K3)
6. அறிவியல்தமிழ் மற்றும் கணித்தமிழின்வளர்ச்சியையும் அதன் கணினி பயன்பாடுகளையும் புரிந்து கொள்ளுதல்.
   To understand the development of Scientific Tamil and its applications in Tamil computing.(K3)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	-	-	-	-	-	-	1	2	1
CO3	3	3	3	3	-	-	-	-	-	-	1	2	1
CO4	3	2	3	3	-	-	-	-	-	-	1	2	2
CO5	3	3	3	3	-	-	-	-	-	-	1	2	1
CO6	3	3	3	3	-	-	-	-	-	-	1	2	2

Recommended by
Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - II

24HSNC201 - SDG NO. 4	NCC COURSE LEVEL 1	L	T	P	CP	C
		2	0	0	2	0

ARMY WING

NCC GENERAL **6**

NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS **4**

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT **7**

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP **5**

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT **8**

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

NAVAL WING

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	TOTAL: 30 PERIODS	

ARMY WING

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

NATIONAL INTEGRATION AND AWARENESS **4**

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT **7**

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP **5**

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT **8**

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

SEMESTER - II

24ESGE102 - SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To provide exposure to the students with hands-on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering.

ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp, and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring.

Recommended By
Board of Studies of Mech dept.
Meeting No. 8 Dated: 1/6/2024

CHAIRMAN
Board of Studies
Mechanical Engineering

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipment – Resistor- colour coding, measurement of AC signal parameter (peak-peak RMS, period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR, and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices, and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of Half Wave Rectifier and Full Wave Rectifier.
6. Simulation of Half Wave Rectifier and Full Wave Rectifier using TinkerCAD.

CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings,unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

Recommended by Board of Studies Mech. dept. Meeting No. 8 Dated: 1/6/2024

CHAIRMAN
Board of Studies
Mechanical Engineering

2. Gas welding demo practice.

Basic Machining:

1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:

1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

Demonstration on:

1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items:	
Iron box, fan and regulator, emergency lamp	1 Each
4. Megger (250V/500V)	1 No
5. Power Tools:	
Range Finder	2 Nos
Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos
2. Assorted electronic components for making circuits	50 Nos
3. Small PCBs	10 Nos
4. Multimeters	40 Nos

Recommended by
Board of Studies of Mech dept.
Meeting No. 8 Dated: 1/6/2024

CHAIRMAN
Board of Studies
Mechanical Engineering

CIVIL

1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2.	Carpentry vice (fitted to work bench).	15 Nos
3.	Standard woodworking tools.	15 Sets
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power Tools:	
	Rotary Hammer	2 Nos
	Demolition Hammer	2 Nos
	Circular Saw	2 Nos
	Planner	2 Nos
	Hand Drilling Machine	2 Nos
	Jigsaw	2 Nos

MECHANICAL

1.	Arc welding transformer with cables and holders	5 Nos
2.	Arc welding transformer with cables and holders	5 Nos
3.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets
4.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5.	Centre lathe.	2 Nos
6.	Hearth furnace, anvil and smithy tools.	2 Sets
7.	Moulding table, foundry tools.	2 Sets
8.	Power Tool: Angle Grinder.	2 Nos
9.	Study-purpose items: centrifugal pump, air-conditioner.	1 each

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Infer the values of resistance, peak to peak RMS values, time period, frequency. [K2]
2. Outline the logic gates, rectifier, timer circuits and soldering practices. [K2]
3. Demonstrate the measurement of electrical parameters such as voltage, current, resistance, power and energy. (K2)
4. Illustrate the residential wiring, staircase wiring and fluorescent lamp wiring. [K2]
5. Prepare the carpentry and plumbing joints. (K2)

Recommended by Board of Studies of Mech dept. Meeting No. 8 Dated: 1/6/2021.

CHAIRMAN
Board of Studies
Mechanical Engineering

6. Perform the basic operations of welding, sheet metal work and basic machining operations in Lathe and Drilling (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	-	-	-	-	-	-	-	-	-	-	2	2
CO3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO4	3	-		-	-	-	-	-	-	-	-	2	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2
CO6	2	-	-	-	-	-	-	-	-	-	-	2	2

SEMESTER - II

24ESID201 SDG NO. 1-17	IDEA ENGINEERING LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

To impart the basics of technologies that are used to identify sustainable solutions to societal problems

- To Provide awareness on Printed Circuit Board (PCB) design using ORCAD software.
- To Raise awareness of at least three Internet of Things (IoT) projects and their applications.
- To Upskill learners through practical experience with 3D printing and scanning technologies.
- To prepare the learners to correctly align the ideas to SDGs
- To comprehensive knowledge on entrepreneurship and effective idea presentation techniques.
- To evaluate the effectiveness of SDGs and implementation strategy

MODULE-1 BASICS OF DESIGN THINKING IN ELECTRICAL AND ELECTRONIC COMPONENTS 4

- Awareness Session on Basics of Design Thinking
- Study of Active & Passive Electronic Components
- Study of Basic AC & DC Electrical Circuits
- Study of Microprocessors & Microcontrollers

Recommended by
Board of Studies of H & S dept.
Meeting No. 6 Dated: 31/5/2024

CHAIRMAN
Board of Studies
Humanities & Science

- Demonstration of Arduino Board, ESP 32 Board ,Raspberry Pi Board & PCB design software-Eagle
- Demonstration of PCB design using the software's Orcad, Eagle etc.

MODULE-2 EMBEDDED SYSTEMS, IOT AND ROBOTICS 4

- Study of sensors and transducers
- Study of embedded protocols, IOT Protocols & Embedded C
- Demonstration of Robotics & Drone models

MODULE-3 BASICS OF MECHANICAL ENGINEERING 4

- Study of Mechanical Modeling using Fusion 360
- Demonstration of 3D Scanner,3D Printer, Laser Cutter &RD Works Software
- Study of Slicer Software & Master Cam Software

MODULE 4 ALIGNMENT AND MAPPING OF IDEAS 4

- **Project Title:** Justification of SDG and SAP - Problem Statement & Solution

MODULE-5 ENTREPRENEURSHIP SKILLS 4

- Startup Awareness
- Entrepreneurship Opportunities
- Mock Presentations
- Innovation
- Novelty
- Feasibility
- Presentation Skills

MODULE-6 SCOUT for SDG IDEATHON 12

Evaluation Stages:

- First Round
- Second Round
- Idea Pitching

TOTAL: 30 PERIODS

REFERENCES:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
4. Basic Mechanical Engineering by Pravin Kumar, Pearson Education

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 21/5/2024

CHAIRMAN
Board of Studies
Humanities & Science

5. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
6. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2017.
7. John J.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc24_ee112/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs115/preview
3. https://onlinecourses.nptel.ac.in/noc24_me104/preview
4. https://onlinecourses.nptel.ac.in/noc24_me88/preview

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Gain the knowledge on Basic Electronics & Electrical Circuits (K2)
2. Understand the Basics of Embedded systems,IOT & Robotics (K1)
3. Explore the the Basics of Mechanical Modeling (K2)
4. Interpret the mapping of SDGs to ideas. (K4)
5. Illustrate the ideas in the Ideathon event emphatically .(K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	-	1	-	-	-	-	-	-
CO2	1	-	-	-	1	-	-	-	-	-	-
CO3	1	-	-	-	1	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	3	3	-	2
CO5	-	-	-	-	-	3	-	3	3	-	2

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 21/5/2024.

CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - II

24ENTP201 - SDG NO. 4	DIGITAL DYNAMICS	L	T	P	CP	C
		1	0	1	2	0

OBJECTIVES:

- Explore online communication
- Master computer skills
- Use virtual platforms
- Understand digital ethics and cyber security
- Observe and follow do's and don'ts

MODULE - I DIGITAL CULTURE AND SOCIETY 6

Adapting to changes
Importance in today's digital landscape
Digital identity and self- presentation
Online communities and forums
Digital divide and consequences
Online collaboration and collective action

MODULE - II DIGITAL LITERACY AND ACCESS TO TECHNOLOGY 5

Computer skills
Social and cultural understanding
Social media campaign and Activism
Netiquettes
Trending Technologies
Digital tools and softwares

MODULE - III DIGITAL ETHICS 3

Digital ethics and moral panics
The art of protecting secrets
Overview of digital tools

MODULE - IV CYBER SECURITY 3

Threats, vulnerability and consequences
Data making and usage practice
Importance of security

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

MODULE - V DIGITAL NETWORKING 7

Remote work and virtual teams
Authenticity in digital interactions
Engaging content creation
Tools and and techniques for insightful usage
Balancing online and offline interactions
Collaboration for research and innovation

MODULE - VI BUREAU OF INDIAN STANDARDS (BIS): BASIC CONCEPTS, STANDARDS FORMATION PROCESS AND CHALLENGES 6

Standardization –Basic Concepts:

Basic concepts of standardization

Purpose of standardization, marking and certification of articles and processes

Importance of standards to industry, policy makers, trade, sustainability and innovation

Standards Formulation Process and Challenges:

Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/ IEC Directives

WTO Good Practices for Standardization

World of Standards:

Important Indian and International Standards

TOTAL: 30 PERIODS

REFERENCES:

1. Communication Skills and Soft Skills – an Integrated Approach. Edited by E. Sureshkumar, P. Sreehari and J. Savithri, Pearson.
2. Silvia. P.J.2007. How to Read a Lot. Washington DC, American Psychological Association.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Apply online communication techniques and collaboration skills (K3)
2. Enumerate the principles of digital ethics in online interactions (K2)

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Narayanan
CHAIRMAN
Board of Studies
Humanities & Science

3. Understand the importance of Bureau of Indian Standards (BIS). (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	-	-	-	-	-	-	-	3	2	-	2	-	-

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - III

24BSMA302 - SDG NO. 4	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- The aim of this course is to impart knowledge in the concepts of linear algebra as a prerequisite for the recent thrust areas of technological advancement.
- To know the importance of partial differential equations in modelling various engineering problems.

MODULE - I VECTOR SPACES 9

Vectors and Linear combinations-Vector spaces (Definitions and examples) – Subspaces (Definitions and examples) – Linear independence and linear dependence – Bases and dimensions.

MODULE - II LINEAR TRANSFORMATION 12

Linear transformation - Null and range spaces - Dimension theorem (Statement only) - Matrix of a linear transformation

MODULE - III INNER PRODUCT SPACES 9

Inner product - Norm - Gram Schmidt orthogonalization process(Statement only) - QR decomposition.

MODULE - IV ADJOINT OPERATORS 9

Adjoint of a linear operator - Least square approximation- Normal and self - adjoint operators.

MODULE - V SOLUTIONS OF FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of standard types of first order partial differential equations - Singular integral - Complete integral – Lagrange's linear equation.

MODULE - VI SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS 9

Linear homogeneous and non-homogeneous partial differential equations of second and higher order with constant coefficients.

TOTAL: 60 PERIODS

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

TEXT BOOKS:

1. Linear Algebra, Friedberg A.H., Insel A.J. and Spence L., 4th Edition, Pearson, 2018.
2. Transforms and Partial Differential Equation, Veerarajan T., 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., , New Delhi, 2016.

REFERENCES:

1. Linear Algebra and its applications, Strang G., 4th Edition, Thomson (Brooks/Cole), New Delhi, 2005.
2. Linear Algebra and its Applications ,Lay D. C. , 5th Edition, Pearson Education, 2015.
3. Linear Algebra – A Geometric Approach, Kumaresan S.,1st Edition, Prentice Hall of India, New Delhi, Reprint, 2010.
4. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
5. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, Reprint, Laxmi Publications, 2008.
6. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

WEB RESOURCES

1. https://nptel.ac.in/courses/111/103/111103021/
2. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/download/
3. https://theengineeringmaths.com/wp-content/uploads/2016/02/Partial-differential-equations.pdf

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra
2. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/
3. https://freevideolectures.com/course/3244/advanced-engineering-mathematics
4. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/video_galleries/video-lectures/
5. https://nptel.ac.in/courses/111106135

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/08/2024

CHAIRMAN
Board of Studies
Humanities & Science

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

1. Determine the bases and dimension of vector spaces and subspaces. (K3)
2. Analyse the matrix of a linear transformation for its rank and nullity. (K4)
3. Construct an orthonormal basis using Gram-Schmidt orthogonalization process and use it for QR decomposition of a matrix. (K3)
4. Determine the adjoint of a linear operator and solve least squares approximation problems. (K3)
5. Classify the solutions of first order partial differential equations including Lagrange's linear equation. (K4)
6. Solve linear homogeneous and non-homogeneous partial differential equations of second and higher order with constant coefficients. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	-	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	-	3	-	-	-	-	-	-	-	-	-	3	2
CO6	3	-	-	-	-	-	-	-	-	-	-	3	2

Recommended by

Board of Studies of H&S dept.

Meeting No. 6 Dated: 31/5/2024

CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - III

24EIPC301 108105153 SDG NO. 4, 9	ELECTRICAL MEASUREMENTS AND SENSORS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To explore the instruments used for measuring electric current and voltage, understand their working principles, and examine their applications.
- To develop a solid understanding of power and energy measurement techniques, for accurate monitoring.
- To explore potentiometers and instrument transformers in detail, with a focus on their functioning and importance in electrical measurements.
- To learn various methods of measurement and delve into the classification of transducers, with an emphasis on error analysis and its impact on measurements.
- To analyze static and dynamic characteristics of transducers, including their behavior and performance in both steady-state and time-varying conditions.
- To examine and to gain familiarity with different types of resistive, Capacitive and Inductive transducers and their specific applications in various fields.

MODULE - I MEASUREMENT OF ELECTRICAL PARAMETERS 7

Types of ammeters and voltmeters: PMMC Instruments, Moving Iron Instruments, Dynamometer type Instruments, Resistance measurement: Wheatstone bridge, Kelvin double bridge Measurement of Inductance: Maxwell-Wein Bridge and Anderson Bridge - Measurement of Capacitance: Schering Bridge

MODULE - II POWER AND ENERGY MEASUREMENTS 7

Electro-dynamic type wattmeter: Theory and its errors – LPF wattmeter – Phantom loading –Single phase Induction type energy meter: Theory and Adjustments –Calibration of wattmeter and Energy meters - smart energy Meter

MODULE - III ANALOG AND DIGITAL INSTRUMENTS 7

Potentiometer - DC,AC -Wave analyzers – Signal and function generators – Digital voltmeter and multimeter – Frequency & time period measurement – digital LCR meter.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of
Electronics and Instrumentation

MODULE - IV CLASSIFICATION OF TRANSDUCERS 8

Units and standards – Static calibration – Classification of errors, – Error analysis – Statistical methods – Classification of transducers – Selection of transducers.

MODULE - V CHARACTERISTICS OF TRANSDUCERS 8

Static characteristics: - Accuracy, precision, resolution, sensitivity, linearity, span and range. Dynamic characteristics: Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and inputs.

MODULE - VI VARIABLE R - L - C TRANSDUCERS AND OTHER SENSORS 8

Principle of operation, construction details, characteristics and applications of strain gauge, resistance thermometer, Thermistor, Thermocouple ,LVDT,capacitive transducers,Piezoelectric transducer,Environmental Monitoring sensors (Water Quality & Air pollution) , Nano Sensors,Proximity sensor

TOTAL : 45 PERIODS

TEXT BOOKS:

1. E.W. Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H. Wheeler& Co, 2001
2. H.S. Kalsi, Electronic Instrumentation, McGraw-Hill Education, New Delhi, 2010
3. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2010.

REFERENCES:

1. S.K.Singh, 'Industrial Instrumentation and control', Tata McGraw Hill, 2nd edn., 2002.
2. J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation',S.K.Kataria& Sons, Delhi, 2003.
3. Martin U. Reissland, 'Electrical Measurement – Fundamental Concepts and Applications', New Age International (P) Ltd., 2001.
4. Bela G.Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol. 1, ISA/CRC Press, 2003.
5. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
6. John P. Bentley, Principles of Measurement Systems, III Edition, Pearson Education, 2000.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engg.

WEB REFERENCES:

1. https://archive.nptel.ac.in/courses/108/105/108105153/
2. https://onlinecourses.nptel.ac.in/noc21_ee107/preview
3. https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee44/

ONLINE RESOURCES:

1. https://edurev.in/courses/24749_Electrical-and-Electronic-Measurements

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply voltage and current measurement techniques to design and implement bridge circuits for accurate measurement of resistance, inductance, and capacitance. (K3)
2. Apply appropriate methods to analyze and measure electrical quantities such as power and energy in practical circuits. (K3)
3. Apply suitable techniques for measuring frequency and time period in electrical signals (K3)
4. Apply various measurement techniques and use transducers considering error analysis to determine measurement accuracy. (K3)
5. Design and model transducer systems that perform effectively under static and dynamic conditions for innovative practical measurement applications. (K4)
6. Analyze and make an oral presentation for the characteristics of resistive, capacitive, and inductive transducers to evaluate their suitability for specific applications across different fields. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	-	-	-	-	-	-	-	-	-	-	2	2
CO3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO4	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	-	-	3	-	-	-	-	-	-	-	-	2	2
CO6	-	3	-	-	-	-	-	-	2	-	2	2	2

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation

SEMESTER - III

24EIPC302 108106188 SDG NO. 4,9,11	ANALOG ELECTRONIC CIRCUITS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To describe the structure of basic electronic devices and BJT amplifiers
- To elaborate the operation and applications of transistor FET and Power amplifiers
- To analyse the required functionality of positive and negative feedback systems
- To review and analyze linear and non-linear applications using Op-amp
- To describe the Functional blocks and the applications of special ICs like Timer, regulator Circuits

MODULE - I OPERATION AND CHARACTERISTICS OF DIODES, TRANSISTOR, THYRISTORS 7

PN junction diode: structure, operation and V-I characteristics, diffusion and transition capacitance-Zener diode characteristics- Zener Reverse characteristics – Zener as regulator. BJT: NPN and PNP transistors, Characteristics of CE, CB and CC amplifier configurations, Biasing circuits, Small Signal analysis of BJT amplifiers- Thyristors: SCR and UJT,Introduction to power Amplifiers.

MODULE - II OPERATION, CHARACTERISTICS OF FET & POWER DEVICES 7

FET: JFET and MOSFET, Characteristics of CS, CG and CD amplifier configurations – Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers-Push-Pull amplifiers- Design of power output, efficiency and cross-over distortion.

MODULE - III OPERATION OF FEEDBACK AMPLIFIERS AND DIFFERENT TYPES OF OSCILLATORS 7

Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations,– Wien Bridge, Colpitts and Crystal oscillators.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies

MODULE - IV LINEAR APPLICATIONS OF OP-AMP 8

Ideal op-amp – Block diagram - Inverting and Non-inverting Amplifiers, differential amplifier - differentiator and integrator - Instrumentation amplifier – Isolation amplifier - comparator - Astable and Monostable multivibrator - clippers, clampers, S/H circuit.

MODULE - V NON-LINEAR APPLICATIONS OF OP-AMP 8

Zero Crossing Detector,Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot multivibrator.

MODULE - VI OPERATION AND THE APPLICATIONS OF SPECIAL ICS LIKE TIMERS AND REGULATOR CIRCUITS 8

555 Timer - Functional block diagram – Astable and Monostable mode – applications. LM317, 723 Variable voltage regulators, switching regulator - IC8038 function generator IC.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. AS Sedra and K.C.Smith, "Microelectronic Circuits", New York, Oxford University Press,1998.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCES:

1. Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
2. Robert L.Boylestad, "Electronic devices and circuit theory", 2002
3. Prof. K.R.K. Rao, IITM. NPTEL video lectures on "Electronics for Analog Signal Processing I".
4. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital circuits system", McGraw Hill, 2003.
5. Floyd ,Buchla, "Fundamentals of Analog Circuits", Pearson,2013.

WEB RESOURCES:

1. https://kolegite.com/EE_library/books_and_lectures/%D0%95%D0%BB%D0%B5%D0%BA%D1%82%D1%80%D0%BE%D0%BD%D0%B8%D0%BA%D0%B0/Electronic%20Devices%20and%20Circuit%20Theory%20-%2011th%20Edition.pdf
2. https://www.madeeasy.in/uploads/examsolution/EDC.pdf

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 01.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

3. https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.htm

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/117103063/
2. https://onlinecourses.nptel.ac.in/noc21_ee55/preview

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply knowledge of semiconductor device behavior to perform circuit analysis. (K3)
2. Analyze FET and BJT characteristics to assess and refine amplifier designs for meeting specified performance criteria (K4)
3. Apply appropriate topologies to develop feedback amplifier and oscillator circuits and verify their performance. (K3)
4. Apply operational amplifier principles to design and test linear applications. (K3)
5. Apply operational amplifier principles to design and test nonlinear applications. (K3)
6. Analyze timing circuits and power supply modules for practical applications. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO2	-	-	2	-	-	-	-	-	-	-	-	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	3	3
CO6	-	-	2	-	-	-	-	-	-	-	2	2	2

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - III

24EIPC303 108106177 SDG NO. 4, 11	DIGITAL SYSTEM DESIGN AND APPLICATIONS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To review the number systems and simplify logical expressions using Boolean algebra and Karnaugh maps.
- To explain the design procedures and characteristics of different logic families, including TTL and CMOS technologies, and simulate them using VHDL.
- To design combinational circuits such as multiplexers, decoders, and arithmetic units and simulate them using VHDL.
- To design synchronous sequential circuits using shift registers, and counters, and simulate them using VHDL.
- To design asynchronous sequential logic circuits and simulate them using VHDL.
- To explain Programmable Logic Devices for digital design applications and simulate using VHDL

MODULE - I NUMBER SYSTEMS 7

Review of number systems, binary codes, Error detection and correction codes (Parity and Hamming code) - Representation of logic functions- SOP and POS forms - K-map representations - minimization using K maps.Introduction to VHDL-VHDL program simulation using SOP and POS forms, K-map representations.

MODULE - II DIGITAL LOGIC FAMILIES 7

Digital Logic Families -comparison of RTL, DTL, TTL, ECL, and MOS families - operation, characteristics of the digital logic family. VHDL program simulation using Logic gates and Code converters.

MODULE - III COMBINATIONAL CIRCUITS 8

Combinational logic - Simplification and implementation of combinational logic – Adders, Subtractors, - Code converters - Multiplexers and De-multiplexers - Encoders and Decoders.VHDL implementation of combinational circuits- Adders- Multiplexers & De multiplexers.

MODULE - IV SYNCHRONOUS SEQUENTIAL CIRCUITS 8

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025
CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

registers - design of synchronous sequential circuits – Moore and Mealy models- Counters, state diagram; state reduction; state assignment.VHDL implementation of Sequential circuits- counters, Flipflops.

MODULE - V ASYNCHRONOUS SEQUENTIAL CIRCUITS 8

Asynchronous sequential logic circuits-Transition table flow table-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits.VHDL implementation of Asynchronous Sequential circuits.

MODULE - VI PROGRAMMABLE LOGIC DEVICES 7

Introduction to Programmable Logic Devices: PROM – PLA –PAL, CPLD-FPGA.VHDL implementation for Industrial applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES:

1. S.Salivahanan and S.Arivazhagan, "Digital Circuits and Design" Fifth Edition, Oxford University Press.
2. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
3. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
4. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
5. Charles H.Roth, Jr, LizyLizyKurian John, 'Digital System Design using VHDL, Cengage, 2013.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc20_ee32/preview
2. http://www.nptelvideos.in/2012/11/digital- logic circuits

ONLINE RESOURCES:

1. https://www.electronics-tutorials.ws/

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply various number systems and use Boolean algebra and Karnaugh maps to simplify logical expressions.(K3)
2. Apply the design procedures and characteristics of different logic families (K3)
3. Design combinational circuits such as multiplexers, decoders, and arithmetic units and simulate them using VHDL (K4)
4. Develop and implement synchronous sequential circuits, including flip-flops, counters, and shift registers using VHDL (K4)
5. Construct and simulate asynchronous sequential circuits using VHDL to model application-oriented digital systems (K4)
6. Apply Programmable Logic Devices (PLDs) for digital design applications and simulate them using VHDL. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	-	2	-	-	2	-	-	-	-	-	-	3	2
CO4	-	2	2	-	2	-	-	-	-	-	-	3	2
CO5	-	2	2	-	2	-	-	-	-	-	-	3	2
CO6	3	-	-	-	2	-	-	-	-	-	2	3	2

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - III

24ESIT301 106105225 SDG NO. 4	DATA STRUCTURES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To Understand and analyze fundamental data structures and their applications.
- To Implement linear data structures such as arrays, linked lists, stacks, and queues.
- To Design and apply non-linear data structures like trees and graphs.
- To Evaluate and implement searching and sorting algorithms efficiently.
- To Apply advanced structures such as heaps and hashing for optimized data access.

MODULE - I LINEAR DATA STRUCTURES - LIST 7

Algorithm Analysis: Running time calculations; Abstract Data Types (ADTs); List ADT: Array implementation of lists – Linked lists – Circular linked lists – Doubly linked lists – Applications of Lists: Polynomial manipulation.

MODULE - II LINEAR DATA STRUCTURES – STACKS AND QUEUES 7

Stack ADT: Stack model – Implementation of stacks – Applications: Balancing symbols – Infix to postfix conversion – Evaluating postfix expressions – Function calls; Queue ADT: Queue model – Array implementation of queues – Applications of queues.

MODULE - III NON-LINEAR DATA STRUCTURES - TREES 7

Preliminaries; Binary trees: Expression trees; Binary search tree ADT; AVL trees; Tree traversals; BTrees; Priority Queues: Binary heap.

MODULE - VI NON LINEAR DATA STRUCTURES - GRAPHS 8

Graph Algorithms: Definitions – Representation of graphs; Graph Traversals: Breadth-first traversal – Depth-first traversal; Topological sort – Shortest-Path Algorithms: Dijkstra's algorithm – All-pairs shortest path

MODULE - V SEARCHING AND SORTING SORTING TECHNIQUES 8

Sorting: Quick Sort – Shell Sort – Heap Sort – Bucket Sort – Merge Sort– Radix Sort – Analysis of Sorting Algorithms – Searching: Linear Search – Binary Search – Applications.

Recommended by
Board of Studies of IT dept.
Meeting No. 7 Dated: 9.4.2025

CHAIRMAN
Board of Studies
Information Technology

MODULE - VI HASHING TECHNIQUES AND HEAP 8

Hash Functions – Open Hashing – Separate Chaining, Closed Hashing – Linear Probing, Quadratic Probing, Double Hashing, Random Probing, Rehashing, Extendible Hashing. Heaps – Min/Max Heaps – Operation on Heap – Binary Heaps

TOTAL : 45 PERIODS

TEXT BOOKS:

1. 1M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. Richard F Gilberg, Behrouz A Forouzan, "Data Structures: A Pseudocode Approach withC", 2ndEdition, Cengage India, 2007.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983
4. Yashavant Kanetkar," Data Structures Through C", BPB, ISBN-13:978-9388511391,2019.

WEB REFERENCES :

1. https://www.programiz.com/dsa
2. http://masterraghu.com/subjects/Datastructures/ebooks/remathareja.pdf
3. https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs25/
4. https://nptel.ac.in/courses/106102064

OUTCOMES

Upon completion of the course, the student will be able to:

1. Build the ability to evaluate algorithm performance and implement linear data structures such as arrays and linked lists.(K3)
2. Utilize stack and queue operations to construct solutions for expression evaluation and control flow in programming. (K3)
3. Classify different types of tree structures and construct appropriate trees like BSTs, AVL trees, and heaps for various applications.(K4)

Recommended by
Board of Studies of IT dept.
Meeting No. 7 Dated: 9.4.2025

CHAIRMAN
Board of Studies
Information Technology

4. Inspect graphical representations to evaluate traversal and shortest-path algorithms for solving real-world problems.(K4)
5. Experiment various sorting and searching algorithms to determine their efficiency in data organization tasks.(K3)
6. Examine and apply hashing techniques and heap structures to enhance data access and retrieval performance.(K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	2	2
CO2	2	-	2	-	-	-	-	-	-	-	-	2	2
CO3	-	3	3	-	-	-	-	-	-	-	2	3	3
CO4	2	3	-	-	-	-	-	-	-	-	2	2	2
CO5	-	2	3	-	-	-	-	-	-	-	3	2	2
CO6	2	3	2	-	-	-	-	-	-	-	2	2	2

SEMESTER - III

24HSMC301 - SDG NO. 4 & 9	UNIVERSAL HUMAN VALUES – II UNDERSTANDING HARMONY	L	T	P	CP	C
		2	1	0	3	3

OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Developing clarity with harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.
- Recognizing the potential of excellence than competition

SYLLABUS:

The course has 28 lectures and 14 practice sessions in 6 modules:

MODULE - I COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION (5+2)

1. Purpose and motivation for the course, recapitulation from Universal

Recommended by Human Values-I Board of Studies of IT dept. Meeting No. 7 Dated: 9.4.2025

CHAIRMAN Board of Studies Information Technology

2. Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario

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

MODULE - II UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF (5+2)

6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

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

MODULE - III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY HARMONY IN HUMAN-HUMAN RELATIONSHIP (6+2)

12. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values ofrelationship
13. Understanding the meaning of Trust; Difference between intention and competence
14. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationsh

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025
CHAIRMAN
Board of Studies

15. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) an. o-existence as comprehensive Human Goals

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

MODULE - IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE (6+2)

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

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

MODULE - V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS (4+4)

20. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family
21. Natural acceptance of human values
22. Definitiveness of Ethical Human Conduct
23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
24. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

MODULE - VI UNIVERSAL HUMAN ORDER (4+3)

25. Programs to ensure Sanyam and Health
26. Case studies of typical holistic technologies, management models and production systems

Recommended by
Board of Studies of E IE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc

TOTAL : 45 PERIODS

TEXT BOOKS:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3rd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

REFERENCES:

1. AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology)Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values,A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj- Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda- Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOMES

Upon completion of the course, the student will be able to:

1. Express the harmony of relationship among human being, family, society, nature and existence with right understanding and right feeling. (K2)
2. Develop the responsibility of handling problems by finding holistic and sustainable solutions based on the natural acceptance for maintaining mutual human relationships. (K2)

Recommended by
Board of Studies of EIE dept.
Meeting No 7 Dated: 1.2.2025

CHAIR

3. Develop a holistic perspective of life based on self-exploration about self, family, society and nature/existence. (K2)
4. Elucidate a critical ability for dedicative commitment towards human values, relationships and society. (K2)
5. Implement the process of verification and validation of learning in daily life. (K2)
6. Develop self reflection, commitment and courage to act in life challenging situations. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	3	2	-	-	3
CO2	-	1	-	-	-	3	3	2	-	-	-
CO3	-	-	3	-	-	3	3	2	-	-	-
CO4	-	-	-	-	-	3	3	2	-	2	3
CO5	-	-	-	-	-	3	3	-	-	-	3
CO6	-	-	-	-	-	3	3	-	-	3	2

SEMESTER - III

24HSNC301 NPTEL CODE : - SDG NO. 4	NCC COURSE LEVEL 2	L	T	P	CP	C
		3	0	0	3	0

ARMY WING

PERSONALITY DEVELOPMENT **9**

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP **7**

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT **13**

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

Recommended by Board of Studies of EIE dept Meeting No. 7 Dated: 1.3.2025

CHAIRMAN Board of Studies Electronics and Instrumentation Engineering

DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION **3**

EA 1	Environmental Awareness and Conservation	3

GENERAL AWARENESS **4**

GA 1	General Knowledge	4

ARMED FORCES 6

AF 1	Armed Forces, Army, CAPF, Police	6

ADVENTURE 1

AD 1	Introduction to Adventure Activities	1

BORDER & COASTAL AREAS **2**

BCA 1	History, Geography & Topography of Border/Coastal areas	2

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT **9**

PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5	Public Speaking	3

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7

DISASTER MANAGEMENT **13**

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION **3**

EA 1	Environmental Awareness and Conservation	3

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

GENERAL AWARENESS **4**

GA 1 General Knowledge 4

NAVAL ORIENTATION 6

AF 1 Armed Forces and Navy Capsule 3

EEZ 1 EEZ Maritime Security and ICG 3

ADVENTURE 1

AD 1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS **2**

BCA 1 History, Geography & Topography of Border/Coastal areas 2

TOTAL: 45 PERIODS

AIR FORCE WING

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP 7

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT **13**

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters 9

DM 3 Fire Service & Fire Fighting 1

ENVIRONMENTAL AWARENESS & CONSERVATION **3**

EA 1 Environmental Awareness and Conservation 3

GENERAL AWARENESS **4**

GA 1 General Knowledge 4

Recommended by

Board of Studies of _____ dept.

Meeting No. _____ Dated: _____

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

GENERAL SERVICE KNOWLEDGE		**6**
GSK 1	Armed Forces & IAF Capsule	2
GSK 2	Modes of Entry in IAF, Civil Aviation	2
GSK 3	Aircrafts - Types, Capabilities & Role	2
ADVENTURE	**1**	
AD 1	Introduction to Adventure Actitivities	1
BORDER & COASTAL AREAS		**2**
BCA 1	History, Geography & Topography of Border/Coastal areas	2

TOTAL :45 PERIODS

SEMESTER - III

24EIPL301 - SDG NO. 4,9	SENSORS AND TRANSDUCERS LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To make the students aware of basic concepts of measurement
- To make the students to measure resistance using bridge circuits
- To make the students to calibrate the electrical instruments
- To make the students learn about static and dynamic characteristics of different types of transducers.
- To make the students to analyze step response of RTD, Thermocouple
- To implement the functions of various sensors using arduino

LIST OF EXPERIMENTS:

1. Wheatstone and Kelvin's bridge for measurement of resistance.
2. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
3. Calibration of Ammeter and Voltmeter
4. Characteristics and Step response of RTD
5. Characteristics and Step response of thermocouple
6. Characteristics of Thermistor
7. Measurement of Angular displacement using resistive and Capacitive transducer
8. Characteristics of Strain gauge and Load cell.
9. Characteristics of Photoelectric tachometer and Simulation of LVDT using Virtual Lab

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

10. Three Phase Power Measurement by Two Wattmeter Method using Virtual Lab
11. Calibration and Testing of Single Phase Energy Meter using virtual Lab

Content Beyond the syllabus

12. Function of LDR and IR sensor using arduino
13. Function of ultrasonic sensor and servo motor using arduino

TOTAL : 60 PERIODS

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze the measurement of resistance, inductance, and capacitance, and assess the calibration process of voltmeters and ammeters to ensure measurement accuracy. (K4)
2. Analyze and interpret the characteristics and step response of temperature transducers such as RTDs and thermocouples, along with resistive and inductive transducers, to evaluate their suitability for applications. (K4)
3. Assess the operation of various sensors using Arduino to evaluate their performance in practical measurement applications. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	2	-	-	-	-	-	2	2	-	-	2	2
CO2	-	-	2	-	-	-	-	2	2	-	-	3	3
CO3	-	-	2	-	-	-	-	2	2	-	-	3	3

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - III

24EITP301 SDG NO. 4	APTITUDE SKILLS - I	L	T	P	CP	C
		0	0	2	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Enrich students on quantitative ability, reasoning ability, and verbal ability
- Build a strong foundation for solving recruitment-based problems with speed and accuracy.
- Enhance creative thinking skills and Strengthen problem-solving skills.

MODULE - I QUANTITATIVE ABILITY **22**

Number Properties, Speed Math, HCF and LCM, Percentages, Time and Work, Time Speed and Distance, Ratio Proportion and Variations, Averages Mixtures and Alligation

MODULE - II QUANTITATIVE ABILITY AND REASONING ABILITY **16**

Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

MODULE - III VERBAL ABILITY **7**

Verbal Analogy – Vocabulary building – Sentence Structures - Comprehension – correct usage of words – Error deduction

TOTAL: 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2. A Modern Approach to Logical Reasoning – R.S. Aggarwal
3. High School English Grammar & Composition – Wren & Martin
4. Word Power Made Easy – Norman Lewis.
5. Fast Track Objective Arithmetic – Rajesh Verma

LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS – PHASE 2

OBJECTIVES:

- Familiarize the team and leadership skills.
- Gain Scouting spirit.
- Understand the standards relevant to EIE.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I JEEVAN KAUSHAL 2.0 – TEAM SKILLS AND LIFE SKILLS 12

Trust and Collaboration: Importance of Trust in Creating a Collaborative Team- Agree to Disagree and Disagree to Agree – Spirit of Teamwork - Understanding Fear of Being Judged and Strategies to Overcome.

Brainstorming: Basics and the process – Effective technique for ideation – Types – Importance and Benefits

Internal Communication: Internal Communication – Meaning and the Need, Use of Various Channels for Transmitting Information to Team Members including Digital and Physical.

Leadership Skills: Leadership concept - Leadership skills – Leadership moralities – Leadership models

MODULE - II RANGER AND ROVER 10

Four Bonds of BSG: Sign, Salute, Left Handshake, Moto and Good Turn.

Discipline and Uniform: Uniform of Rovers and Rangers, 14 Programme ideals.

Knowledge of Merit: Know about Knowledge of Merit Badges (Proficiency Badge).

Sustainability E-learning: (Online Course Available in WOSM Learning Zone).

Activating the Earth Tribe Initiative in your Community.

MODULE - III IS 13875-1 AND IS 13875-2(PART I AND II) -STANDARD FOR DIGITAL MEASURING INSTRUMENTS FOR MEASUREMENT, CONTROL 8

General specifications concerning -terms, tests, data sheet details-Terms Relating to measuring Instruments Display-Influence Quantity reference Conditions -vibration test, data sheet for digital measuring Instruments. Terms.tests,data sheet details of Instruments for measuring Analog Quantities

TOTAL: 30 PERIODS

REFERENCES:

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

ONLINE RESOURCES

1. https://www.cambridgeenglish.org/learning-english
2. https://lms.scout.org/course_items/show/1172182?course_id=214307#course-item-id=1172182
3. https://lms.scout.org/courses/show/214123?force_course_hub=true

OUTCOMES

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

1. Apply quantitative aptitude for solving numerical problems [K3]
2. Describe logical reasoning to tackle emotional challenges. [K2]
3. Use verbal communication and comprehension skills through grammar and language exercises. [K3]
4. Apply critical thinking and problem-solving skills in various cognitive scenarios. [K3]
5. Interpret language nuances in diversified situations and exhibit scouting spirits amidst communities. [K2]
6. Explain the basic principle of BIS Standards relevant to EMC and EMI. [K2]

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	2	-	-	-	-	1	-	-
CO3	-	-	-	-	-	-	-	-	2	-	1	-	-
CO4	-	2	-	-	-	-	-	-	-	-	1	-	-
CO5	-	-	-	-	-	-	-	2	3	-	1	-	-
CO6	-	-	-	-	-	3	-	-	-	-	1	-	-

Recommended by

Board of Studies of EIE dept.

Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - III

24EIID301 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To provide opportunities for students to develop an entrepreneurial mindset and explore real-world problem-solving through a startup-centric approach.
- To enable hands-on experience in identifying market needs
- To enable development of skill sets for designing, validating, and realizing a Minimum Viable Product (MVP) for an entrepreneurial venture.
- To guide students in validating market opportunity, and formulating a solution with realistic constraints.
- To inculcate ethical research practices, foster a commitment to lifelong learning, and promote the development of socially responsible and sustainable innovations aligned with relevant Sustainable Development Goals (SDGs).
- To prepare students to design sustainable business models and present entrepreneurial ideas through structured, outcome-driven business pitches using core startup frameworks.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, specifically through the lens of entrepreneurship and innovation.
2. The project work must involve identifying a problem, validating market opportunity, and developing a solution with realistic constraints, culminating in a business plan and prototype/MVP. It must also include appropriate elements of the following: market research, competitive analysis, value proposition design, business model development, financial feasibility, go-to-market strategy, and potentially software/hardware development for the MVP.
3. Project can be individual work or a group project, with a maximum of 3 students. In case of a group project, the individual project report of each student should specify the individual's contribution to the group project. The roles and responsibilities of all team members must be well-defined and documented.
4. On completion of the project, the student shall submit a detailed project report outlining their entrepreneurial journey, solution development, and business plan. The project should be reviewed and the report shall

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

be evaluated, and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION:

1. First evaluation (Milestone 1 - Week 4): 20 marks (Focus on Problem Identification, Opportunity Discovery, Customer & Markets, Value Proposition)
2. Second evaluation (Milestone 2 - Week 8): 30 marks (Focus on Competitive Advantage, Business Model, and MVP Development)
3. Final evaluation (Milestone 3 & 4 - Last week of the semester): 50 marks (Focus on Financial Feasibility, Go-to-Market Strategy, Growth and Scale, Funding Strategy, and Overall Project Report & Viva-Voce)

Note: All three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

1. Apply entrepreneurial thinking to identify and articulate real-world problems and explore market needs using structured approaches. (K3)
2. Develop skill sets to design potential solutions and validate market opportunities within realistic constraints. (K4)
3. Evaluate sustainable, ethical, and responsible innovation strategies, and communicate business models effectively. (K5)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	-	-		2	2
Co3	3	3	3	-	-	-	-	2	-	-	-	2	2

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - IV

24BSMA403 - SDG NO. 4	STATISTICS AND NUMERICAL METHODS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To identify relationship between multiple input variables
- To introduce the basic concepts of solving algebraic and transcendental equations
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines
- To introduce the knowledge of various techniques and methods of solving ordinary and partial differential equations

MODULE - I TESTING OF HYPOTHESIS **12**

Sampling distributions - Statistical hypothesis - large sample tests based on single proportion and difference proportions, single mean and difference of means -Tests based on t, and F-distributions for mean, variance respectively - Chi-square test for independence of attributes - Goodness of fit.

MODULE - II DESIGN OF EXPERIMENTS **9**

One way and two-way classifications - Completely randomized design – Randomized block design – Latin square design.

MODULE - III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **12**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Maximum Eigenvalues of a matrix by Power method.

MODULE - IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION **9**

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single integrals using Trapezoidal and Simpson's 1/3 rules.

Recommended by Board of Studies of H&S dept. Meeting No. 6 Dated: 31/05/2024

S. Veerakumar
CHAIRMAN
Board of Studies
Humanities & Science

MODULE - V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step method : Milne's predictor corrector method for solving first order differential equations.

MODULE - VI NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **9**

Solution of two-dimensional Laplace's and Poisson's equations on rectangular domain-Forward time central space scheme - One dimensional heat flow equation by Crank Nicholson Method-One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Miller and Freund's Probability and Statistics for Engineers, Johnson, R.A., Miller, I and Freund J., 8th Edition, Pearson Education, Asia, 2015.
2. Numerical methods for Scientific and Engineering Computation, Jain M. K., Iyengar S. R. K., Jain R. K., 4th Edition, New Age international Publishers, 2003
3. Numerical Methods in Engineering and Science, Grewal. B.S. and Grewal. J.S., 10th Edition, Khanna Publishers, New Delhi, 2015.

REFERENCES:

1. Numerical Analysis, Burden, R. L. and Faires, J. D., 9th Edition, Cengage Learning, 2016.
2. Probability and Statistics for Engineering and the Sciences, Devore J. L., 8th Edition, Cengage Learning, New Delhi, 2014.
3. Applied Numerical Analysis, Gerald C. F. and Wheatley P.O., 7th Edition, Pearson Education, Asia, New Delhi, 2006.
4. Probability and Statistics for Engineers and Scientists, Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., , 8th Edition, Pearson Education, Asia, 2007.
5. Numerical methods, Kandasamy P., Thilagavathy K., Gunavathy K., 3rd Edition, S. Chand, 2006.

WEB REFERENCES:

1. https://www.classcentral.com/course/swayam-numerical-analysis-17709
2. https://online-learning.harvard.edu/course/statistics-and-r?delta=1

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

CHAIRMAN
Board of Studies
Humanities & Science

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3057/numerical-methods-and-computation
2. https://nptel.ac.in/courses/111107105/

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

1. Apply appropriate statistical hypothesis tests for large and small samples to make inferences about population parameters using t, F, and Chi-square distributions. (K3)
2. Apply appropriate experimental designs such as CRD, RBD, and Latin Square to analyze and interpret data from one-way and two-way classifications. (K3)
3. Apply numerical methods to solve algebraic, transcendental, and linear systems of equations, and compute dominant Eigenvalues using the Power method. (K3)
4. Apply interpolation techniques and numerical methods to approximate derivatives and evaluate definite integrals. (K3)
5. Apply single-step and multi-step numerical methods to solve first-order ordinary differential equations. (K3)
6. Apply finite difference methods to solve partial differential equations such as Laplace, Poisson, heat, and wave equations. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	3	3
CO6	3	-	-	-	-	-	-	-	-	-	-	3	3

Recommended by
Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/05/2024

S. Ramakrishnan
CHAIRMAN
Board of Studies
Humanities & Science

SEMESTER - IV

24EIPC401 108105155 SDG NO. 4, 9	ELECTRICAL MACHINES AND DRIVES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To introduce the principle of operation of DC machines as motor and as generator
- To introduce the principle of operation of Transformers
- To introduce the principle of operation of Induction machines
- To provide comprehensive introduction to various power electronic devices, their structure, operating principle and characteristics
- To introduce other special machines
- To get an overview about dc and ac drives and their control using power electronic circuits.

MODULE - I DC MACHINES 7

Construction of D.C. Machines – DC Generator: Principle of operation – Characteristics- DC Motor: Principle of operation -Types-Torque equation-Characteristics.

MODULE - II TRANSFORMERS 7

Transformer – Principle – Theory of ideal transformer – EMF equation – Construction details of shell and core type transformers – Tests on transformers.

MODULE - III SINGLE-PHASE INDUCTION MOTOR 7

Constructional details of single-phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Types of Induction motor– Capacitor-start capacitor run induction motor - Shaded pole induction motor - Linear Induction motor.

MODULE - IV SPECIAL ELECTRICAL MACHINES 8

Construction, working and principle of operation of Stepper motor, Switched reluctance motor, Synchronous reluctance motors, Permanent Magnet Brushless DC motor, Permanent magnet synchronous motors.

MODULE - V CONTROL OF INDUCTION MOTOR DRIVE 8

VSI and CSI fed induction motor drives-principles of V/f control-closed loop variable frequency PWM inverter with dynamic braking- static Scherbius

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

drives- power factor considerations– modified Kramer drives-principle of vector control.

MODULE - VI DRIVES AND CONTROL **8**

Static and Dynamic equations of DC and AC machines – Rectifier and chopper control of DC drives– implementation-block diagram, Design of closed loop operation of V/f control of Induction motor drive systems.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. J.B.Gupta, "Theory and Performance of Electrical Machines", S.K.Kataria & Sons, 15th Edition 2015.
2. 2. B.L.Theraja and A.K.Theraja, "A Textbook of Electrical Technology", S.Chand, 2012.
3. Rashid, M.H., "Power Electronics – Circuits, Devices and Applications", PHI, 3rd Edition, 2004.
4. Mohan, Udeland and Robbins., "Power Electronics", John Wiley and Sons, New York,2002

REFERENCE BOOKS:

1. P.S.Bimbhra, "Electrical Machinery", Khanna Publishers, 7 Edition, Reprint, 2013.
2. B.R. Gupta, "Fundamental of Electric Machines", New age International rd Publishers, 3 Edition,Reprint 2015.
3. R.Krishnan, "Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application", CRC Press, 2017.
4. E.G. Janardanan, "Special Electrical Machines", PHI learning Private Limited, Delhi, 2014.
5. Singh, M.D., and Khanchandani, K.B., "Power Electronics", 2nd Edition., TataMcGraw-Hill, 2011.
6. Bimbra, P.S., "Power Electronics", Khanna Publishers, 5th edition, 2012.
7. Moorthi, V.R., "Power Electronics - Devices, Circuits and Industrial Applications", Oxford University Press, 2005.

WEB RESOURCES:

1. https:/www.st.com/en/applications/industrial-drives.html
2. https://www.designworldonline.com/stepper-motor-basics/
3. https://www.electronicshub.org/brushless-dc-motor-bldc-motor/

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.2.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108108077
2. https:/swayam.gov.in/nd1_noc19_ee65/preview

OUTCOMES

Upon completion of the course, the student will be able to:

1. CO1- Apply the principles, construction, and operational characteristics of DC generators and DC motors to understand their performance and behavior. (K3)
2. Apply the design aspects of single-phase and three-phase transformers to select, configure, and implement them for efficient performance in electrical systems. (K3)
3. Apply the construction, operating principles, and testing methods of single-phase induction motors, including various types, to understand their performance and characteristics. (K3)
4. Apply the construction and working principles of special electrical machines to understand their performance (K3)
5. Design, simulate, and evaluate power electronic circuits such as rectifiers, inverters, and voltage regulators for real-world applications. (K4)
6. Analyze and make an oral presentation on various control techniques such as open-loop, closed-loop, V/f control, vector control, and direct torque control based on system requirements. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	1	1
CO4	3	-	-	-	-	-	-	-	-	-	-	1	3
CO5	-	-	2	-	-	-	-	-	-	-	-	2	3
CO6	-	2	-	-	-	-	-	-	2	-	2	2	3

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - IV

24ICPC402 108105064 SDG NO. 4	INDUSTRIAL INSTRUMENTATION	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To introduce and explain the standard measurement techniques for viscosity, humidity, and moisture.
- To explore the principles and techniques used in temperature measurement.
- To familiarize with various pressure measurement techniques and devices.
- To learn the key principles and methods involved in measuring fluid flow.
- To demonstrate an understanding of electrical flow measurement techniques.
- To explain the principles and operation of level measurement techniques and transmitters.

MODULE - I MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 7

Viscosity: Saybolt viscometer - Rotameter type and Torque type viscometers. Humidity: Dry and wet bulb psychrometers - Resistive and capacitive type hygrometers - Dew cell - Commercial type dew meter. Moisture: Different methods of moisture measurements - Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, Application of moisture measurement - Moisture measurement in solids.

MODULE - II TEMPERATURE MEASUREMENT 8

Definitions and standards - Different types of filled in system thermometers - Bimetallic thermometers - Thermocouples, Signal conditioning for thermocouple, Circuits for cold junction compensation - Radiation methods of temperature measurement - Total radiation pyrometers.Optical pyrometers - Fiber optic sensor for temperature measurement - Thermograph - Temperature sensor selection, Installation and Calibration.

MODULE - III PRESSURE MEASUREMENT 7

Units of pressure, Manometers: Different types, elastic type pressure gauge, Bourdon tube, Bellows, Diaphragms and Capsules, Electrical Type - elastic elements with LVDT and strain gauges - Capacitive type pressure gauge - piezo resistive pressure sensor - Resonant pressure sensor - measurement of

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN Board of Studies Electronics and Instrumentation Engineering

vacuum - Mcleod gauge, thermal conductivity gauge, Ionization gauge, testing and calibration of pressure gauge using dead weight tester.

MODULE - IV FLOW MEASUREMENT **7**

Orifice plate: different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle – Dall tube – Pitot tube, Installation and applications of head lowmeters, Positive displacement flow meters, Rotameter –theory, characteristics, installation and applications, Mass flow meter, Calibration of flow meters: – Dynamic weighing method.

MODULE - V ELECTRICAL TYPE FLOW METERS **8**

Principle and constructional details of Electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter – Open channel flow measurement – Solid flow rate measurement.

MODULE - VI LEVEL MEASUREMENT AND TRANSMITTERS **8**

Level measurement: Float gauges - Displacer type, Ultrasonic gauge - Boiler drum level measurement, Differential pressure method and Hydrastep method - Solid level measurement, Operation of Electronics and Smart transmitters - Principle of operation of flow, level, temperature and pressure transmitters.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Doebelin, E.O. and Manik, D.N., "Measurement systems Application and Design",6thMcGraw-Hill Education Pvt. Ltd,2011.
2. Jones, B.E., "Instrument Technology", Vol.2, Butterworth-Heinemann, International Edition, 2003.

REFERENCES:

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press,2005.
2. Patranabis, D., "Principles of Industrial Instrumentation", 3rd Edition, McGraw-Hill Education,2017.
3. Eckman D.P., "Industrial Instrumentation", Wiley Eastern Limited,1990.
4. Singh,S.K., "Industrial Instrumentation and Control", Tata Mc-Graw-Hill Education Pvt. Ltd., New Delhi,2009.
5. AlokBarua, "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IITKharagpur.
6. Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

7. A.K. Sawhney and PuneetSawhney, "Mechanical Measurements and Instrumentation and Control", DhanpatRai& Co. (P) Limited, 2015.
8. Jain, R.K., Mechanical and Industrial Measurements, Khanna Publishers, Delhi,1999.McGraw-Hill, 2002.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_ee13/preview
2. https://nptel.ac.in/courses/108108111/

ONLINE RESOURCES:

1. https://instrumentationtoolbox.com
2. https://Our instrumentation.com

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply appropriate viscosity, humidity, and moisture measurement techniques in practical engineering scenarios.(K3)
2. Apply the various temperature monitoring methods for effective control in industrial processes.(K3)
3. Apply different pressure measurement techniques to assess and monitor industrial systems.(K3)
4. suitable flow measurement techniques for accurate fluid flow monitoring in engineering systems.(K3)
5. Apply appropriate flow measurement techniques for accurate process monitoring in engineering applications(K3)
6. Analyze and make an oral presentation on various level measurement techniques and operate industrial transmitters for process control.(K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-		3	3
CO6	-	-	-	-	-	-	-	-	2	-	2	3	3

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.8.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER - IV

24EIPC403 108104091 SDG NO. 4, 11	PRINCIPLES OF COMMUNICATION ENGINEERING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Introduce the fundamental principles of amplitude modulation and demodulation techniques.
- Explain the concepts and types of angle modulation used in analog communication.
- Provide an understanding of sampling, quantization, pulse modulation, and multiplexing techniques.
- Introduce basic digital modulation techniques and their significance in communication systems.
- Impart knowledge on information theory and coding techniques for error detection and correction.
- Familiarize students with wireless communication concepts and multiple access techniques.

MODULE - I AMPLITUDE MODULATION 7

Amplitude Modulation – AM, DSBSC, SSBSC, VSB, modulators and demodulators – Super heterodyne receivers.

MODULE - II ANGLE MODULATION 7

Angle modulation – PM and FM, modulators and demodulators - Comparison of NBFM and WBFM.

MODULE - III PULSE MODULATION 8

Low pass sampling theorem – Quantization – PAM,PTM – Line coding – PCM , DM, and ADM - Time Division Multiplexing, Frequency Division Multiplexing– Inter Symbol interference– Eye pattern.

MODULE - IV DIGITAL MODULATION AND TRANSMISSION 7

Amplitude Shift Keying-Frequency Shift Keying- Phase shift keying – BPSK,QPSK, 8 PSK,8 QAM,Telemetry-RFID applications

MODULE - V INFORMATION THEORY AND CODING 8

Measure of information – Entropy – Source coding theorem -Shannon–Fanocoding, Huffman Coding-Mutual Information – Channel capacity – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding and Viterbi coding.

Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - VI WIRELESS COMMUNICATION 8

Spread Spectrum-DSSS-FHSS-Multiple AccessTechniques - FDMA, TDMA, CDMA –Global system for Mobile Communication (GSM)- Satellite Communication.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems" 3/e, TMH2011.
2. S. Haykin "Digital Communications" John Wiley2013.

REFERENCES:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd edition, OxfordUniversity Press,2007
2. H P Hsu, Schaum Outline Series – "Analog and Digital Communications" TMH2006
3. B.Sklar, Digital Communications Fundamentals and Applications" 2/e Pearson Education2007.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_ee16/preview
2. https://www.scientechworld.com/education-software-training-and-skill- development/ sku- online- learning/ analog- and- digital-communication

ONLINE RESOURCES:

1. https://freevideolectures.com/search/communication-engineering/
2. https://www.tutorialspoint.com/principles_of_communication/index.htm

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply amplitude modulation techniques in the design of transmitters and receivers for efficient signal transmission and reception.(K3)
2. Apply angle modulation techniques in communication systems and compare their performance.(K3)
3. Analyze sampling, quantization, digital modulation techniques, line coding, multiplexing, and signal distortion in digital communication.(K4)
4. Apply and compare various encoding schemes such as PCM, DPCM, DM, and ADM for digital data representation.(K3)

Recommended by Board of Studies of E T E dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN Board of Studies Electronics and Instrumentation Engineering

5. Apply channel coding theorems and implement error control coding techniques including block codes, Hamming codes, cyclic codes, convolutional codes, and the Viterbi decoder.(K3)
6. Analyse spread spectrum techniques, multiple access methods, GSM and satellite communication systems for real time applications.(K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3			-	-	-	-	-	-	-	-	3	2
CO2	3	-		-	-	-	-	-	-	-	-	3	2
CO3	-	2		-	-	-	-	-	-	-	-	3	2
CO4	3			-	-	-	-	-	-	-	-	3	2
CO5	3			-	-	-	-	-	-	-	-	3	2
CO6	-	2		-	-	-	-	-	-	-	2	3	2

SEMESTER - IV

24EIPC404 107106081 SDG NO. 4,9	CONTROL SYSTEMS	L	T	P	CP	C
		3	1	0	4	3

OBJECTIVES:

- To Understand and model various physical systems using mathematical representations.
- To Analyze time-domain and frequency-domain responses of control systems.
- To Apply stability analysis techniques to determine system behavior.
- To Design compensators for feedback systems using frequency domain techniques.
- To Develop state-space representations and analyze system properties using state variable methods.
- To Apply appropriate control strategies to meet system performance requirements.

MODULE - I MATHEMATICAL MODELLING OF SYSTEM 8

Open loop and closed loop systems - Physical system - Linear and Non-Linear systems Transfer function Mathematical modeling of Electrical and Mechanical systems, Analogous systems - Block diagram representation - Signal flow graphs and their properties Mason's gain formula.

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN Board of Studies Electronics and Instrumentation Engineering

MODULE - II TIME DOMAIN ANALYSIS **8**

Standard test signals-Time response of first order and second order feedback control system to step input-Time domain specifications-Steady state error-Static error constants - Dynamic error coefficients - Introduction to P, PI, PID modes of feedback control.

MODULE - III FREQUENCY DOMAIN ANALYSIS **8**

Frequency domain specifications - Correlation between frequency domain and time domain specifications Bode plot - Polar plot - Determination of closed loop response from open loop response.

MODULE - IV STABILITY ANALYSIS **8**

Concepts of Stability: Necessary conditions for stability Routh Hurwitz stability criterion - Relative stability analysis. Root locus: Concepts of root - locus construction of root locus Determination of open loop gain for a specified damping of the dominant roots.

MODULE - V DESIGN OF FEEDBACK CONTROL SYSTEM **6**

Design specifications: Lead, Lag and Lag-Lead compensators using Bode plot techniques.

MODULE - VI STATE VARIABLE METHODS **7**

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability – Effect of state feedback

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Benjamin C. Ku and Farid Golnaraghi, "Automatic Control Systems", 10th edition McGraw-Hill Education, 2017.
2. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", 7th edition New Age International Publishers, 2017.

REFERENCES:

1. M.Gopal, "Control System–Principles and Design", Tata McGraw Hill,4th Edition, 2012.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education, 13th impression 2017
3. John J.D., Azzo Constantine, H. and Houpis Stuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor & Francis Reprint, 2014

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

4. Katsuhiko Ogata, "Modern Control Engineering", PHI Learning Private ltd, PEARSON 5th edition 2015.
5. NPTEL Video Lecture Notes on "Control Engineering "by Prof. S. D. Agashe, IIT Bombay.

WEB REFERENCES:

1. https://nptel.ac.in/courses/108106098/
2. https://nptel.ac.in/courses/108101037/

ONLINE RESOURCES:

1. https://lecturenotes.in/notes/15854-note-for-control-system-engineering-cse-by-amity-kumar
2. https://lecturenotes.in/notes/23763-note-for-control-system-engineering-cse-by-suman-kumar-acharya

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply the mathematical modeling techniques to represent physical, mechanical, and electrical systems. (K3)
2. Apply time-domain analysis to a physical model system to compute steady-state and dynamic errors using error constants (K3)
3. Apply frequency-domain techniques such as Bode and polar plots to the transfer function model and relate the outcomes to time-domain behavior (K3)
4. Apply the Routh-Hurwitz criterion and Root Locus methods to evaluate system stability and gain margins. (K3)
5. Design lead, lag, and lag-lead compensators to satisfy specified performance requirements. (K4)
6. Analyze state-space representations of linear time-invariant systems to evaluate controllability, observability, and the impact of state feedback. (K4)

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	1	2
CO2	3	-	-	-	-	-	-	-	-	-	-	1	2
CO3	3	-	-	-	-	-	-	-	-	-	-	1	2
CO4	3	-	-	-	-	-	-	-	-	-	-	2	3
CO5	-	-	3	-	-	-	-	-	-	-	-	2	3
CO6	-	3	-	-	-	-	-	-	-	-	2	2	3

SEMESTER - IV

24HSNC401 NPTEL CODE : - SDG NO. 4	NCC COURSE LEVEL 3	L	T	P	CP	C
		3	0	0	3	0

ARMY WING

PERSONALITY DEVELOPMENT **9**

PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4

BORDER & COASTAL AREAS **4**

BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2

ARMED FORCES 3

AF 2	Modes of Entry to Army, CAPF, Police	3

COMMUNICATION **3**

C 1	Introduction to Communication & Latest Trends	3

INFANTRY **3**

INF 1	Organisation of Infantry Battalion & its weapons	3

MILITARY HISTORY **23**

MH 1	Biographies of Renowned Generals	4
MH 2	War Heroes - PVC Awardees	4

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation

MH 3	Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4	War Movies	6

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT **9**

PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5	Public Speaking	3

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7

DISASTER MANAGEMENT **13**

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION **3**

EA 1 Environmental Awareness and Conservation 3

GENERAL AWARENESS **4**

GA 1	General Knowledge	4

NAVAL ORIENTATION 6

AF 1	Armed Forces and Navy Capsule	3
EEZ 1	EEZ Maritime Security and ICG	3

ADVENTURE 1

AD 1	Introduction to Adventure Activities	1

BORDER & COASTAL AREAS **2**

BCA 1	History, Geography & Topography of Border/Coastal areas	2

TOTAL: 45 PERIODS

AIR FORCE WING

PERSONALITY DEVELOPMENT **9**

PD 3 Group Discussion: Team Work 2

Recommended by Board of Studies of EIE dept. Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4
BORDER & COASTAL AREAS		**4**
BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2
AIRMANSHIP		**1**
A 1	Airmanship	1
BASIC FLIGHT INSTRUMENTS		**3**
FI 1	Basic Flight Instruments	3
AERO MODELLING		**3**
AM 1	Aero Modelling Capsule	3
GENERAL SERVICE KNOWLEDGE		**2**
GSK 4	Latest Trends & Acquisitions	2
AIR CAMPAIGNS		**6**
AC 1	Air Campaigns	6
PRINCIPLES OF FLIGHT		**6**
PF 1	Principles of Flight	3
PF 2	Forces acting on Aircraft	3
NAVIGATION		**5**
NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3

TOTAL :45 PERIODS

SEMESTER - IV

24EIPL401 - SDG NO. 3, 4, 9	INDUSTRIAL INSTRUMENTATION LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To impart an adequate knowledge and expertise to handle equipment
- To make the students aware about calibration of meters, sensors and transmitters

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

- To make the students conscious about the working and operation of different types of analytical instruments
- To formulate and analyze problems regarding sensors and transmitter

LIST OF EXPERIMENTS:

1. Measurement of speed, torque and vibration.
2. Calibration of ammeter, voltmeter and wattmeter using multifunction calibrator.
3. Calibration of pressure gauge using dead weight tester.
4. Measurement of level using d/p transmitter and fibre optics system
5. Measurement of flow using a) Discharge coefficient of orifice plate b) Calibration of Rotameter
6. Design and Testing of Electromagnetic Flow meters
7. Measurement of temperature using IR thermometer and IC sensor
8. Measurement of Absorbance and Transmittance of Test solutions using UV-Spectrometer
9. Measurement of Conductivity, Moisture and Viscosity of test solutions
10. Standardization and Measurement of pH values of different solutions
11. Measurement and analysis of ECG and pulse rate

TOTAL : 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

1. Orifice plate – 1 No
2. Dead weight tester with pressure gauge. – 1 No
3. Torque trainer. – 1 No
4. Saybolt Viscometer. – 1 No
5. Vacuum gauge. – 1 No
6. DP transmitter – 1 No
7. UV – Visible spectrophotometer. – 1 No
9. pH meter. – 1 No
10. Conductivity meter. – 1 No
11. ECG trainer. – 1 No
12. Pulse rate trainer. – 1 No
13. Tachometer. – 1 No

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze and perform measurements of mechanical parameters such as speed, torque, and vibration, and calibrate electrical instruments

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

including ammeters, voltmeters, wattmeters, and pressure gauges using standard calibration techniques. (K4)

2. Analyze and measure process parameters such as level, flow, and temperature using devices like d/p transmitters, fibre optic systems, orifice plates, rotameters, electromagnetic flow meters, IR thermometers, and IC sensors. (K4)
3. Analyze optical, chemical, and biomedical measurements by determining absorbance, transmittance, conductivity, moisture content, viscosity, pH, ECG signals, and pulse rate using appropriate instruments. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	2	-	-	-	-	-	2	2	-	-	2	2
CO2	-	2	-	-	-	-	-	2	2	-	-	2	2
Co3	-	2	-	-	-	-	-	2	2	-	-	2	2

SEMESTER - IV

24EIPT402 108105102 SDG NO. 4	MICROCONTROLLERS AND EMBEDDED SYSTEMS LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- To describe the architectural features of the 8051 microcontroller and to develop and execute programs that perform arithmetic and logical operations for solving computational problems.
- To Utilize simulation tools to configure timers, interrupts, and I/O ports of the 8051 microcontroller for executing real-time embedded applications
- To design and interface devices like stepper motors and traffic light controllers using the 8051 microcontroller.
- To Utilize simulation tools for executing Embedded C programs using 8051 Microcontrollers.
- To describe the architectural features of the Raspberry Pi and to develop and execute programs for simple applications.
- To develop programs to implement Raspberry Pi in real-time embedded applications.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I INTRODUCTION TO MICROCONTROLLERS 8

Architecture and features of the 8051 microcontroller. Instruction set and addressing modes. Comparison between microcontrollers and microprocessors.

LIST OF EXPERIMENTS

1. Perform 8-bit and 16-bit addition and subtraction.
2. Perform multiplication and division of two 8-bit numbers.
3. Perform basic logical operations. Write programs to find the square and cube of a number.

MODULE - II PROGRAMMING 8051 MICROCONTROLLER 8

Special Function Registers, Timers, Serial Communication, Interrupts, and I/O Ports.

LIST OF EXPERIMENTS:

1. Simulate timer programming using the 8051 microcontroller.
2. Simulate interrupt programming using the 8051 microcontroller.
3. Simulate I/O ports to generate a square wave.

MODULE - III INTERFACING TECHNIQUES 7

Interfacing stepper motor, traffic light controller, ADC & DAC with 8051 microcontroller

LIST OF EXPERIMENTS

1. Interface LEDs and design a traffic control system
2. Interface a stepper motor and control the speed and direction
3. Interface a DAC for the generation of waveforms

MODULE - IV EMBEDDED C PROGRAMMING FOR 8051 MICROCONTROLLER 7

Introduction to Embedded System -Classification – Embedded C programming essentials for 8051 Microcontroller in KEIL/Proteus Software

LIST OF EXPERIMENTS

1. LED blinking using with 8051 microcontroller
2. Displaying a number on 7-segment display using 8051 microcontroller
3. Keypad Programming using 8051 microcontroller

MODULE - V INTRODUCTION TO RASPBERRY Pi 8

Raspberry Pi: Raspberry Pi Architecture - Memory organization - I/O port expansion -GPIO access -setting and configuring the board, programming on Raspberry Pi.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

LIST OF EXPERIMENTS

1. LED blinking with Raspberry Pi
2. Interfacing a button using Raspberry Pi
3. Interfacing a Display using Raspberry Pi

MODULE - VI PROGRAMMING RASPBERRY PI FOR REAL TIME APPLICATION 7

UART - Keyboard interfacing – Key concepts in interfacing sensors and camera with Raspberry Pi

LIST OF EXPERIMENTS

1. UART communication with Raspberry Pi
2. Interface a temperature and humidity sensor with Raspberry Pi
3. Interface a camera with Raspberry Pi

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Muhammad Ali Mazidi & Janice Gilli Mazidi, "The 8051 Microcontroller and Embedded Systems," Pearson Education, 2nd Edition, 2011.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, "The PIC Microcontroller and Embedded Systems," 2010.
3. Dean, Alexander G, "Embedded systems fundamentals with arm cortex-M based microcontrollers: a practical approach, Cambridge ARM Education Media , 2017
4. Tristram Soto, "RASPBERRY PI : The Absolute Beginner's Guide to Raspberry Pi", Notion Press, 2023.

REFERENCES:

1. Douglas V. Hall, "Microprocessors & Interfacing," Tata McGraw Hill, 3rd Edition, 2017.
2. Krishna Kant, "Microprocessors & Microcontrollers," Prentice Hall of India, 2007.
3. Mike Predko, "8051 Microcontrollers," McGraw Hill, 2009.
4. Kenneth Ayala, "The 8051 Microcontroller," Thomson, 3rd Edition, 2004.
5. Benjamin Wilson "Raspberry Pi for Beginners: Tips and Tricks to Learn Raspberry Pi Programming",2023.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc22_cs93/preview
2. https://nielit.gov.in/calicut/content/nptel-lab
3. https://onlinecourses.nptel.ac.in/noc22_ee12/preview
4. https://onlinecourses.nptel.ac.in/noc20_ee98/preview

ONLINE REFERENCES

1. https://ebooks.inflibnet.ac.in/csp13/chapter/introduction-to-arm-processor/
2. https://ebooks.inflibnet.ac.in/csp13/chapter/microcontrollers-and-embedded- processors-2
3. https://www.geeksforgeeks.org/introduction-to-8051-microcontroller
4. https://www.raspberrypi.com/

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply the instruction set of the 8051 microcontroller to develop and execute programs that perform arithmetic and logical operations for solving computational problems (K3)
2. Analyze the simulation outputs to evaluate the configuration and operation of timers, interrupts, and I/O ports of the 8051 microcontroller for real-time embedded applications. (K4)
3. Design and interface devices like stepper motors and traffic light controllers using the 8051 microcontroller (K4)
4. Analyze the execution flow and performance of embedded C programs simulated using the 8051 microcontroller. (K4)
5. Analyze programming approaches for the Raspberry Pi processor using simulation tools to identify suitable solutions for simple applications. (K4)
6. Analyze Raspberry Pi interfacing techniques to develop real-time monitoring and control systems using sensors and actuators (K4)

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	2	-	-	2	2
CO2	-	3	-	-	2	-	-	2	2	-	-	2	2
CO3	-	-	3	-	-	-	-	2	2	-	-	3	2
CO4	-	3	-	-	2	-	-	2	2	-	-	3	2
CO5	-	3	-	-	2	-	-	2	2	-	-	3	2
CO6	-	-	2	-	2	-	-	2	2	-	2	3	2

Lab requirement for batch of 30 students / 2 student per experiment

S.No	Equipment	Quantity
1	8051 Microcontroller Trainer Kits	15
2	ADC and DAC Interface Boards	5
3	Stepper Motor Interface Boards with stepper motor	5
4	Traffic Light Interface Boards	5
5	Sensors- Temperature, Humidity, Light	5 each
6	Standalone desktop PC with MASM, Keil µVision, Flash magic, and UART driver software installed	15
7	Raspberry –Pi	15

SEMESTER - IV

24EITP401 NPTEL CODE : - SDG NO. 4	APTITUDE SKILLS - II	L	T	P	CP	C
		0	0	2	2	0

PROBLEM SOLVING TECHNIQUES USING C PROGRAMMING – PHASE 1

OBJECTIVES:

- Build a strong foundation in C programming concepts and problem-solving techniques.
- Develop the ability to write efficient and modular code.
- Enhance understanding of data structures, memory management, and algorithms for optimized solutions.

MODULE - I FOUNDATIONS OF PROGRAMMING 12

- Understanding Programming Languages: Why they are essential and their various types.

Recommended by Board of Studies of E & C Dept. Meeting No. 7 Dated: 1.9.2025

CHAIRMAN Board of Studies Electronics and Instrumentation Engineering

- Operators in C: Exploring assignment, arithmetic, relational, and logical operators.
- Tokens and Identifiers: Learning about keywords, naming conventions, and best practices.
- Control Structures in C: Choosing the right structure for efficient programming:
- Selective Control (Decision-making statements)
- Iterative Control (Loops for repetition)
- Unconditional Control (Jump statements)

MODULE - II DATA TYPES, NUMBER SYSTEMS, AND FUNCTIONS 12

- Operators in Depth: Understanding increment, decrement, and short-circuit operators.
- Number Systems & Conversions: Mastering different number systems, conversions, and format specifiers.
- Data Types in C: Exploring signed and unsigned types (int, float, char) and their usage.
- Functions in C:
- Importance of modular programming.
- Writing and using functions effectively.

MODULE - III POINTERS, ARRAYS, AND PROBLEM-SOLVING 21

- Pointers in C:
- Understanding memory management.
- How pointers enable direct hardware communication.
- Arrays in C:
- Efficiently storing multiple elements.
- Single-dimensional and multi-dimensional arrays.
- Problem-Solving Techniques:
- Tackling challenges related to arrays and strings.
- Optimizing algorithms for efficiency.

TOTAL: 45 PERIODS

REFERENCES:

1. Let Us C – Yashavant Kanetkar
2. Programming in ANSI C – E. Balagurusamy
3. The C Programming Language – Brian W. Kernighan and Dennis M.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

Ritchie
4. C: How to Program – Paul Deitel and Harvey Deitel
5. Problem Solving and Program Design in C – Jeri R. Hanly and Elliot B. Koffman

PHASE 2

(BIS STANDARDS, RANGER AND ROVER, LIFE SKILLS)

OBJECTIVES:

- Explore core domain BIS standards related to Information security and AI.
- Implement strategies to learn career and managerial skills for career growth.

MODULE - I JEEVAN KAUSHAL 2.0 – CAREER SKILLS AND MANAGERIAL SKILLS **14**

Group Discussion Skills - Meaning and Methods of Group Discussion - Procedure of Group Discussion - Group Discussion - Simulation - Group Discussion - Common Errors.

Managerial Skills - Basic Managerial Skills - Planning for effective management - How to organize teams? - Recruiting and retaining talent - Delegation of tasks - Learn to coordinate - Conflict management - Self- management Skills - Understanding self-concept - Developing self- awareness - Self-examination - Self-reflection and Introspection - Self- regulation.

Entrepreneurial Skills - Basics of Entrepreneurship - Meaning of entrepreneurship – Classification and types of entrepreneurships - Traits and competencies of entrepreneur -. Creating Business Plan - Problem identification and idea generation - Idea validation - Pitch making.

Managing Personal Finance - Budgeting - Setting personal goals - Estimate likely expenses Monitor spending to obtain the most value for the available funds - Saving and Investing - Advantages of saving money - Concept of present and future value of money.

MODULE - II RANGER AND ROVER **10**

Scouting for Boys: Scout Craft, Campaigning.

Knots: Managing of rope, types of ropes and uses, Basic Knots: - Clove Hitch, Reef Knot, Fisherman knot, Sheet bend, Bowline, Sheep shank, whippings.

Growing Together: Understanding the growth context.

Intergenerational Dialogue: How to enhance learning and cooperation across generations.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - III INDIAN STANDARDS ON INSULATORS, CABLE AND POWER CAPACITOR 6

Insulators: Design characteristic of Overhead Insulators and overview of faults in transmission system. Cable: Introduction to selection, design and testing of Cables in distribution and transmission system. Power Capacitor: Working principle, Classification of Power Capacitors, Test methods, Indian Standards available on various types of Power Capacitors.

TOTAL: 30 PERIODS

REFERENCES:

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES

1. https://lms.scout.org/courses/show/214175?force_course_hub=true
2. https://lms.scout.org/courses/show/214194?force_course_hub=true

OUTCOMES

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

1. Understand and apply the fundamentals of C programming for problem-solving. (K2)
2. Utilize control structures, operators, and functions to write modular programs. (K2)
3. Implement pointers and arrays for efficient memory and data management. (K2)
4. Solve real-world problems by designing and optimizing algorithms. (K2)
5. Demonstrate career and managerial skills. (K2)
6. Understand BIS standards for Information security and AI domain. (K2)

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	-	-	-	-	-	-	-	2	2	-
CO3	2	2	2	-	2	-	-	-	-	-	-	2	2
CO4	2	2	2	2	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	2	2	2	2	-	2
CO6	2	-	2	2	2	2	-	-	-	-	2	2	2

SEMESTER - IV

24EIID401 SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To empower students to transform innovative ideas into viable venture blueprints through structured entrepreneurial exploration and opportunity framing.
- To provide experiential learning in adaptive product evolution by focusing on user-centric redesign, iterative testing, and technical refinement.
- To develop proficiency in assessing market traction, decoding customer behavior, and aligning product strategy with investment-readiness metrics.
- To instill a foundation of ethical entrepreneurship by integrating inclusive design principles, sustainability values, and responsible leadership.
- To enable data-driven innovation by leveraging field research, applying performance analytics, and integrating emerging technologies for solution optimization.
- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, focusing on the practical execution and refinement of entrepreneurial ventures.
2. The project work must involve the continuous development, iterative enhancement, and potential launch of an entrepreneurial solution. It must also include appropriate elements of the following: compliance with advanced engineering standards, iterative design analysis, enhanced prototyping, robust experimentation, real-world user feedback collection, data correlation, and advanced software/hardware development for the solution.
3. Projects can be individual work or group projects, with a maximum of Three students. In case of a group project, each student must submit an individual project report clearly specifying their unique contributions to the collective work.
4. On completion of the project, the student shall submit a detailed project report encompassing the evolution of their venture, technical implementation, market validation, and future roadmap. The project shall undergo a formal review process, after which the report will be evaluated. Students shall appear for a mandatory viva-voce examination on the project, approved jointly by the Coordinator and the respective project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination): 20 marks (Focus on refined problem statement, advanced MVP design, and detailed development plan)
2. Second evaluation (Immediately after second internal examination): 30 marks (Focus on prototype/MVP implementation, initial testing, and preliminary market validation results)
3. Final evaluation (Last week of the semester): 50 marks (Focus on the complete refined solution, comprehensive market validation, growth strategy, final project report, and viva-voce)

Note: All three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

1. Apply structured entrepreneurial exploration to convert innovative ideas into venture blueprints, incorporating user-centric and iterative design approaches. (K4)

Recommended by
Board of Studies of EIE dept.
Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

2. Assess customer behavior and market traction to align product strategies with ethical and sustainable entrepreneurship principles. (K5)
3. Integrate multidisciplinary knowledge, field data, and emerging technologies to optimize and validate engineered solutions. (K6)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	-	-	-	2	2
Co3	3	3	2	-	-	-	-	2	-	-	-	2	2

Recommended by

Board of Studies of EIE dept.

Meeting No. 7 Dated: 1.3.2025

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER V

COURSE CODE: 24EIPC501	PROCESS DYNAMICS AND CONTROL	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 103101142	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC404					

OBJECTIVES:

- To introduce the technical terms and nomenclature associated with process control.
- To develop mathematical models for industrial processes.
- To familiarize students with the characteristics, selection, and sizing of control valves and actuators.
- To provide an overview of industrial PID controllers and implementation techniques.
- To apply various tuning methods for designing PID controllers and advanced control strategies.
- To apply model-based control schemes and multi-loop regulatory control for industrial processes.

MODULE - I PROCESS DYNAMICS 8

Need for process control – Nomenclature of Process instruments-Servo and regulatory operations – Mathematical Modeling of Processes: Level, Flow, Pressure and Thermal processes – Self regulation – Interacting and Non interacting system – Continuous and Batch processes – Lumped and Distributed parameter models – Heat exchanger – CSTR– Linearization of nonlinear systems

MODULE - II CONTROL ACTIONS AND PID IMPLEMENTATION 7

Characteristic of ON-OFF, Proportional, Single speed floating, Integral and Derivative controllers P+I, P+D and P+I+D control modes – Practical forms of PID Controller – PID Implementation Issues: Bumpless Auto/manual Mode transfer, Anti-reset windup Techniques – Direct/reverse action.

MODULE - III PID CONTROLLER TUNING 8

PID Controller Design Specifications: Criteria based on Time Response and Criteria based Frequency Response- PID Controller Tuning: Z-N and Cohen-

Coon methods, Continuous cycling method and Damped oscillation method, Evaluation criteria – ISE, IAE, ITAE and ¼ decay ratio, Auto tuning

MODULE - IV ADVANCED CONTROL STRATEGIES AND MODEL BASED CONTROL SCHEMES **7**

Cascade control – Split-range – Feed-forward control – Ratio control – Inferential control – override control – Smith predictor control scheme – Internal Model Controller – IMC-PID controller–Dynamic Matrix Control – Generalized Predictive Control.

MODULE - V CONTROL VALVES AND ACTUATION SYSTEMS **8**

Actuators: Pneumatic and Electric actuators – I/P converter- Control Valve Terminology – Characteristic of Control Valves: Inherent and Installed characteristics – Valve Positioner – Modeling of a Pneumatically Actuated Control Valve – Control Valve Sizing – Cavitation and flashing–Control Valve selection. for flow and level process.

MODULE - VI MULTI-LOOP REGULATORY CONTROL AND CASE STUDIES **7**

Introduction to Multivariable control – Multivariable PID Controller - Multivariable IMC – Multivariable Dynamic Matrix Controller – Multiple Model based Predictive Controller –Predictive PID Control – Control Schemes for Distillation Column, Bioreactor- Four-tank system, pH, and polymerization reactor.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Seborg, D.E., Edgar, T.F. and Mellichamp, D.A.,"Process Dynamics and Control",Wiley John and Sons,4thEdition, September, 2016.
2. Stephanopoulos, G., "Chemical Process Control – An Introduction to Theory and Practice",Pearson Education India Ltd, First edition, January 2015.
3. Antonio Visioli, "Practical PID Control", 1st Edition, Springer London (Series: Advances in Industrial Control), 2006

REFERENCES:

1. Curtis d Jonson, "Process Control Instrumentation Technology", Pearson, 8th edition, 2015.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

2. Surekha Bhanot, "Process Control: Principles and Applications", Oxford University Press, 2008.
3. Bela G. Liptak, "Instrument Engineers' Handbook, Volume Two: Process Control and Optimization", CRC.
4. D. Patranabis, "Principles of Process Control", McGraw Hill Education, 3rd edition, 2017.
5. D. P. Eckman, "Automatic Process control", Wiley India Pvt. Ltd, September 2009.
6. S. K. Singh, "Process Control: Concepts, Dynamics and Applications", Prentice Hall India Learning Private Limited, 2009.
7. S. Sundaram, "Process Dynamics and Control", Cengage, 1st edition, 2012.

WEBREFERENCES:

1. https://swayam.gov.in/nd1_noc20_ch11/preview
2. https://nptel.ac.in/courses/103106148/
3. https://nptel.ac.in/courses/103101142/

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3126/process-control-and-instrumentation

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply principles of process control terminology and mathematical modeling to develop dynamic models of common industrial processes. (K3)
2. Select and apply suitable control valves for flow and level control applications based on valve characteristics and process requirements. (K3)
3. Analyze the performance of ON–OFF, floating, composite, and PID controllers and evaluate practical issues involved in PID implementation. (K4)
4. Apply appropriate PID tuning techniques and implement advanced control strategies such as Auto-tuning, Cascade, and Feed-forward control to meet desired performance specifications. (K3)
5. Analyze single-loop and multi-loop industrial processes using model-based control strategies to assess stability and performance. (K4)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

6. Analyze and compare control schemes used in industrial applications such as Boiler Drum Level Control, CSTR, and Heat Exchanger systems. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	1	-	-	-	-	-	-	1	1	2
CO2	3	2	3	1	-	-	-	-	-	-	1	1	2
CO3	2	3	2	-	2	-	-	-	-	-	1	1	2
CO4	3	2	2	1	-	-	-	-	-	-	1	1	2
CO5	2	2	2	2	-	-	-	-	-	-	1	1	2
CO6	2	2	3	-	-	-	-	-	-	-	1	1	2

SEMESTER V

COURSE CODE: 24HSMG501	PRINCIPLES OF ENGINEERING MANAGEMENT	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4,8,9,10,12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To Understand the Basic Management Concepts and Principles in Corporate Practices.
- To Apply Management Functions Innovatively in Organizational Practices, globally.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 8

Management – Science or Art – Manager Vs Entrepreneur – types of managers – Engineers as Managers. Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current issues and future trends in Management; Industry 5.0 – Engineering management in modern business.

MODULE - II PLANNING 8

Planning, Technology Planning - Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – MBO – process - Principles and functions of engineering management – Planning Tools and Techniques – Decision-making steps and process.

MODULE - III ORGANISING 8

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization, and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning, and management.

MODULE - IV DIRECTING AND CONTROLLING 7

Foundations of individual and group behaviour – Motivation – theories and techniques–Leadership – Level 5 leadership - theories – Leadership as a determinant of Engineering management - Communication – process, and barriers – effective communication – Communication and IT - System and process of controlling – budgetary and non-budgetary control techniques.

MODULE - V INNOVATION AND TECHNOLOGY MANAGEMENT 7

Innovation management of Products and Services, Role of R & D in Entrepreneurship, Breakthrough Innovation, Disruptive Innovation – Modern approaches in Engineering management – Green management, Lean management, Managing diversity. IPR – Principles of Ethics for Engineering Managers.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - VI MODERN MANAGEMENT FRAMEWORKS AND AI APPLICATIONS 7

SWOT Analysis - PESTLE Analysis - Agile Management Principles - Design Thinking for Problem Solving - AI in Workforce Analytics and Performance Management - Generative AI for Knowledge Management and Innovation - Ethical and Responsible AI in Management.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. Tripathy, P.C. and Reddy, P.N., Principles of Management, McGraw-Hill Education, 2023 Edition.

REFERENCES:

1. Robbins, S.P., Coulter, M.A. and Long, L., Management, 16th Edition, Pearson, 2025.
2. Stoner, J.A.F., Freeman, R.E. and Gilbert, D.R., Management, 6th Edition, Pearson Education.
3. Robbins, S.P., Coulter, M.A. and DeCenzo, D.A., Fundamentals of Management, 11th Edition, Pearson Global Edition, 2026.
4. Kreitner, R. and Mohapatra, M., Management, Cengage Learning India.
5. Koontz, H., Weihrich, H. and Cannice, M., Essentials of Management, 11th Edition, McGraw-Hill.
6. Iansiti, M. and Lakhani, K., Competing in the Age of AI, Harvard Business Review Press.
7. Osterwalder, A. and Pigneur, Y., Business Model Generation, Strategyzer.
8. Lewrick, M., Link, P. and Leifer, L., The Design Thinking Playbook, Wiley.

WEB RESOURCES:

1. https:// www. managementstudyguide. com/ organization-management.htm
2. https://nptel.ac.in/courses/110/105/110105034/
3. https://courses.lumenlearning.com/boundless-management/chapter/principles-of-management/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/110/105/110105033/

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

OUTCOMES:

At the end of this course, the students should be able to:

1. Explain the fundamental concepts, theories and evolution of management in engineering organizations. (K2)
2. Apply planning principles and decision-making techniques for organizational problem solving. (K3)
3. Analyze organizational structures and human resource management practices in engineering enterprises. (K4)
4. Demonstrate leadership, communication and control mechanisms for effective organizational performance. (K3)
5. Examine innovation, technology management, sustainability and ethical practices in engineering management. (K4)
6. Apply modern management frameworks and AI-enabled managerial tools to support strategic and operational decisions. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	1	2	2	2	3	2	-	1
CO2	-	-	1	1	1	1	2	2	2	3	3	-	1
CO3	-	1	2	1	1	1	2	2	2	3	3	-	1
CO4	-	-	1	1	1	1	2	2	3	3	3	-	1
CO5	-	1	1	1	1	2	3	3	2	2	3	-	1
CO6	-	2	2	2	3	1	2	2	2	3	3	1	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER V

COURSE CODE: 24MGMC501	CONSTITUTION OF INDIA	L	T	P	CP	C
		2	0	0	2	0
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4, 9				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To know about Indian constitution.
- To know about central government functionalities in India.
- To know about state government functionalities in India.
- To know about Constitution function.
- To Know about Constitutional remedies

MODULE - I INTRODUCTION 5

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties.

MODULE - II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 5

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

MODULE - III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 5

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

MODULE - IV CONSTITUTION FUNCTIONS 5

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

MODULE - V CONSTITUTIONAL REMEDIES 5

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/12/2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - VI CONSTITUTIONAL GOVERNANCE IN THE DIGITAL ERA AND CONTEMPORARY ISSUES **5**

Constitutional Values and Good Governance – Right to Information (RTI) and Citizen Participation – Digital Governance and e-Governance Initiatives in India – Constitutional Perspectives on Artificial Intelligence (AI) and Emerging Technologies.

TOTAL : 30 PERIODS

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, 27th Edition (2024), LexisNexis Butterworths Wadhwa.
2. M. V. Pylee, An Introduction to the Constitution of India, Latest Revised Edition (2024), Vikas Publishing House.
3. P. M. Bakshi, The Constitution of India, 18th Edition (2025), Universal LexisNexis
4. Brij Kishore Sharma, Introduction to the Constitution of India, 15th Edition (2024), PHI Learning

REFERENCE BOOKS:

1. D. D. Basu, Shorter Constitution of India, Latest Revised Edition, LexisNexis
2. Subhash C. Kashyap, Our Constitution: An Introduction to India's Constitution and Constitutional Law, Latest Edition, National Book Trust
3. M. Laxmikanth, Indian Polity, 7th Edition (2025), McGraw Hill Education
4. J. N. Pandey, Constitutional Law of India, Latest Edition (2024), Central Law Agency.
5. V. N. Shukla, Constitution of India, Revised by Mahendra Pal Singh, 14th Edition / Latest Available Edition, Eastern Book Company

ONLINE REFERENCES

1. https://iasexamportal.com/ebook/the-constitution-of-india
2. https://eclass.cc/courses/udemy_basics_of_indian_constitution_a_refresher_course
3. https://ox.libguides.com/c.php?g=422964&p=2888489
4. https://mylaw.net/litigation/constitutional-law-course
5. www.tutorialspoint.com/indian_polity/indian_polity_sources_consitution.htm

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

6. www.drishtiias.com/gs-special/gs-special-polity/important-sources-of-the-indian-constitution
7. www.india.gov.in/my-government/constitution-india/constitution-india-full-text
8. http://legislative.gov.in/constitution-of-india

MOOC REFERENCES

1. https://www.mooc-list.com/tags/law
2. https://www.udemy.com/course/polity-and-constitution/
3. https://swayam.gov.in/nd2_cec19_hs13/preview
4. https://www.udemy.com/course/basics-of-indian-constitution-a-refresher-course/

OUTCOMES:

At the end of this course, the students should be able to:

1. Explain the historical evolution, philosophy and fundamental principles of the Constitution of India. (K2)
2. Describe the structure, powers and functions of the Union Government under the Constitution. (K2)
3. Interpret the structure and functioning of State Governments and the judicial system in India. (K2)
4. Analyze federal relations, constitutional amendments and constitutional functionaries. (K4)
5. Examine constitutional remedies and mechanisms for protection of fundamental rights. (K4)
6. Apply constitutional values and principles to contemporary governance, digital rights, AI ethics and emerging societal challenges. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	1	-	-	-	2	1	2	-	-	-	2	2
CO2	-	2	-	-	-	2	2	2	-	-	-	2	2
CO3	-	2	-	-	-	2	2	2	-	-	-	2	2
CO4	-	2	1	-	-	2	2	2	-	-	-	2	2
CO5	-	2	1	-	-	2	2	2	-	-	-	2	2
CO6	-	2	1	-	-	2	2	2	-	-	-	2	2

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER V

COURSE CODE: 24EIPL501	PROCESS CONTROL AND SIMULATION LABORATORY	L	T	P	CP	C
		0	0	4	4	2
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC404					

OBJECTIVES:

- To experimentally analyze the characteristics and performance of various process control systems, including level, pressure, flow, and temperature control loops.
- To develop practical skills in designing and implementing ON/OFF, PID, and advanced control strategies for different process control applications.
- To evaluate the dynamic response of first-order, second-order, interacting, and non-interacting systems for better process understanding.
- To familiarize students with multi-input multi-output (MIMO) systems and advanced control techniques such as cascade control and auto-tuning of controllers.

LIST OF EXPERIMENTS:

1. Study of AC and DC drives
2. Study of pH Control Test Rig.
3. Characteristics of Pneumatically Actuated Control Valve (with and without Positioner).
4. Level Control and Pressure Control in Process Control Training Plant.
5. Flow Control for Process Control Training Plant.
6. Design of ON/OFF Controller for the Temperature Process.
7. Response of Non-Interacting Level System
8. Response of Interacting level system
9. Response of the first-order and second order process
10. Tuning of PID Controller for mathematically described processes.
11. Closed loop response of cascade control system
12. Closed loop response of feed-forward control system
13. Design of controllers for non-linear system
14. Auto-tuning of PID Controller
15. Analysis of Multi-input Multi-output system (Four-tank System).

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026 **TOTAL : 60 PERIODS**

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

1. Control Valve Setup (with and without Positioner)
2. Level process Station
3. Pressure process Station
4. Flow process Station
5. Temperature Process
6. Two-Tank Interacting and non-Interacting level system
7. MATLAB Software
8. Four-tank System setup
9. Personal Computers – 15 Nos

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze the characteristics and dynamic responses of process control systems, including level, flow, pressure, and temperature processes, as well as interacting and non-interacting systems. (K4)
2. Design and implement control strategies such as ON/OFF, PID, cascade, feed-forward, and auto-tuned controllers for linear and non-linear industrial processes. (K5)
3. Evaluate the performance of advanced process control setups and industrial instrumentation, including control valves, AC/DC drives, pH control systems, and multi-input multi-output (MIMO) systems. (K5)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	2	-	-	-	2	2	-	-	-	3
CO2	2	2	-	2	2	-	-	2	2	-	-	-	3
CO3	2	2	-	2	-	-	-	2	2	-	-	1	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2024

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

SEMESTER V

COURSE CODE: 24EIPT501	SMART SYSTEMS AND IoT LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9 & 11				
PRE-REQUISITE COURSES	24EIPC303, 24EIPT402					

OBJECTIVES:

- Analyze the architecture and capabilities of ESP32-based embedded systems for IoT applications.
- Evaluate sensor integration methods for real time applications
- Analyze the communication protocols for reliable data acquisition and transmission.
- Apply Python programming to develop real-time monitoring and automation solutions.
- Examine network architectures and industrial IoT standards to design scalable connected systems.
- Assess cloud platforms, data visualization techniques, and security practices for creating end-to-end IoT solutions to address real-world engineering challenges.

MODULE - I ESP32-BASED EMBEDDED PROGRAMMING FOR IOT 8

Overview of the ESP32 architecture and features-Setting up the development environment using ESP-IDF -Embedded C basics for ESP32 applications

List of Experiments

1. LED Blinking application
2. Program using Timers, counters,
3. PWM, and interrupt handling

MODULE - II ESP32 BASED SENSOR INTEGRATION 8

Working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches.

List of Experiments

1. GPIO programming for interfacing Ultrasonic sensor, IR sensor , Temperature Sensors

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

2. GPIO programming for interfacing actuators
3. Wireless ECG/EEG Monitoring System

MODULE - III IOT- COMMUNICATION PROTOCOLS **8**

Communication Protocols: IEEE 802.15.4, ZigBee,Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA,MQTT), connecting into existing Modbus and Profibus technology

List of Experiments

1. Interfacing Built-in Wi-Fi and Bluetooth configuration-
2. Interfacing UART, SPI, and I2C communication protocols
3. Interfacing LoRAWAN for low-power IoT devices

MODULE - IV PYTHON FUNDAMENTALS FOR IOT **7**

Introduction to Python for connected devices- Data types, control structures, and functions-File handling and exception management-Working with Python libraries for hardware communication-Introduction to serial communication-Reading sensor data using Python

List of Experiments

1. Serial Communication Setup: Read data from a microcontroller/sensor and display it in Python.
2. Sensor Data Logging: Store real-time sensor data into a CSV file for analysis.
3. Threshold-Based Alert System: Generate an alert when sensor values exceed preset limits.

MODULE - V NETWORK PROGRAMMING AND IOT PROTOCOLS **7**

Basics of IoT architecture for Client-server communication-HTTP requests using Python-MQTT protocol for lightweight messaging-Working with REST APIs-Data transmission over networks

List of Experiments

1. Send Sensor Data to a Web Server: Use HTTP to upload real-time readings.
2. MQTT Publisher–Subscriber Model: Transmit sensor data between devices.
3. Weather/API Data Retrieval: Fetch cloud data and display it on a local dashboard.

MODULE - VI CLOUD INTEGRATION AND REAL-TIME VISUALIZATION **7**

Connecting devices to cloud platforms-Real-time dashboards-Data

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

visualization techniques-Remote monitoring concepts-Automation using Python scripts-Basics of IoT security

List of Experiments

1. Cloud Data Dashboard: Stream live sensor data and visualize graphs.
2. Remote Device Monitoring: Build a simple web-based monitoring interface.
3. Automated Email/SMS Alerts: Send notifications when abnormal conditions occur.

TOTAL : 45 PERIODS

LAB REQUIREMENTS:

S.No	Equipment	Quantity
1	ESP 32 Kits	10
2	ARDUINO UNO/ARM Microcontroller Kits	10
3	ADC and DAC Interface Boards	5
4	Actuators Interface Boards	5
5	ARM 7 trainer kit	10
6	Temperature sensor , Ultrasonic Sensor, MQ Sensors	2 Each
7	Standalone desktop PC with ESP-IDF	15

TEXT BOOK:

1. Simon Monk, Programming ESP32: Learn MicroPython Coding and Electronics ,MonkMakes Press,Year of Publication: 2025
2. Dr. Ovidiu Vermesan and Dr. Peter Friess, Internet of Things: From research and innovation to market deployment, River Publishers 2014.
3. Honbo Zhou,"The Internet of Things in the Cloud: A Middleware Perspective" - CRC Press 2012.

REFERENCES:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hand-on Approach, Universities press, 2015
2. Dieter Uckelmann et.al, Architecting the Internet of Things, Springer, 2011
3. Pethuru Raj and Anupama C.Raman, "The Internet of Things: Enabling Technologies and Use Cases, CRC Press

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_cs65
2. The Internet of Things in the Cloud | A Middleware Perspective | Honbo (taylorfrancis.com)

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze ESP32 architecture and develop embedded programs for smart device applications. (K4)
2. Evaluate and implement sensor interfacing and industrial communication protocols for efficient data transmission. (K5)
3. Analyze and develop Python-based applications for real-time monitoring, automation, and data logging. (K5)
4. Evaluate network architectures and IoT protocols to build reliable and scalable connected systems. (K4)
5. Design cloud-integrated dashboards with appropriate security measures for remote monitoring. (K5)
6. Create a comprehensive IoT system that integrates embedded programming, communication technologies, data analytics, and visualization to solve real-world engineering problems (K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	-	-	3	-	-	2	2	-	-	2	2
CO2	-	-	3	-	3	-	-	2	2	-	-	2	2
CO3	-	-	3	-	3	-	-	2	2	-	-	3	2
CO4	-	3	-	-	3	-	-	2	2	-	-	3	2
CO5	-	-	2	-	2	-	-	2	2	-	-	3	2
CO6	-	-	2	-	2	-	-	2	2	-	-	3	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies

SEMESTER V

COURSE CODE: 24EITP501	SKILL ENHANCEMENT	L	T	P	CP	C
		0	0	2	2	1
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4				
PRE-REQUISITE COURSES	24EITP301, 24EITP401					

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Educate and enrich students on quantitative ability, reasoning ability, and verbal ability.
- Build a strong foundation for solving recruitment-based problems with speed and accuracy.
- Enhance creative thinking skills.
- Enhance logical problem-solving skills.

MODULE - I QUANTITATIVE ABILITY **22**

Number Properties, Speed Math, HCF and LCM, Percentages, Time and Work, Time Speed and Distance, Ratio Proportion and Variations, Averages Mixtures and Alligation

MODULE - II QUANTITATIVE ABILITY REASONING ABILITY **16**

Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

MODULE - III VERBAL ABILITY **7**

Subject-Verb Agreement, Tenses, Prepositions - Concepts, Error Spotting, Sentence Correction, Fill in the Blanks

TOTAL : 45 PERIODS

REFERENCES

1. Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2. A Modern Approach to Logical Reasoning – R.S. Aggarwal
3. High School English Grammar & Composition – Wren & Martin
4. Word Power Made Easy – Norman Lewis.
5. Fast Track Objective Arithmetic – Rajesh Verma

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engg.

BIS STANDARDS, RANGER AND ROVER, LIFE SKILLS – PHASE 2

OBJECTIVES

To enable students to,

- Familiarize the team and leadership skills.
- Understand the standards relevant to ECE.

MODULE - I JEEVAN KAUSHAL 2.0 - COGNITIVE SKILLS, INNOVATIVE LEADERSHIP AND DESIGN THINKING, ETHICS AND INTEGRITY **14**

Cognitive and Non-cognitive Skills - Cognitive Skills: Meaning, Types of Cognitive Skills, Strategies to Develop Cognitive Skills- Critical Thinking Skills- Problem-solving skills - Ability to Learn, Non-cognitive Skills: Meaning and Types of Non-cognitive Skills, Strategies to Develop Non-cognitive Skills- Empathy- Creativity- Teamwork- Collaboration- Resilience - Interpersonal Skills- Perseverance- Social Control- Social Skill, Peer Pressure – Stress and Stress Management.

Innovative Leadership and Design Thinking- Concept of emotional and social intelligence, Concept of emotional and social intelligence, innovative Leadership- Synthesis of human and artificial intelligence, Why does culture matter for today's global leaders? Design Thinking- What is design thinking?, Key elements of design thinking, How to transform challenges into opportunities?, How to develop human-centric solutions for creating social good?

Ethics and Integrity - Learning through Biographies - What makes an individual great?, Understanding the persona of a leader for deriving holistic inspiration, Drawing insights for leadership, How leaders sail through difficult situations? Ethics and Conduct - Importance of ethics, Ethical decision making, Personal and professional moral codes of conduct, creating a harmonious life

MODULE - II RANGER AND ROVER **10**

Scouting for Boys: Camp Life, Trekking Wood Craft.

Community Service: Meaning, Types of Community Service & duration, difference between Community Service and Community Development.

WOSM / WAGGGS / Govt. of India Initiatives (One Event At least) - Surf Smart, Free Being Me, Messengers of Peace, Scouts of the World Award

Messengers of Peace and Scouts

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - III INTERNET OF THINGS AND ENVIRONMENTAL TESTING OF ELECTRONIC EQUIPMENT PROCEDURES 6

Internet of Things: Brainstorming about the standards pertaining to IoT & Digital Twins, including maritime and underwater IoT i.e; IS/ISO/IEC TR 22417:2017, IS/ISO/IEC 21823 series.

Environmental Testing of Electronics Equipment: Introduction to Standards pertaining to Environmental Test Procedures i.e. IS/IEC 60068 series, IS 9000, IS 9001 and IS 9002 series that are used extensively in the testing of all electronics products.

TOTAL : 30 PERIODS

REFERENCES:

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES

1. https://lms.scout.org/courses/show/214209?force_course_hub=true
2. https://free-being-me.com/wp-content/media/ABC_OLDER-2.pdf
3. https://www.wagggs.org/en/what-we-do/surf-smart-20/surf-smart-get-involved/

OUTCOMES

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

1. Demonstrate improved quantitative aptitude for solving numerical problems. [K2]
2. Apply logical reasoning to tackle reasoning-based challenges. [K2]
3. Enhance verbal communication and comprehension skills through grammar and language exercises. [K2]
4. Use ethical principles, emotional intelligence, and leadership insights from biographies to practice responsible decision-making and professional conduct. (K3)
5. Illustrate the objectives and practices of WOSM/WAGGGS and Government of India initiatives such as Messengers of Peace, Surf Smart, and Scouts of the World Award. (K3)
6. Apply the concepts of IoT, Digital Twins, and related standards in identifying applications of connected systems in modern technologies. (K3)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	1	-	-	-	1	-	2	-	-
CO3	2	2	2	2	-	-	-	-	1	-	2	-	-
CO4	-	-	-	-	-	2	-	3	3	3	-	2	2
CO5	-	-	-	-	-	3	2	2	2	2	1	2	2
CO6	3	2	2	-	3	1	-	-	-	-	-	2	2

SEMESTER V

COURSE CODE: 24EIID501	PROTOTYPE DEVELOPMENT LABORATORY – I	L	T	P	CP	C
		0	0	0	4	1
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24ESID101, 24ESID201, 24EIID301, 24EIID401					

OBJECTIVES:

- To enable students to transform innovative ideas into feasible prototype solutions through structured problem identification, design thinking, and concept development.
- To provide experiential learning in prototype design and development by focusing on user-centric requirements, iterative design, and technical validation.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

- To develop proficiency in problem analysis, feasibility assessment, requirement engineering, and prototype implementation.
- To instill a foundation of innovation and entrepreneurship by integrating ethical design principles, sustainability values, and responsible technology development.
- To enable data-driven solution development through literature survey, user feedback analysis, and technology exploration.
- To facilitate multidisciplinary problem-solving through engineering design, prototype realization, testing, validation, and technical communication.

COURSE METHODOLOGY

- This course is designed to develop innovation-oriented thinking and practical problem-solving abilities through prototype development activities focusing on real-world challenges.
- The project work shall involve the identification of a problem, requirement analysis, feasibility study, solution design, prototype development, testing, validation, and documentation. Students shall apply design thinking principles throughout the development cycle.
- Projects may be carried out individually or in groups with a maximum of three students. In the case of group projects, each student shall submit an individual project contribution report clearly specifying their role and responsibilities.
- Students shall maintain a detailed project portfolio containing problem statements, literature survey findings, design documents, prototype iterations, testing results, and validation reports.
- Periodic reviews shall be conducted to assess progress in prototype development, implementation, testing, and refinement. Students shall demonstrate prototype functionality during review evaluations.
- At the end of the semester, students shall submit a comprehensive project report and present a working prototype for evaluation by the course coordinator and project review committee.

EVALUATION

1. First Evaluation (Immediately after first internal examination): 20 Marks
   (Problem Identification and Validation, Literature Survey, Requirement Analysis, Initial Design Proposal)
2. Second Evaluation (Immediately after second internal examination): 30 Marks
   (Prototype Design Completion, Prototype Development Progress, Initial Testing and Validation Results)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

3. Final Evaluation (Last week of the semester): 50 Marks
   (Functional Prototype Demonstration, Innovation and Creativity, Technical Implementation, Project Report, Viva-Voce)

Note: All three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL : 30 PERIODS

OUTCOMES:

At the end of this course, the students should be able to:

1. Analyze real-world problems, user requirements, and design constraints to formulate innovative prototype solutions using design thinking methodologies. (K4)
2. Evaluate alternative technologies, development approaches, and feasibility aspects for prototype design and implementation. (K5)
3. Create functional prototypes by integrating appropriate tools, technologies, and engineering principles to address identified problems. (K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	-	-	-	-	2	3
CO2	3	3	3	--	3	-	-	-	-	-	-	2	3
CO3	3	3	3	-	3	-	-	-	-	-	-	3	3

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24EIEL501	INSTRUMENTATION STANDARDS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 110105094	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24IXPC401					

OBJECTIVES:

- To impart basic knowledge on Instrumentation standards, principles and its behavior.
- To understand the purpose and importance of instrumentation standards and their role in industrial measurement and control systems.
- To familiarize students with national and international standards organizations, and understand their contributions to industrial instrumentation and control practices.
- To interpret instrument symbols, identification systems, and documentation standards used in process industries.
- To apply ISA standards in the design, installation, and operation of industrial instrumentation

MODULE - I INSTRUMENT SYMBOLS AND STANDARDS **8**

Instrumentation standards: Purpose, Industry codes and standards, Government Regulations - Application to Industries, Application to work activities - Application to classes of Instrumentation and to Instrument functions. Identification Systems, Identification System guidelines: Instrument Index - Multipoint, Multivariable and Multifunction devices - System Identification - Loop Identification number - Identification Letter Tables.

MODULE - II STANDARDS ORGANIZATION **8**

Standards: Introduction International and National Standards organization: IEC, ISO, NIST, IEEE, ISA, API, BIS, DIN, JISC and ANSI. API: Process Measurement and Instrumentation (APIRP551): recommended practice for installation of the instruments - flow, level, temperature, pressure - Process Instrument and Control (API RP554): performance requirements and considerations for the selection, specification, installation and testing of process instrumentation and control systems.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - III ISA STANDARDS 8

Documentation of Measurement and Control, Instruments and System (ISA 5): 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7 - General Requirements for Electrical Equipment in Hazardous Location (ISA 12): 12.2, 12.4, 12.24, 12.29 - Instrument Specification Forms (ISA20): Measurement Transducers (ISA37)

MODULE - IV ISA STANDARDS - CONTROL VALVE AND ACTUATOR 7

Control Valve Standards (ISA75): 75.01, 75.04, 75.05, 75.7, 75.11, 75.13, 75.14, 75.23, 75.24, 75.26. Actuator (ISA 96): 96.01, 96.02, 96.03, 96.04.

MODULE - V ISA STANDARDS - FOSSIL AND NUCLEAR POWER PLANTS 7

Fossil Power Plant Standards (ISA 77): 77.14, 77.22, 77.30, 77.41, 77.42, 77.44, 77.60, 77.70. Nuclear Power Plant Standards (ISA67): 67.01, 67.02, 67.03, 67.04, 67.06.

MODULE - VI BS, ISO, IEC & ANSI 7

Wireless sensor networks: Hardware components - energy consumption of sensor nodes - Network architecture - sensor network scenario. Wireless MAC Standards - IEEE 802.11, IEEE 802.15.4. Zigbee Wireless HART - Wireless Standard for Process Industry - ISA100 - Introduction to Industrial IOT.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. API Recommended Practice 551, "Process Measurement Instrumentation", American
2. Petroleum Institute, Washington, D.C., 1st Edition, May 1993.
3. API Recommended Practice 554, "Process Instrumentation and Control – 3 parts", American 4. Petroleum Institute, Washington, D.C., 1st Edition, October 2008.
5. ISA standard 5, "Documentation of Measurement and Control Instruments and Systems", ISA, North Carolina, USA.
6. ISA standard 12, "Electrical Equipment for Hazardous Locations", ISA, North Carolina, USA.
7. ISA standard 20, "Instrument Specification Forms", ISA, North Carolina, USA.
8. ISA standard 37, "Measurement Transducers", ISA, North Carolina, USA.
9. ISA standard 75, "Control Valve Standards", ISA, North Carolina, USA.
10. ISA standard 96, "Valve Actuator", ISA, North Carolina, USA.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

11. ISA standard 77, "Fossil Power Plant Standards", ISA, North Carolina, USA.
12. ISA standard 67, "Nuclear Power Plant Standards", ISA, North Carolina, USA.
13. BS EN 60584-1, "Thermocouples - EMF specifications and tolerances", British Standard, 2013.

OUTCOMES:

At the end of this course, the students should be able to:

1. Explain the purpose, scope, and significance of instrumentation standards in industrial measurement and control systems. (K2)
2. Identify and compare the roles of national and international standards organizations in industrial instrumentation applications. (K4)
3. Interpret and apply standards to develop and analyze instrumentation drawings and system layouts.(K3)
4. Apply ISA standards related to industrial instrumentation design and practice. (K3)
5. Analyze and select appropriate control valves and actuators based on ISA standards.(K4)
6. Analyze instrumentation and control requirements for fossil fuel and nuclear power plants (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	3	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO4	3	2	2	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3	3
CO6	3	3	2	2	-	-	-	-	-	-	-	3	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - I

COURSE CODE: 24EIEL502	SENSORS FOR AIR POLLUTION MONITORING SYSTEMS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 108108147	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24IXPC301, 24IXPC302					

OBJECTIVES:

- To develop a comprehensive understanding of regulatory standards governing air quality.
- To explain the fundamental principles of gas and particulate sensors.
- To analyze and compare the performance characteristics.
- To equip students with knowledge of advanced sensor techniques.
- To design and evaluate IoT-enabled air quality monitoring systems and real-time analytics.

MODULE - I AIR POLLUTION OVERVIEW 8

Introduction to air pollution: sources, types, and impacts - Criteria and non-criteria air pollutants (PM, SO_2, NOx, CO, O_3, VOCs) - Air quality standards and guidelines (WHO, EPA, CPCB, EU) - Need for air pollution monitoring systems - Overview of conventional vs sensor-based monitoring approaches.

MODULE - II PRINCIPLES OF GAS AND PARTICULATE SENSORS 8

Basic sensing principles: resistive, capacitive, optical, electrochemical. Gas sensing mechanisms: adsorption, reaction kinetics, diffusion, Particulate matter (PM_{10}, $PM_{2.5}$) sensing principles. Sensor performance metrics: sensitivity, selectivity, accuracy, response time Cross-sensitivity and interference effects.

MODULE - III TYPES OF SENSORS FOR AIR POLLUTION MONITORING 8

Electrochemical gas sensors (CO, NO_2, SO_2, O_3), Metal Oxide Semiconductor (MOS) sensors, Optical and infrared (NDIR) sensors, Photoionization detectors (PID) for VOCs, Laser-based and optical particle counters for particulate matter.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - IV SENSOR CALIBRATION, DATA ACQUISITION AND SIGNAL CONDITIONING **8**

Calibration techniques: laboratory and field calibration, Sensor drift, aging, and environmental effects (temperature, humidity) , Signal conditioning circuits and amplification, Analog-to-digital conversion and data logging, Noise reduction and error analysis.

MODULE - V AIR QUALITY MONITORING SYSTEMS AND IOT INTEGRATION **7**

Architecture of air pollution monitoring systems, Fixed, mobile, and wearable sensor networks, Wireless communication technologies (Wi-Fi, LoRa, GSM, NB-IoT), IoT-based air quality monitoring platforms, Data storage, visualization, and cloud-based analytics.

MODULE - VI CASE STUDIES **6**

Urban air quality monitoring and smart cities, Industrial emission monitoring, Indoor air quality monitoring systems.

TOTAL : 45 PERIODS

TEXT BOOK:

1. S. C. Bhatia, Environmental Pollution and Control in Chemical Process Industries, Khanna Publishers, New Delhi.
2. R. S. Khurmi and J. K. Gupta, A Textbook of Environmental Engineering, S. Chand & Company.
3. Jiri Janata, Principles of Chemical Sensors, Springer Science & Business Media.
4. Bhattacharya, A., Sensors and Transducers, PHI Learning Pvt. Ltd.
5. A. Kumar and V. K. Jain, Air Pollution and Control, Narosa Publishing House.

REFERENCE BOOKS

1. G. Korotcenkov, Handbook of Gas Sensor Materials: Properties, Advantages and Shortcomings, Springer.
2. P. T. Moseley and B. C. Tofield, Solid State Gas Sensors, Adam Hilger, Bristol.
3. William W. Nazaroff and Lisa Alvarez-Cohen, Environmental Engineering Science, Wiley.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

4. S. P. Mishra, Environmental Engineering, Khanna Publishers.
5. Marco Brugnone and Stefano Squartini, Sensor Systems for Air Quality Monitoring, Elsevier.

OUTCOMES

Upon completion of the course, the student will be able to:

1. Explain the fundamental concepts of air pollution and international air quality standards. (K2)
2. Analyze the working principles of various gas and particulate sensors and evaluate their performance characteristics. (K4)
3. Apply advanced techniques to enhance sensor accuracy and reliability in real-world monitoring. (K4)
4. Design and implement IoT-enabled air quality monitoring systems for real-time environmental assessment. (K4)
5. Critically assess and compare sensor technologies and air quality monitoring systems. (K4)
6. Explore emerging trends and propose innovative solutions for future challenges. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	2	2
CO6	3	3	2	2	-	-	-	-	-	-	-	3	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - I

COURSE CODE: 24EIEL503	BIOMEDICAL INSTRUMENTATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 102106669	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24IXPC301, 24IXPC302, 24IXPC304					

OBJECTIVES:

- To impart the fundamental concepts of Biomedical Engineering.
- To explain the communication mechanisms in biomedical systems with relevant examples.
- To apply appropriate techniques to acquire important electrical physiological parameters.
- To analyze electrical physiological signals for effective interpretation and diagnosis.
- To explain the principles underlying biomedical imaging techniques.
- To describe the functions and applications of life-assisting and therapeutic devices.

MODULE - I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 7

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone -soft tissues -Physiological signals and transducers - selection criteria – Piezoelectric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

MODULE - II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 8

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

MODULE - III ELECTRICAL PARAMETERS ACQUISITION 7

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Electro Physiological Measurement - ECG – EEG – EMG – ERG – Lead systems.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - IV ELECTRICAL PARAMETERS ANALYSIS 7

ECG – EEG – EMG – ERG and recording methods Typical waveforms - Electrical safety in medical environment, shock hazards leakage current-Instruments for checking safety parameters of biomedical equipment.

MODULE - V IMAGING MODALITIES AND ANALYSIS 8

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

MODULE - VI LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 8

Pacemakers – Defibrillators – Ventilators – incubators, drug delivery devices - Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system , Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi,2nd Edition 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, NewDelhi, 2nd Edition, 2003.
3. Joseph J Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and sons, New York, 4th Edition,2012.

REFERENCES:

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York Fifth Edition ,1998.
2. Duane Knudson, "Fundamentals of Biomechanics", Springer, Second Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., "Health Care Systems, Technology and Techniques", Springer, Second Edition,2011.
4. Ed. Joseph D. Bronzino, "The Biomedical Engineering Hand Book", Third Edition, Boca Raton, CRC Press LLC,2006.
5. M.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies,Second Edition 2003.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

WEB REFERENCES:

1. https://www.nhlbi.nih.gov
2. https://psychology.wikia.org/wiki/Medical_therapeutic_devices

ONLINE RESOURCES:

1. https://www.udemy.com/course/biomechanics-cervical-spine-module-1/
2. https://academicearth.org/biomedical-engineering/
3. https://www.edx.org/learn/biomedical-engineering
4. https://www.coursera.org/courses?query=biomedical
5. https://www.distancelearningportal.com/study-options c/short/269778974/bio-biomedical-engineering-united-states.html
6. https://www.classcentral.com/tag/biomedical-engineering

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply the human physiological principles to select, justify, and operate appropriate physiological transducers for accurate biomedical measurements. (K3)
2. Make Use of the design and operating principles of modern non-electrical biomedical devices . (K3)
3. Apply the various sensing and measurement devices of electrical origin for bio-medical applications. (K3)
4. Apply suitable medical imaging modalities for effective healthcare diagnosis. (K3)
5. Apply the important modern methods of imaging techniques and their analysis with Biometric systems. (K3)
6. Examine and apply robotics, therapeutic devices, and contemporary medical technologies for various clinical purposes. (K4)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	-	-	-	-	-	-	3	3
CO3	2	3	3	-	-	-	-	-	-	-	-	2	3
CO4	2	3	3	-	-	-	-	-	-	-	-	2	3
CO5	2	2	2	-	-	-	-	-	-	-	-	2	3
CO6	1	2	2	2	2	-	-	-	-	-	2	3	3

PROFESSIONAL ELECTIVE - I

COURSE CODE: 24EIEL507	ANALYTICAL INSTRUMENTATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 108105064	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC301, 24EIPC402					

OBJECTIVES:

- To introduce the principle and instrumentation of Infrared (IR) spectrophotometry for identification of functional groups in chemical compounds.
- To explain the working principle, advantages, and applications of FTIR spectrophotometry in modern analytical analysis.
- To familiarise the fundamental principle of Atomic Absorption Spectrophotometry (AAS) for quantitative determination of metal ions.
- To impart the instrumentation and analytical significance of flame emission and atomic emission photometry.
- To compare IR, FTIR, AAS, and emission-based techniques with respect to sensitivity, selectivity, and applications.
- To apply these spectroscopic and photometric techniques in pharmaceutical, environmental, industrial, and clinical analysis.

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I SPECTROPHOTOMETRY 7

Fundamentals & UV–Visible Techniques: Spectral methods of analysis, Electromagnetic radiation and interaction with matter, Beer–Lambert Law (derivation, deviations, applications) Derivative Spectrophotometry – principle and analytical advantages

MODULE - II ADVANCED SPECTROPHOTOMETRIC TECHNIQUES 8

UV–Visible Spectroscopy Principle , Construction, Sources, Detectors, Applications, Infrared (IR) Spectrophotometry, Near-Infrared (NIR), ICP–AES and ICP–MS, Spectroscopy, FTIR Spectrophotometry, Atomic Absorption Spectrophotometry (AAS),Flame emission and atomic emission photometry , Principle, Instrumentation, and applications.

MODULE - III CHROMATOGRAPHIC TECHNIQUES 7

General principles of chromatography, Classification of chromatographic techniques Chromatographic behavior of solutes ,Quantitative determination in chromatography,Gas Chromatography (GC),Liquid Chromatography (LC),High-Performance Liquid Chromatography (HPLC),Ultra Performance Liquid Chromatography (UPLC) Hyphenated techniques: GC–MS and LC–MS

MODULE - IV INDUSTRIAL GAS ANALYZERS 8

Industrial gas analyzers – principles of Oxygen analyzers ,NO_2 analyzers, H_2S analyzers, Infrared gas analyzers, Thermal conductivity detectors, Gas analysis based on ionization, Electrochemical gas sensors and smart gas analyzers,IoT-based continuous emission monitoring systems (CEMS)

MODULE - V ELECTROCHEMICAL ANALYZERS 7

Electrochemical and Water Quality Analyzers, Selective ion electrodes, Principle of pH measurement, Conductivity measurements ,Dissolved oxygen analyzer, Sodium analyzer, Silicon analyzer, Water quality analyzer

MODULE - VI NMR & MASS SPECTROMETRY 8

Nuclear Magnetic Resonance (NMR),Basic principles of Continuous-wave NMR-Pulsed Fourier Transform NMR,.Mass Spectrometry, Sample introduction systems-Ionization methods Mass analyzers Types of mass spectrometry ,Advanced Analytical Techniques, Solid-state NMR ,High-resolution mass spectrometry (HRMS) and tandem MS (MS/MS)

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

TEXT BOOK:

1. Willard, H.H.,Merritt, L.L.,Dean, J.A.,Settle, F.A" Instrumental methods of analysis",CBSpublishing&distribution,7thEdition,2014.
2. Braun, R.D., "Introduction to Instrumental Analysis", Pharma Book Syndicate, Singapore, 2006.

REFERENCES:

1. Khandpur, R.S., "Handbook of Analytical Instruments", Tata McGraw-Hill publishing Co.Ltd., 2nd Edition 2007.
2. Ewing, G.W., "Instrumental Methods of Chemical Analysis", McGraw-Hill, 5th Edition reprint 1985. (Digitizedin2007).
3. Robert E. Sherman., "Analytical Instrumentation", Instruments Society of America, 1996.
4. Liptak, B.G., "Process Measurement and Analysis", CRC Press, 5th Edition, 2015.
5. Nelu Grinberg, Sonia Rodriguez Ewing's Analytical Instrumentation Handbook, Fourth Edition, Published March 12, 2019 by CRCPress
6. NPTEL lecture notes on, "Modern Instrumental Methods of Analysis" by Dr. J.R. Mudakavi, IISC, Bangalore.

WEB REFERENCES:

1. https://www.analytical-training-solutions.com/
2. http://www.anachem.umu.se/jumpstation.htm
3. http://roswell.ca.sandia.gov/~mmyoung
4. https://www.classcentral.com/course/analyticalchem-838

ONLINE RESOURCES:

1. https://www.my-mooc.com/en/mooc/analyticalchem/
2. https://www.spectroscopyonline.com/topic/analytical-instrumentation
3. https://onlinelibrary.wiley.com/

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze the principles and instrumentation of spectrophotometry and evaluate their relevance in industrial applications. (K4)
2. Analyze the fundamental principles and operational features of UV, IR, flame, and atomic spectrophotometers.(K4)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and instrumentation Engineering

3. Analyze the chromatographic behavior of solutes in gas chromatography and liquid chromatography to interpret separation mechanisms.(K4)
4. Analyze the functioning of industrial gas analyzers such as oxygen, NO_2, H_2S, and IR analyzers, along with techniques used for dust and smoke measurement.(K4)
5. Analyze the working principles and performance of pH, sodium, silicon, and water quality analyzers in process industries.(K4)
6. Analyze the operating principles of NMR and mass spectrometry and evaluate their applications in material and chemical analysis.(K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	1	-	-	-	-	-	-	-	3	3
CO3	2	3	3	2	-	-	-	-	-	-	-	2	3
CO4	2	3	3	3	-	-	-	-	-	-	-	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	2	3
CO6	1	2	2	2	-	-	-	-	-	-	2	3	3

PROFESSIONAL ELECTIVE - I

COURSE CODE: 24EIEL508	FIBER OPTICS AND LASER INSTRUMENTATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 108106167	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11				
PRE-REQUISITE COURSES	24EIPC402, 24EIPC403					

OBJECTIVES:

- To impart the fundamentals of optics and light propagation in fibers
- To introduce optical fiber characteristics, losses and dispersion mechanisms
- To familiarise the working principles of optical sources and detectors
- To describe the laser principles, types and characteristics
- To describe the fiber optic communication systems
- To apply laser and fiber optic concepts in instrumentation and sensing

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I PRINCIPLES OF OPTICS AND OPTICAL FIBERS 8

Nature of light – electromagnetic spectrum – reflection, refraction and Snell's law – total internal reflection – numerical aperture – acceptance angle – structure of optical fiber – step index and graded index fibers – modes of propagation – single mode and multimode fibers.

MODULE - II OPTICAL FIBER CHARACTERISTICS AND LOSSES 7

Attenuation mechanisms – absorption losses – Rayleigh scattering – bending losses – dispersion: material, waveguide and modal dispersion – bandwidth and rise time – fiber optic cables – strength and reliability of fibers.

MODULE - III OPTICAL SOURCES, DETECTORS AND COMPONENTS 7

Optical sources: LED and laser diode – characteristics and comparison – optical detectors: PIN and avalanche photodiodes – responsivity – quantum efficiency – noise – optical couplers, isolators, circulators and connectors.

MODULE - IV LASER PRINCIPLES AND TYPES 8

Stimulated emission – population inversion – pumping mechanisms – Einstein coefficients – optical resonators – characteristics of laser beam – solid state lasers – gas lasers – semiconductor lasers – fiber lasers – applications.

MODULE - V FIBER OPTIC COMMUNICATION SYSTEMS 7

Block diagram of fiber optic communication system – analog and digital transmission – modulation techniques – optical amplifiers – WDM systems – basic link power budget analysis.

MODULE - VI LASER AND FIBER OPTIC INSTRUMENTATION 8

Fiber optic sensors: intensity, phase and wavelength based sensors – interferometric sensors – fiber Bragg grating sensors – laser based instruments for distance, displacement and velocity measurement – industrial and biomedical applications.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Gerd Keiser, "Optical Fiber Communications", McGraw Hill, 5th Edition.
2. John Wilson and John F. B. Hawkes, "Optoelectronics – An Introduction", Pearson Education, 3rd Edition, 1998.
3. William T. Silfvast, "Laser Fundamentals", Cambridge University Press 2008.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

REFERENCES:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", Wiley, 5th edition,2003.
2. Dennis Derickson, "Fiber Optic Test and Measurement", Prentice Hall,1997.
3. M. J. Adams, "An Introduction to Optical Waveguides", Wiley,1981.

WEB RESOURCES:

1. https://www.rp-photonics.com
2. https://www-hep.phys.sinica.edu.tw/RadWork_www/Publications/Reference_Books/Fiber_Optics_Engineering_M.Azadeh/978-1-4419-0304-4.pdf

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/117101054
2. https://onlinecourses.nptel.ac.in/noc20_ph07/preview
3. https://nptel.ac.in/courses/108106167

OUTCOMES

Upon completion of the course, the student will be able to:

1. Explain the principles of optics and light propagation to evaluate signal transmission in optical fibers. (K2)
2. Analyze optical fiber characteristics, losses, and dispersion mechanisms to optimize communication performance. (K3)
3. Analyze and select suitable optical sources, detectors, and components for efficient system design. (K3)
4. Examine laser principles, types, and characteristics to determine their suitability for engineering applications. (K3)
5. Examine and analyze fiber optic communication systems with respect to specified performance requirements
6. Analyze laser- and fiber optic–based solutions for advanced instrumentation and sensing applications. (K4)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	1	-	-	-	-	-	-	-	3	3
CO3	2	3	3	2	-	-	-	-	-	-	-	2	3
CO4	2	3	3	3	-	-	-	-	-	-	-	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	2	3
CO6	1	2	2	2	-	-	-	-	-	-	2	3	3

PROFESSIONAL ELECTIVE - I

COURSE CODE: 24EIEL509	SMART AND WIRELESS INSTRUMENTATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 106105160	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11				
PRE-REQUISITE COURSES	24EIPC301, 24EIPC403					

OBJECTIVES:

- To introduce students to the fundamentals of smart sensors and MEMS devices for measuring physical and environmental parameters.
- To impart knowledge of wireless sensor network architectures and node designs for industrial and IoT applications.
- To enable students to understand and apply wireless communication protocols such as Zigbee, BLE, LoRa, NB-IoT, WirelessHART, and ISA100.11a.
- To introduce the concepts of power management and energy harvesting for designing energy-efficient wireless instrumentation systems.
- To impart awareness of cyber security threats and enable the application of strategies to secure wireless instrumentation networks.
- To enable students to analyze system requirements and design end-to-end wireless instrumentation systems for real-time monitoring and industrial IoT applications

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - I SMART SENSORS **8**

Introduction to MEMS Inertial Sensors (Motion & Vibration)-Smart Accelerometers,Gyroscopes, Smart Environmental Sensors-Digital Temperature & Humidity-Barometric Pressure (MEMS), Air Quality (Gas) Sensors, Smart Pressure Transmitters-Smart Flow Meters:-Sensor selection criteria for real-time applications

MODULE - II WIRELESS SENSOR NETWORKS **8**

Introduction to Wireless Sensor Networks - Sensor Node Architecture (generic model) - Components: Sensor nodes, Sink/Base station, Gateway, Cloud interface- Layered architecture of WSN - Network architectures: Flat, Clustered, Hierarchical

MODULE - III WIRELESS COMMUNICATION INTERFACE **8**

Communication models: single-hop and multi-hop communication, Zigbee (IEEE 802.15.4) – Bluetooth / BLE – Wi-Fi (IEEE 802.11) – LoRa / LoRaWAN – NB-IoT / LTE-M – Cellular IoT communication- Wireless HART, ISA100.11a-Comparative analysis based on range, power, and data rate

MODULE - IV POWER MANAGEMENT AND ENERGY HARVESTING **8**

Power sources for WSN - Energy harvesting techniques: -Solar energy and battery systems (Lead-acid, Li-ion basics) -RF energy harvesting -Vibration-based harvesting -Thermal energy harvesting - Energy management techniques in embedded systems - Battery selection and life estimation (numerical approach) - Basics of power management ICs (PMIC) and circuits

MODULE - V CYBER SECURITY THREATS TO WIRELESS COMMUNICATION **7**

Introduction to security in WSN and IoT- Threats in wireless communication: -Eavesdropping -Data tampering and message modification -Denial of Service (DoS) and jamming attacks -Device spoofing and impersonation -Man-in-the-Middle (MitM) attacks -Physical node capture and key extraction -Routing and network layer attacks -Basic security mechanisms: -Encryption techniques -Authentication methods

MODULE - VI DESIGN OF WIRELESS INSTRUMENTATION SYSTEMS **6**

WSN based physiological parameters monitoring system-WSN based smart power monitoring system. Case Studies in Smart agriculture-Environmental

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

monitoring-Smart cities and building automation-Introduction to advanced sensing technologies: -Smart Camera -LiDAR (Light Detection and Ranging)

TOTAL : 45 PERIODS

TEXT BOOK:

1. C.S. Raghavendra, K. M. Sivalingam, T. Znati, Editors, Wireless Sensor Networks, Springer India,2006
2. Sudip Misra, Wireless Communication and Networks, McGraw Hill,2017
3. Smart Sensors, Measurement and Instrumentation , Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.

REFERENCE BOOKS:

1. Fadi Al-Turjman, et al., Advanced Wireless Communication and Sensor Networks: Applications and Simulations, CRC Press -Taylor & Francis Group, 2022
2. Fei Hu ,Security and Privacy in Internet of Things (IoTs): Models, Algorithms and Implementations,: CRC Press (Taylor & Francis Group), 2016 Edgar H. Callaway Jr. and Edgar H. Callaway,1st Edition, 2003, CRC Press (Taylor & Francis Group).
3. Stephen Beeby, Neil White,Energy Harvesting for Autonomous Systems,Artech House, 2010.
4. Halit Eren , Wireless Sensors and Instruments: Networks, Design and Applications,CRC Press (Taylor & Francis Group),2006

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc23_ee105/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs74/preview

ONLINE RESOURCES:

1. https://ebooks.inflibnet.ac.in/itp12/chapter/wireless-sensor-networks/
2. https://lecturenotes.in/notes/23763-note-for-control-system-engineering-cse-by-suman-kumar-acharya

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply the working principles of smart sensors, including MEMS-based inertial sensors, environmental sensors, and smart measurement devices, to identify suitable sensors for real-time applications.(K3)
2. Analyze the architecture and components of wireless sensor networks, including sensor nodes and network topologies, to evaluate their suitability for different applications.(K4)
3. Analyze various wireless communication technologies such as Zigbee, Bluetooth, Wi-Fi, LoRa, and NB-IoT to select appropriate communication protocols for IoT-based systems.(K4)
4. Analyze power management techniques and energy harvesting methods to design energy-efficient wireless sensor systems.(K4)
5. Analyze common cyber security threats in wireless communication systems and evaluate mitigation strategies to ensure secure data transmission. (K4)
6. Design wireless instrumentation systems using WSN for real-time applications such as smart agriculture, environmental monitoring, and smart infrastructure.(K5)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	1	2	-	-	-	-	-	-	3	3
CO3	2	3	3	2	2	-	-	-	1	-	-	2	3
CO4	2	3	3	3	2	-	-	-	-	-	-	2	3
CO5	2	2	2	2	3	-	-	-	-	-	-	2	3
CO6	1	2	2	2	2	–	–	–	1	2	2	3	3

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL504	PROCESS MODELLING AND SIMULATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 103105215	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24BSMA302, 24EIPC404					

OBJECTIVES:

- To understand the fundamentals, classifications, applications, advantages, and limitations of mathematical modelling in process engineering systems.
- To apply numerical methods and computational techniques for solving process model equations including ODEs, IVPs, BVPs, and iterative solution methods.
- To analyze and develop models for distributed parameter processes such as packed bed systems, reactors, and reactive separation processes.
- To perform process modelling methodology and Degree of Freedom (DOF) analysis for industrial process systems and subsystem interactions.
- To develop steady-state mathematical models for industrial process equipment including heat exchangers, flash vessels, distillation columns, absorbers, strippers, and CSTRs.
- To understand and apply process simulation approaches and software tools for analysing, designing, and optimizing industrial process systems.

MODULE - I FUNDAMENTALS OF MATHEMATICAL MODELLING 8

Introduction to mathematical modelling - Need for modelling in process engineering - Advantages and limitations of models - Applications of process models in industrial systems - Classification of models:Linear and Nonlinear models, Lumped and Distributed parameter models, Static and Dynamic models, Continuous and Discrete models

MODULE - II NUMERICAL METHODS FOR PROCESS MODELS 8

Introduction to numerical methods - Iterative convergence methods - Numerical integration techniques - Solution of: Ordinary Differential Equations (ODE), Initial Value Problems (IVP), Boundary Value Problems (BVP) - Overview of numerical software tools

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - III MODELLING OF DISTRIBUTED PARAMETER PROCESSES 8

Introduction to distributed parameter systems - Steady state models and Differential Algebraic Equations (DAE) - Rate-based modelling of staged processes - Modelling of packed bed systems - Packed bed reactors modelling - Reactive separation process modelling

Module - IV Process Modelling Methodology and Degree of Freedom Analysis 8

Process modelling procedure - Degree of Freedom (DOF) analysis - System and subsystem concepts - Information flow in process systems - Design variable selection - Persistent recycle systems - Examples:Heat exchanger, Equilibrium still

MODULE - V MODELLING OF INDUSTRIAL PROCESS EQUIPMENT 8

Development of steady state process models -Nonlinear algebraic equation systems (NAE) - Modelling of: Flash vessels, Distillation columns, Absorbers, Strippers, Continuous Stirred Tank Reactor (CSTR), Heat exchangers - Solution techniques - Software tools overview.

MODULE - VI SIMULATION OF PROCESS MODELS 8

Introduction to simulation - Need and applications of simulation - Simulation approaches: Modular approach, Sequential approach, Simultaneous approach, Equation-oriented approach- Simulation software tools - Industrial case studies.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Denn M. M., "Process Modeling", Longman, 1986
2. Aris R., "Mathematical Modeling, A Chemical Engineering Perspective (Process System Engineering)", Academic Press, 1999.
3. Luyben W.L., "Process Modeling, Simulation, and Control for Chemical Engineering", McGraw Hill.

REFERENCE BOOKS

1. D. F. Rudd and C. C. Watson, "Strategy of Process Engineering", Wiley international.
2. M.M. Denn, "Process Modelling", Wiley, New York,
3. A. K. Jana, "Chemical Process Modelling and Computer Simulation", PHI

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

4. C.D. Holland, "Fundamentals of Modelling Separation Processes", Prentice Hall,
5. Hussain Asghar, "Chemical Process Simulation", Wiley Eastern Ltd., New Delhi,

ONLINE RESOURCES

1. https://archive.nptel.ac.in/courses/103/107/103107096/
2. https://nptel.ac.in/courses/103101111
3. https://nptel.ac.in/courses/111107105
4. https://www.academia.edu/37228967/Process_Modeling_Simulation_and_Control_for_Chemical_Engineers

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply fundamentals of control systems to derive the Transfer Function(K3)
2. Interpret the time response and stability of a given control system(K4)
3. Use relevant controller for controlling a given process system(K3)
4. Use relevant control system component for process control(K3)
5. Use relevant control system component for position control(K3)
6. Choose appropriate actuators for a given application(K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	1	–	–	–	–	–	–	2	2
CO2	3	3	–	-	1	–	–	–	–	–	–	1	3
CO3	2	2	2	-	2	–	–	–	–	–	–	2	3
CO4	2	1	2	–	3	–	-	–	–	–	–	3	2
CO5	2	2	2	–	3	–	–	–	–	–	–	3	2
CO6	2	3	3	-	2	–	–	–	–	–	1	3	3

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL505	IOT FOR INDUSTRIAL AUTOMATION	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 16105166	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC301, 24EIPT402					

OBJECTIVES:

- To understand IoT architecture and industrial automation requirements.
- To study sensors, actuators, and embedded platforms.
- To learn IoT communication protocols for industry.
- To understand security, standards, and future trends in IIoT.
- To design secure and scalable IIoT solutions.
- To apply IoT protocols in real-time industrial use cases.

MODULE - I INTRODUCTION TO INDUSTRIAL IoT 7

Industrial Revolutions – Digital Transformation - Smart Manufacturing – Industry 4.0 Components , The Fourth Revolution – Cyber Physical Systems – Design Principles of Industry 4.0.

MODULE - II SENSORS AND EMBEDDED SYSTEMS 8

IoT vs IIoT ,Industrial Sensors and Actuators, PLCs, RTOS, Edge Devices, Embedded Platforms for IIoT.

MODULE - III IoT COMMUNICATION PROTOCOLS 7

MQTT, CoAP, AMQP, DDS, OPC-UA, Protocol Comparison for Industrial Use.

MODULE - IV DATA MANAGEMENT AND CLOUD FOR IIoT 7

Industrial Big Data – Data Acquisition – Edge vs Cloud Computing, Industrial Cloud Platforms Predictive Maintenance – Machine Learning and AI Applications.

MODULE - V SECURITY AND STANDARDIZATION 8

Secure Communication -IoT Security Challenges – Cryptography ,Cyber security Frameworks – Safety and Reliability – Standards and Compliance :IEC, ISO, IEEE Standards.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - VI INDUSTRIAL APPLICATIONS AND CASE STUDIES 8

Smart Manufacturing, Predictive Maintenance, IoT Applications in Healthcare, Oil, chemical and pharmaceutical industry- Smart Supply Chain – Industry 5.0 and Future Smart Ecosystems.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Alasdair Gilchrist, "Industry 4.0, Industrial Internet of Things", Apress, 2017.
2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat, "Industrial Internet of Things: Cyber manufacturing Systems", Springer, 2017.
3. Vijay Madisetti and Arshdeep Bahga, Internet of Things: A Hands-On Approach, Universities Press, 2015.

REFERENCES:

1. Klaus Schwab, The Fourth Industrial Revolution, World Economic Forum, 2017.
2. Ovidiu Vermesan and Peter Friess, Internet of Things – From Research and Innovation to Market Deployment, River Publishers, 2014.
3. Rajkumar Buyya et al., Internet of Things: Principles and Paradigms, Elsevier, 2016.
4. H. Lasi et al., Industry 4.0, Springer, 2014.
5. Shancang Li and Li Da Xu, Securing the Internet of Things, Elsevier,2017

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_cs24
2. https://swayam.gov.in/nd1_noc20_cs22

ONLINE RESOURCES:

1. https://www.edx.org/masters/micromasters/curtinx-internet-of-things-iot
2. https://www.coursera.org/learn/iot
3. https://www.academia.edu/search?q=industrial%20IOT
4. https:// link.springer.com/book/10.1007/978-3-319-42559-7
5. https:// www.researchgate.net/publication/327991572_The_industrial_internet_of_things_IIoT_An_analysis_framework

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze the core concepts and guiding principles of Industry 4.0 to understand their impact on modern industries.(K4)
2. Analyze IIoT architecture and industrial communication protocols to determine their roles in enabling connected industrial systems.(K4)
3. Develop smart manufacturing technologies and automation systems to enhance operational efficiency and productivity.(K3)
4. Develop the application of data analytics and AI techniques in industrial environments to support intelligent decision-making.(K3)
5. Construct security requirements, interoperability challenges, and standards in IIoT systems to ensure reliable and secure operations.(K3)
6. Evaluate real-world Industry 4.0 implementations and emerging trends to assess their potential for future industrial transformation.(K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	-	-	-	-	-	-	3	3
CO3	2	3	3	-	-	-	-	-	-	-	-	3	3
CO4	2	3	3	-	-	-	-	-	-	-	-	3	3
CO5	2	2	2	-	-	-	-	-	-	-	-	3	3
CO6	1	2	2	-	-	-	-	-	-	-	2	3	3

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/12/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL506	UNIT OPERATIONS AND CONTROL	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 103107127	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC404					

OBJECTIVES:

- To Study the unit operations involved for transportation, mixing and separation of solids
- To Study the unit operations involved for transportation, mixing and separation of fluids
- To Understand the basic operations involved with heat exchangers, Distillation and chemical reactions
- To Gain knowledge about the operations of evaporators and crystallizers, drying and cooling towers
- To Gain knowledge on the operation of dryers, distillation column, refrigerators and chemical reactors

MODULE - I MECHANICAL OPERATIONS I 7

OPERATIONS ON SOLIDS: General Characteristics of solids; Storage and conveying of solids: bunkers, silos, bins and hoppers, transport of solids in bulk, conveyor selection, different types of conveyors, Estimation of particle size; Screening methods and equipment

MODULE - II MECHANICAL OPERATIONS II 7

OPERATIONS ON SOLIDS -Adjusting particle size: methods of size reduction, classification of equipment, crushers, grinders; size enlargement; Principle of granulation, briquetting, pelletisation and flocculation; Mixing: mixing of powders; Separation: Electrostatic and magnetic separators, applications.

MODULE - III MECHANICAL OPERATIONS III 7

OPERATIONS ON FLUIDS: Transport of fluids; Mixing and agitation: Mixing of liquids, selection of suitable mixers; Separation: Gravity settling, sedimentation, thickening, double cone classifier, centrifugal separation; Cyclones - Operation, equipment, control and applications.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - IV HEAT TRANSFER I 8

Heat exchangers: Single pass and multi pass heat exchangers, condensers, reboilers- Combustion process in thermal power plant; Distillation: Binary distillation, Batch distillation, controls and operations, Chemical reactors.

MODULE - V HEAT TRANSFER II 8

Theory of evaporation; single effect and multiple effect evaporators; Crystallization; nucleation and growth, classification of crystallizers; Drying: classification of Dryers, batch and continuous dryers, dryers for solids and slurries cooling Towers, Refrigeration.

MODULE - VI CASE STUDY 8

Unit Operations and Control schemes applied to Thermal Power plant, Steel Industry, Paper and Pulp industry, Leather Industry.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Balchen ,J.G., and Mumme, K.J., "Process Control structures and applications", Van Nostrand Reinhold Co., New York, 1988.
2. Warren L. McCabe, Julian C. Smith and Peter Harriot, "Unit Operations of Chemical Engineering", McGraw-Hill International Edition, New York, Sixth Edition, 2001.
3. James R. Couper, Roy Penny, W., James R.Fair and Stanley M.Walas, "Chemical Process Equipment : Selection and Design", Gulf Professional Publishing, 2010.

REFERENCE BOOKS:

1. Waddams, A.L., "Chemicals from petroleum", Butler and Taner Ltd., UK, 1968.
2. Liptak, B.G., "Process measurement and analysis", Chilton Book Company, USA, 1995.
3. Luyben W.C., "Process Modeling, Simulation and Control for Chemical Engineers", McGraw-Hill International edition, USA, 1989.

WEB RESOURCES:

1. https://nptel.ac.in/courses/103/103/103103155/
2. https://ocw.mit.edu/courses/10-450-process-dynamics-operations-and-control-spring-2006/
3. https://www.chemengstudent.com/courses/unit-operations/

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=zIz0UXcOBXI&list=PLvOh309NvHlG0EIcqA_F1ShakeyH49Pcx
2. https://www.youtube.com/watch?v=ajRUejrx6z0
3. https://learncheme.com/simulations/

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply the knowledge on solids to handle the raw materials. (K3)
2. Examine the handling methods on solids to refine the raw materials. (K4)
3. Examine the knowledge on fluids to handle the materials (K4)
4. Apply knowledge about the heat exchanger for operation and control (K3)
5. Utilize the knowledge about the evaporation methods in operation and control (K3)
6. Analyze new techniques and developments for life long learning in various types of unit operations in industries. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	1	-	-	-	1	2	2
CO2	2	2	2	-	-	-	1	-	-	-	1	2	2
CO3	2	2	2	-	-	-	1	-	-	-	1	2	2
CO4	2	-	-	-	-	-	1	-	-	-	1	2	2
CO5	2	-	-	-	-	-	1	-	-	-	1	2	2
CO6	2	2	2	-	-	-	1	-	-	-	1	2	2

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL510	INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 106105195	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC404, 24EIPT402					

OBJECTIVES:

- To understand the evolution and principles of Industry 4.0.
- To learn Industrial Internet of Things architecture and communication technologies.
- To analyze smart manufacturing systems and cyber-physical systems.
- To apply data analytics and AI techniques in industrial applications.
- To understand security, standards, and future trends in IIoT.

MODULE - I INTRODUCTION TO INDUSTRY 4.0 7

Industrial Revolutions – Digital Transformation – Smart Manufacturing – Industry 4.0 Components , Industry 4.0:Globalization and Emerging Issues, The Fourth Revolution – Cyber Physical Systems – Design Principles of Industry 4.0.

MODULE - II INDUSTRIAL INTERNET OF THINGS 8

IoT vs IIoT – IIoT Architecture – Sensors and Actuators – Embedded Systems – Industrial Communication Protocols: MQTT, CoAP, OPC-UA – Cloud, Edge and Fog Computing.

MODULE - III SMART MANUFACTURING SYSTEMS 7

Smart Production Systems – Digital Twins – Automation and Robotics – Additive Manufacturing – PLC, SCADA and HMI.

MODULE - IV DATA ANALYTICS AND AI IN INDUSTRY 4.0 7

Industrial Big Data – Data Acquisition – Predictive Maintenance – Machine Learning and AI Applications – Real-time Monitoring and Visualization.

MODULE - V NETWORKING, SECURITY AND STANDARDS 8

Industrial Networking – Interoperability – IIoT Security Challenges – Cybersecurity Frameworks – Safety and Reliability – IEC, ISO, IEEE Standards.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - VI APPLICATIONS AND FUTURE TRENDS **8**

IIoT Applications in Manufacturing, Healthcare, Power Plants, Oil, chemical and pharmaceutical industry- Smart Supply Chain – Sustainability – Industry 5.0 and Future Smart Ecosystems.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Alasdair Gilchrist, "Industry 4.0, Industrial Internet of Things", Apress, 2017.
2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat, "Industrial Internet of Things: Cyber manufacturing Systems", Springer, 2017.
3. Vijay Madisetti and Arshdeep Bahga, Internet of Things: A Hands-On Approach, Universities Press, 2015.

REFERENCES:

1. Klaus Schwab, The Fourth Industrial Revolution, World Economic Forum, 2017.
2. Ovidiu Vermesan and Peter Friess, Internet of Things – From Research and Innovation to Market Deployment, River Publishers, 2014.
3. Rajkumar Buyya et al., Internet of Things: Principles and Paradigms, Elsevier, 2016.
4. H. Lasi et al., Industry 4.0, Springer, 2014.
5. Shancang Li and Li Da Xu, Securing the Internet of Things, Elsevier,2017

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_cs24
2. https://swayam.gov.in/nd1_noc20_cs22

ONLINE RESOURCES:

1. https://www.edx.org/masters/micromasters/curtinx-internet-of-things-iot
2. https://www.coursera.org/learn/iot
3. https://www.academia.edu/search?q=industrial%20IOT
4. https:// link.springer.com/book/10.1007/978-3-319-42559-7
5. https://www.researchgate.net/publication/327991572_The_industrial_internet_of_things_IIoT_An_analysis_framework

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze the fundamental concepts and principles of Industry 4.0 and their influence on digital industrial transformation.(K4)
2. Analyze IIoT architecture and industrial communication protocols to understand their effectiveness in building interconnected industrial ecosystems.(K4)
3. Organise smart manufacturing technologies and automation systems to improve production efficiency and operational flexibility.(K3)
4. Solve the implementation of data analytics and AI techniques in industrial environments for enhanced process optimization and decision-making.(K3)
5. Construct security frameworks, interoperability issues, and industry standards in IIoT systems to ensure robust and secure industrial operations.(K3)
6. Analyze real-world Industry 4.0 applications and emerging trends to determine their strategic impact on future industrial development.(K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	1	-	-	-	-	-	3	3	3
CO2	3	2	2	-	1	-	-	-	-	-	3	3	3
CO3	2	3	3	-	-	-	-	-	1	-	2	3	3
CO4	2	3	3	-	-	-	-	-	-	-	2	3	3
CO5	2	2	2	-	-	-	-	-	-	-	2	3	3
CO6	1	2	2	-	2	-	-	-	-	2	3	3	3

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL511	INTRODUCTION TO PROCESS DATA ANALYTICS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 106106179	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24BSMA403, 24EIPC404					

OBJECTIVES:

- Enable students to apply fundamental concepts of process data analytics for industrial systems.
- Develop the capability to analyze process data characteristics, variability, and quality issues.
- Provide exposure to apply statistical and multivariate techniques for process monitoring and analysis.
- Train students to analyze data-driven models for fault detection and diagnosis in process industries.
- Introduce students to apply machine learning concepts for process data analytics.
- Enable students to analyze industrial case studies involving process optimization and performance improvement.

MODULE - I INTRODUCTION TO PROCESS DATA ANALYTICS 7

Overview of process industries – Nature of process data – Types of data: steady-state and dynamic data – Data sources in process plants – Sensors, historians, and databases – Role of data analytics in process monitoring, control, and optimization – Industry 4.0 perspective.

MODULE - II PROCESS DATA PREPROCESSING AND EXPLORATION 7

Data cleaning and preprocessing – Missing data handling – Outlier detection – Noise filtering – Data normalization and scaling – Exploratory data analysis (EDA) – Visualization techniques – Correlation analysis.

MODULE - III STATISTICAL PROCESS MONITORING 8

Univariate statistical process control (SPC) – Control charts ($\bar{X}$, R, S, CUSUM, EWMA) – Multivariate data analysis – Principal Component Analysis (PCA) – Hotelling's T^2 statistic – Contribution plots – Process monitoring using PCA.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - IV DATA-DRIVEN MODELING AND FAULT DIAGNOSIS 8

Regression models for process data – Linear and multiple regression – Partial Least Squares (PLS) – Model validation – Residual analysis – Fault detection and diagnosis – Root cause analysis – Case studies from chemical and manufacturing processes.

MODULE - V MACHINE LEARNING FOR PROCESS ANALYTICS 7

Introduction to machine learning in process industries – Supervised and unsupervised learning – k-means clustering – Decision trees – Support Vector Machines (SVM) – Artificial Neural Networks (ANN) – Model performance evaluation.

MODULE - VI APPLICATIONS OF PROCESS DATA ANALYTICS 8

Process optimization and performance monitoring – Predictive maintenance – Energy efficiency analysis – Quality improvement – Digital twins and soft sensors – Process analytics for smart manufacturing – Industrial case studies.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Steven J. Qin, Thomas F. Edgar, An Introduction to Statistical Learning and Process Analytics, Elsevier, 2nd Edition, 2021.
2. T. Kourti and S. J. Qin, Process Monitoring and Fault Diagnosis, Springer, 1st Edition, 2018.

REFERENCE BOOKS

1. Stephen J. Chapman, Data Analytics for Process Industries, CRC Press, 1st Edition, 2020.
2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 1st Edition, 2016.
3. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning, Springer, 2nd Edition, 2009.

WEB REFERENCES

1. NPTEL – Process Data Analytics and Industrial Statistics – https://nptel.ac.in
2. AIChE – Process Analytics Resources – https://www.aiche.org
3. IEEE Xplore – Process Data Analytics Research – https://ieeexplore.ieee.org

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

ONLINE RESOURCES

1. Coursera – Data Analytics for Industrial Applications – https://www.coursera.org
2. edX – Data Analytics and Machine Learning – https://www.edx.org
3. Kaggle – Industrial Process Datasets – https://www.kaggle.com

OUTCOMES

Upon completion of the course, the student will be able to:

1. Apply basic concepts of process data analytics to industrial processes. (K3)
2. Analyze process data characteristics and quality issues using exploratory techniques. (K4)
3. Apply statistical and multivariate methods for process monitoring. (K3)
4. Analyze data-driven models for fault detection and diagnosis. (K4)
5. Apply machine learning techniques for process data analytics. (K3)
6. Analyze real-world industrial applications of process data analytics for optimization and decision-making. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	–	–	–	–	–	–	–	–	–	–	2	2
CO2	3	3	–	–	–	–	–	–	–	–	–	1	3
CO3	3	–	2	–	–	–	–	–	–	–	–	2	3
CO4	3	3	–	2	–	–	–	–	–	–	–	2	3
CO5	3	–	2	–	–	–	–	–	–	–	–	3	2
CO6	3	3	–	–	2	–	–	–	–	–	–	2	3

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

PROFESSIONAL ELECTIVE - II

COURSE CODE: 24EIEL512	CONTROL VALVES	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 108105376	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24EIPC402, 24EIPC404					

OBJECTIVES:

- To understand the basic terminologies and types of control valves and actuators
- To understand the characteristics of control valves
- To select control valves and actuators based on the requirement
- To analyze various control valve problems and to test the quality of valves

MODULE - I INTRODUCTION TO CONTROL VALVES 7

Basics Of Control Valves, Importance of Control Valve In Process Industry, Basic Terminologies, Sliding Stem Control Valve, Rotatory Stem Control Valve Terminologies, Types Of Control Valves- Globe Valve, Sanitary Valves, Rotary Valves. Valve Trim Types.

MODULE - II ACTUATORS 8

Actuators – Schematics, Working of Actuator, Types of Actuators- Hydraulic, Pneumatic, Electrical Actuators. Pneumatic Actuator: Linear- Spring & Diaphragm, Piston Type, and Rotary: Scotch Yoke, Rack and Pinion.

MODULE - III CONTROL VALVE ACCESSORIES 7

Valve Body Bonnets, Control Valve Packing, Control Valve Accessories- Positioner and It Types, I/P Coil, Volume Boosters, Position Transmitters, Limit Switches, Solenoid Valves. Special Control Valve

MODULE - IV VALVE CHARACTERISTICS, SIZING AND SELECTION 8

Valve Performance And Characteristics For Different Types Of Valves, Dead Band – Causes, Effects, Performance Test, Valve Response Time- Importance Of Supply Pressure, Dead Time And Solutions To Minimize Dead Time. Valve Sizing, Actuator Sizing, Valve Selection, Actuator Selection.

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

MODULE - V COMMON CONTROL VALVE PROBLEMS 7

Cavitations and Flashing, Control Valve Noise- Noise Prediction and Reduction Techniques, General Valve Problems Valve Passing, Valve Stuck Up, Calibration Issues, Packing Leak, Insufficient Flow. Control Valve Installation and Commissioning Guidelines

MODULE - VI QUALITY TESTS 8

Quality Check Of Control Valves, Non-Destructive Testing: Radiography Test, Ultrasonic Test, Leak And Liquid Penetrating Test, Magnetic Particle Testing. Factory Acceptance Test, Control Valve and Actuator Maintenance, Control Valve Diagnostics

TOTAL : 45 PERIODS

TEXT BOOK:

1. Control system components, M.D.Desai, PHI Learning.
2. ISA Handbook for control valves, James W Hutchison, ISA

REFERENCES:

1. Instrumentation Engineer's Handbook, B.G.Liptak, Chilton Book co.,Philadelphia.
2. Valve selection Handbook- R.W.Zappe Gulf Publishing Co.,Huston.

OUTCOMES

Upon completion of the course, the student will be able to:

1. Analyze Control Valve types suitable In Process Industry.(K4)
2. Analyze the merits and limitations of different types of actuators.(K4)
3. Analyze the suitable accessories of control valves.(K4)
4. Analyze the characteristic features of different types of control valves.(K4)
5. Analyze the common problems associated with control valves outline.(K4)
6. Analyze different quality testing methods for control valves.(K4)

Recommended in Board of Studies (BoS) Meeting No. 8 **held on** 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	1	-	1	-	2	2
CO2	3	-	-	-	-	-	-	1	-	1	-	-	-
CO3	3	-	-	-	-	-	-	1	-	1	-	-	-
CO4	3	3	-	3	-	-	-	1	-	1	-	3	-
CO5	3	-	3	3	3	-	-	1	-	1	-	3	-
CO6	3	3		3	-	-	-	1	-	1	-	3	-

Recommended in Board of Studies (BoS) Meeting No. 8 held on 14/2/2026

CHAIRMAN
Board of Studies
Electronics and Instrumentation Engineering

Imagine the Future and

Make it happen!





Together let's build a better world where there is **NO POVERTY** and **ZERO HUNGER.**

We have **GOOD HEALTH AND WELL BEING** **QUALITY EDUCATION** and full **GENDER EQUALITY** everywhere.

There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY**

which will help to create **DECENT WORK AND ECONOMIC GROWTH.** Our prosperity shall be fuelled

by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to

REDUCE INEQUALITIES by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES.**

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant,

flourishing **LIFE BELOW WATER**, rich and diverse **LIFE ON LAND.**

We will enjoy **PEACE AND JUSTICE** through **STRONG INSTITUTIONS**

and will build long term **PARTNERSHIPS FOR THE GOALS.**



For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

Together we can...

Sai Prakash Leo Muthu

Chairman & CEO – Sairam Institutions

We build a Better nation through Quality education.

Sairam INSTITUTIONS



Sri SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

Accredited by NBA and NAAC "A+"

ISO/IEC 21001 : 2018 (EOMS) Certified by BIS

and NIRF ranked institution

College Campus

Sai Leo Nagar, West Tambaram,

Chennai - 600 044. Ph : 044-2251 2222

Administrative Office

"Sai Bhavan", 31B, Madley Road, T.Nagar,

Chennai - 600 017. Ph : 044-4226 7777

e-mail : sairam@sairamgroup.in

www.sairamgroup.in