



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**

REGULATIONS

2024 - Version 2

Academic Year 2024-25 onwards

AUTONOMOUS
CURRICULUM AND

SYLLABUS
I - IV
SEMESTERS

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			CONTACT PERIODS	CREDITS
			L	T	P		
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			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA202	Differential Equations, Complex Variables and Transforms	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH201	Physics of 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	0	0	2	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

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S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS	
			L	T	P			
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	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			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA401	Probability and Linear Algebra	3	1	0	4	4
2	24EIPC404	Control Systems	3	0	0	3	3
3	24EIPC401	Electrical Machines and Drives	3	0	2	5	3
4	24EIPC402	Industrial Instrumentation	3	0	0	3	3
5	24EIPC403	Principles of Communication Engineering	3	0	0	3	3
6	24XXOEXXX	Open Elective - I#	3	0	0	3	3
7	24HSNC401	NCC course Level 3*	3			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	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	-

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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	Embedded Systems 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

Digital Devices Security, Tools & Techniques for Cyber Security

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

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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

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PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL501	IoT Concepts and Applications	3	IoT and Automation
2	24EIEL502	Industry IoT	3	IoT and Automation
3	24EIEL503	IoT for Industry Automation	3	IoT and Automation
4	24EIEL504	Digital VLSI	3	VLSI DESIGN and Communication
5	24EIEL505	Analog IC Design	3	VLSI DESIGN and Communication
6	24EIEL506	Fundamentals of Semiconductor Devices	3	VLSI DESIGN and Communication
7	24EIEL507	Safety Instrumented Systems	3	Applied Instrumentation
8	24EIEL508	Automotive Instrumentation and Control	3	Applied Instrumentation
9	24EIEL509	Fiber Optics Instrumentation	3	Applied Instrumentation
10	24EIEL510	Python for Data Science	3	Embedded Intelligence
11	24EIEL511	Python Programming for Artificial Intelligence	3	Embedded Intelligence
12	24EIEL512	Artificial Intelligence: Search Methods For Problem Solving	3	Embedded Intelligence
13	24MGEL501	Spirituality in Workplace	3	Embedded Intelligence

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL513	IoT Security	3	IoT and Automation
2	24EIEL514	Data Science for Internet of Things	3	IoT and Automation
3	24EIEL515	Healthcare Analytics	3	IoT and Automation
4	24EIEL516	Wireless Sensor Network Design	3	VLSI DESIGN and Communication
5	24EIEL517	Green Electronics	3	VLSI DESIGN and Communication
6	24EIEL518	Advanced Technologies in Wireless Networks	3	VLSI DESIGN and Communication
7	24EIEL519	Embedded Sensing, Actuation and Interfacing Systems	3	Applied Instrumentation
8	24EIEL520	Aircraft Instrumentation	3	Applied Instrumentation
9	24EIEL521	Artificial Organs and Implants	3	Applied Instrumentation
10	24EIEL522	Computer Vision	3	Embedded Intelligence
11	24EIEL523	Practical Machine Learning with Tensorflow	3	Embedded Intelligence
12	24EIEL524	Advanced R Programming for Data Analytics in business	3	Embedded Intelligence
13	24MGEL502	Indian Ethos and values in Modern Management	3	Mgmt

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PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL601	Data Management in IoT	3	IoT and Automation
2	24EIEL602	Sensor for IoT Application	3	IoT and Automation
3	24EIEL603	Industrial Automation Systems	3	IoT and Automation
4	24EIEL604	VLSI Testing and Design For Testability	3	VLSI DESIGN and Communication
5	24EIEL605	Power Management Integrated Circuits	3	VLSI DESIGN and Communication
6	24EIEL606	Industrial Communication Networks	3	VLSI DESIGN and Communication
7	24EIEL607	Thermal Power Plant Instrumentation	3	Applied Instrumentation
8	24EIEL608	Instrumentation in Petrochemical Industry	3	Applied Instrumentation
9	24EIEL609	Analytical Instrumentation	3	Applied Instrumentation
10	24EIEL610	Foundations of Machine Learning in Artificial Intelligence	3	Embedded Intelligence
11	24EIEL611	Deep Learning Techniques in AI	3	Embedded Intelligence
12	24EIEL612	Data Analytics with Python	3	Embedded Intelligence
13	24MGEL601	Disaster management	3	Mgmt

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL613	Industry 4.0	3	IoT and Automation
2	24EIEL614	Building Automation	3	IoT and Automation
3	24EIEL615	Intelligent Automation	3	IoT and Automation
4	24EIEL616	Automotive Electronics	3	VLSI DESIGN and Communication
5	24EIEL617	Communication Systems	3	VLSI DESIGN and Communication
6	24EIEL618	Optical Communication & Networks	3	VLSI DESIGN and Communication
7	24EIEL619	Electric Vehicle Technology	3	Applied Instrumentation
8	24EIEL620	Renewable Systems	3	Applied Instrumentation
9	24EIEL621	Instrument Standards	3	Applied Instrumentation
10	24EIEL622	Introduction to Machine Learning	3	Embedded Intelligence
11	24EIEL623	Artificial Intelligence for Robotics	3	Embedded Intelligence
12	24EIEL624	Modern Application Development	3	Embedded Intelligence
13	24MGEL602	Fintech For Engineers	3	Mgmt

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PROFESSIONAL ELECTIVES - V

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL625	Smart Manufacturing	3	IoT and Automation
2	24EIEL626	Data Analytics for IoT	3	IoT and Automation
3	24EIEL627	IoT Security	3	IoT and Automation
4	24EIEL628	4G/5G Communication Networks	3	VLSI DESIGN and Communication
5	24EIEL629	RTOS Embedded Systems	3	VLSI DESIGN and Communication
6	24EIEL630	Semiconductor Manufacturing	3	VLSI DESIGN and Communication
7	24EIEL631	Advanced Process Control	3	Applied Instrumentation
8	24EIEL632	Digital Control System	3	Applied Instrumentation
9	24EIEL633	Advanced Control Theory	3	Applied Instrumentation
10	24EIEL634	Natural Language Processing	3	Embedded Intelligence
11	24EIEL635	Artificial Intelligence: Knowledge Representation And Reasoning	3	Embedded Intelligence
12	24EIEL636	Big Data Analytics	3	Embedded Intelligence
13	24MGEL603	Total Quality Management	3	Mgmt

PROFESSIONAL ELECTIVES - VI

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL701	IoT for Smart Agriculture	3	IoT and Automation
2	24EIEL702	IoT for Smart Cities	3	IoT and Automation
3	24EIEL703	Automation System Design	3	IoT and Automation
4	24EIEL704	Simulation of Communication Systems Using Matlab	3	VLSI DESIGN and Communication
5	24EIEL705	Matlab Programming for Numerical Computation	3	VLSI DESIGN and Communication
6	24EIEL706	Statistical Theory of Communication	3	VLSI DESIGN and Communication
7	24EIEL707	Product Design and Development	3	Applied Instrumentation
8	24EIEL708	Distributed Optimization and Machine Learning	3	Applied Instrumentation
9	24EIEL709	Nonlinear System Analysis	3	Applied Instrumentation
10	24EIEL710	Learning Analytics Tools	3	Embedded Intelligence
11	24EIEL711	Business Intelligence &	3	Embedded Intelligence
12	24EIEL712	Applied Natural Language Processing	3	Embedded Intelligence
13	24MGEL701	Foundation Skills in Integrated Product Development	3	Mgmt

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PROFESSIONAL ELECTIVES - VII

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIEL713	IoT and Edge computing	3	IoT and Automation
2	24EIEL714	Artificial Intelligence for IoT	3	IoT and Automation
3	24EIEL715	Wireless Sensors Networks for Robotics	3	IoT and Automation
4	24EIEL716	VLSI Design Flow: RTL to GDS	3	VLSI DESIGN and Communication
5	24EIEL717	Semiconductor Packaging and Testing	3	VLSI DESIGN and Communication
6	24EIEL718	Design and Analysis of VLSI Subsystems	3	VLSI DESIGN and Communication
7	24EIEL719	Process Modeling and Optimization	3	Applied Instrumentation
8	24EIEL720	Medical Imaging Systems	3	Applied Instrumentation
9	24EIEL721	Bio-Mechanics	3	Applied Instrumentation
10	24EIEL722	Reinforcement Learning	3	Embedded Intelligence
11	24EIEL723	Affective Computing	3	Embedded Intelligence
12	24EIEL724	Games and Information	3	Embedded Intelligence
13	24MGEL702	Professional Ethics and values	3	Mgmt

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	24EIIIE611	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	24EIIIE712	Product Development Process	3	Embedded
5	24ECIE712	Project Phase-I	4	Embedded
6	24ECIE811	Internship	3	Embedded
7	24ECIE812	Project Phase-II	6	Embedded

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)

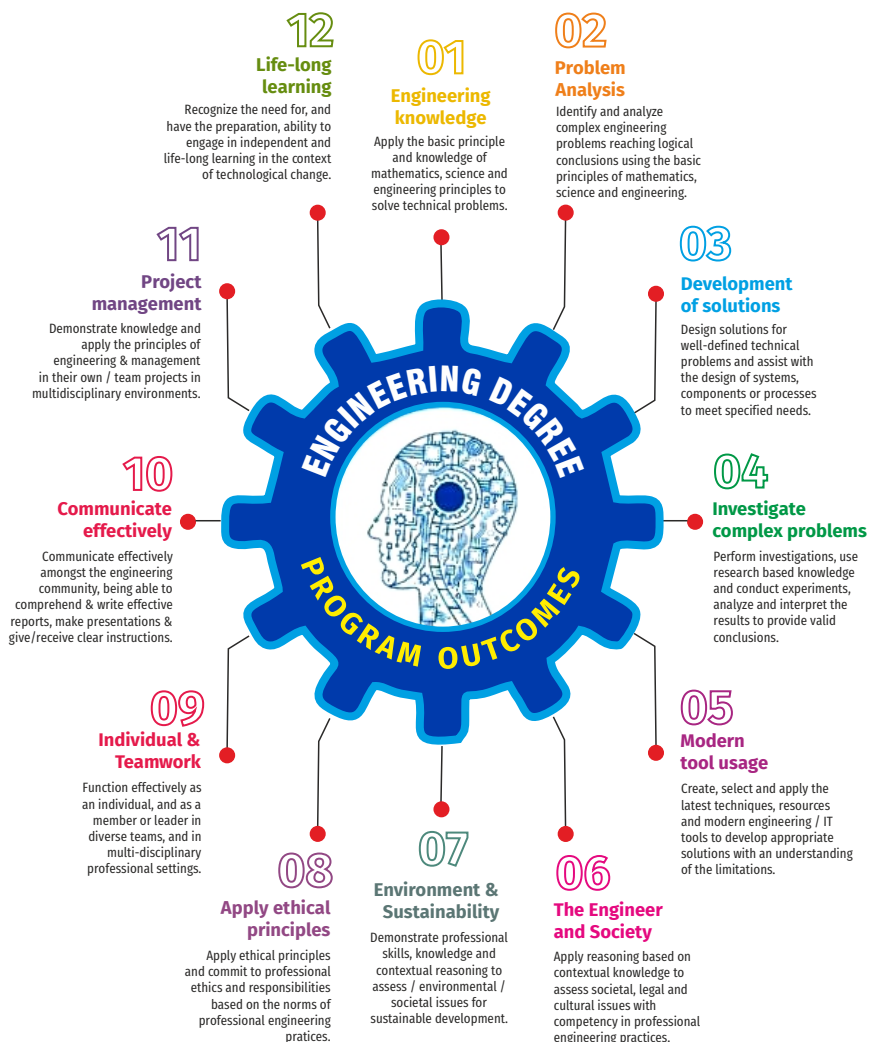
- PSO1** To apply the fundamentals of mathematics and science in the field of Electronics Engineering.
- PSO2** To apply appropriate techniques to formulate and analyze engineering problems in instrumentation and process control.

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

OBJECTIVES:

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives, maxima and minima for functions of several variables.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To provide understanding of double integration, triple integration and their applications.
- To impart the knowledge of Fourier series..

MODULE - I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (without 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. Problems involving 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 - Change of variables from cartesian to Spherical and Cylindrical polar coordinates.

MODULE - VI FOURIER SERIES

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://math.mit.edu/~gs/linearalgebra/ila0601.pdf>
2. <http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/>
3. <https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/>
4. <http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/>

ONLINE RESOURCES:

1. <https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors>
2. <https://www.khanacademy.org/math/differential-calculus>

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	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-
CO6	3	2	2	-	-	-	-	-	-	-	-

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

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

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://www.Pearson.com/english/catalogue/business-english/technical-english.html>
2. <https://www.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)

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	-	-	-	-	-	-	-	-	3	-	2	-	-
C02	-	-	-	-	-	-	-	-	3	-	2	-	-
C03	-	-	-	-	-	-	-	-	3	-	2	-	-
C04	-	-	-	-	-	-	-	-	3	-	2	-	-
C05	-	-	-	-	-	-	-	-	3	-	2	-	-
C06	-	-	-	-	-	-	-	-	3	-	2	-	-

SEMESTER - I

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

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.

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 Wiley & 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	2	-	-	-	-	-	-	-	-

SEMESTER - I

24BSCY101 - SDG NO. 4,7,8,9,11,12,17	ENGINEERING CHEMISTRY	L	T	P	CP	C
		3	0	0	4	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, Nernst's equation (Derivation & Problems), Electrochemical series and its significance.

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 Photosensitization.

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

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, 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)

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

24ESCS101 106105171 SDG NO. 4 & 9	PROBLEM SOLVING AND PROGRAMMING IN C					L	T	P	CP	C
						3	0	0	3	3

OBJECTIVES:

- Interpret Mathematical problems using algorithms, flowchart and pseudocode.
- To understand the programming language.
- To develop C Programs using basic Programming Constructs, Loops, Arrays and Strings.
- To develop applications in C using Functions, Pointers and Structures.
- To perform I/O operations and File Handling in C.

MODULE-I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING**7**

Introduction to Problem Solving through programs- Algorithm-Flowchart-Pseudocode-Memory, Variables, Values, Instructions, Programs-compilation process-Syntax and Semantic Errors- The language of C : Phases of developing a running computer program in C - Character set – Constants – Keywords – Primitive data types –Declaration, Type Conversion.

MODULE - II BASICS OF C PROGRAMMING**7**

Sequential- Arithmetic Operators, Relational Operators, Logical Operators, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, selective – If, Else-If, Switch- repetitive structures-for, while, do while, Nested loops, go to, break, continue –Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD and LCM, Prime number generation.

MODULE - III ARRAYS AND STRINGS**8**

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

MODULE - IV FUNCTIONS AND POINTERS**9**

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions - Factorial and Fibonacci Generation - Towers of Hanoi problem - – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

MODULE - V STRUCTURES**7**

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

MODULE - VI FILE PROCESSING**7**

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. R.G. Dromey, "How to solve it by Computers", Reprint, PHI Publishers, 2011.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2018.
3. Kernighan, B.W and Ritchie D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

1. Yashwant Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
2. Byron Gottfried, "Programming with C", Fourth Edition, Tata McGraw Hill Education, 2018.
3. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication, 2015.
4. Jeri R. Hanly & Elliot B.Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
5. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. <https://www.learn-c.org/>
2. <https://codeforwin.org/>
3. <https://www.cprogramming.com>

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programing_books/gnu_c_programming_tutorial
2. <https://nptel.ac.in/courses/106105171>
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

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

1. Understand the concepts of algorithms for solving a problem.(K2)
2. Illustrate the various constructs in C to develop simple applications.(K3)
3. Understand the concepts of Array & Strings.(K2)
4. Demonstrate the usage of Functions and Pointers.(K3)
5. Explain the Structure and union concepts.(K2)
6. Describe the file manipulation and its organisation.(K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	3	3	-	2	-	-	-	-	-	-	2	2
C02	3	3	3	-	2	-	-	-	-	-	-	2	2
C03	3	3	3	-	2	-	-	-	-	-	-	2	2
C04	2	2	-	-	2	-	-	-	-	-	-	3	2
C05	2	2	-	-	1	-	-	-	-	-	-	3	3
C06	2	2	-	-	2	-	-	-	-	-	-	3	3

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.

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)
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	PO12	PSO1	PSO2
C01	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C02	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C03	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C04	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C05	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C06	3	-	-	-	-	-	-	2	-	2	-	-	3	2

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

UNIT - I LANGUAGE AND LITERATURE**3**

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

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

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

UNIT - III FOLK AND MARTIAL ARTS**3**

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

UNIT- IV THINAI CONCEPT OF TAMILS**3**

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

UNIT - V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**3**

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

TOTAL : 15 PERIODS**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the 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.

தமிழர் மரபு

அலகு - I மொழி மற்றும் இலக்கியம்:

3

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

அலகு - II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:

3

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

அலகு - III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலொட்டம், தொல்பாலைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV தமிழர்களின் திறைக் கோட்பாடுகள்:

3

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

அலகு - V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the 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. Understand Tamil as a classical language & Literature (K2)
2. Explore about Tamil Heritage & Sculptures, Role of temples (K2)
3. Appreciate Sports and games of Tamils (K2)
4. Perceive Thinaï concept of Tamils (K2)
5. Comprehend Education and literacy during Sangam Age (K2)
6. Understand the Contribution of Tamils to National Movement & Indian Culture (K2)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	-	-	-	-	-	3	-	-	-	-	-	3	-	-
C02	-	-	-	-	-	3	-	-	-	-	-	3	-	-
C03	-	-	-	-	-	3	-	-	-	-	-	3	-	-
C04	-	-	-	-	-	3	-	-	-	-	-	3	-	-
C05	-	-	-	-	-	3	-	-	-	-	-	3	-	-
C06	-	-	-	-	-	3	-	-	-	-	-	3	-	-

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.
(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.
- 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)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3	-	-	2	-	-	-	-	-	2
C02	3	3	-	-	2	-	-	-	-	-	2
C03	3	3	-	-	2	-	-	-	-	-	2
C04	3	3	-	-	2	-	-	-	-	-	2

SEMESTER - I

24ESPL101 - SDG NO. 4 & 9	PROGRAMMING IN C LABORATORY	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. 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.
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:
- Total marks obtained by each student.
 - The highest marks in each subject and the marks of the student who secured it.
 - 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: 30 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 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:

- Illustrate C programs for simple applications making use of basic constructs, arrays, strings, functions and recursion. (K2)
- Demonstrate C programs involving pointers, and structures. (K3)
- Interpret applications using sequential and random access files. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	2	-	-	-	-	-	-	3	1	2
C02	3	3	3	3	2	-	-	-	-	-	-	3	2	1
C03	3	3	3	3	2	-	-	-	-	-	-	3	3	2

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 recognise 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)

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

- 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. Understand the United Nations Agenda of MDGs and SDGs (K1)
2. Summarize the targets and indicators of SDGs (K2)
3. Interpret the constitutional amendments of LSDG in Gram Panchayat (K2)
4. Classify various localized and regional government schemes (K2)
5. Understand social responsibility in community development (K1)
6. Implement viable projects in SDGs through the immersion program (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	-	2	-	2	2
CO2	-	-	-	-	-	2	2	-	2	-	2	2
CO3	-	-	-	-	-	2	2	-	2	-	2	2
CO4	-	-	-	-	-	2	2	-	2	-	2	2
CO5	-	-	-	-	-	2	2	-	2	-	2	2
CO6	2	2	-	-	-	2	2	-	2	-	2	2

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

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. Utilize various listening techniques effectively (K1)
2. Demonstrate the ability to speak spontaneously in different contexts (K1)
3. Comprehend and interpret written texts accurately (K2)
4. Exhibit the ability to write freely with sufficient and relevant content (K1)
5. Articulate explanations clearly and concisely (K1)
6. Understand and present convincing speeches/ arguments effectively (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	-	-	-	-	-	-	-	-	2	-	2	-	-
C02	-	-	-	-	-	-	-	-	2	-	2	-	-
C03	-	-	-	-	-	-	-	-	2	-	2	-	-
C04	-	-	-	-	-	-	-	-	2	-	2	-	-
C05	-	-	-	-	-	-	-	-	2	-	2	-	-
C06	-	-	-	-	-	-	-	-	2	-	2	-	-

SEMESTER - II

24BSMA202 - SDG NO. 4	DIFFERENTIAL EQUATIONS, COMPLEX VARIABLES AND TRANSFORMS	L	T	P	CP	C
		3	1	0	4	5

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.

MODULE - VI Z-TRANSFORMS

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 RESOURCES:

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/>

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	PS01	PS02
C01	3	2	-	2	-	-	-	-	-	-	-	3	2
C02	3	2	-	2	-	-	-	-	-	-	-	3	2
C03	3	2	-	2	-	-	-	-	-	-	-	3	2
C04	3	2	-	2	-	-	-	-	-	-	-	3	3
C05	3	2	-	2	-	-	-	-	-	-	-	3	3
C06	3	2	-	2	-	-	-	-	-	-	-	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

- 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

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)

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
C01	-	-	-	-	-	-	-	-	3	-	3	-	-
C02	-	-	-	-	-	-	-	-	3	-	3	-	-
C03	-	-	-	-	-	-	-	-	3	-	3	-	-
C04	-	-	-	-	-	-	-	-	3	-	3	-	-
C05	-	-	-	-	-	-	-	1	3	-	3	-	-
C06	-	-	-	-	-	-	-	1	3	-	3	-	-

SEMESTER - II

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

OBJECTIVES:

- To understand the essential principles of physics of conducting materials.
- To educate the basic principles of semiconductor device and electron transport properties.
- 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.

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

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. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration and their variations with temperature (K3)
3. Have an insight into the different types of magnetic materials and magnetic data storage device (K2)
4. Recognize, choose and apply knowledge to develop materials for sensor applications(K3).

5. Recall the basic knowledge of different types of polarization mechanisms, measurement of dielectric loss, elementary ideas of piezo, pyro, ferroelectric materials and their applications. (K3)
6. Acquire knowledge on quantum structures and apply it for illustrating nanodevices and explore the basics of quantum computing and their applications (K3)

CO-PO MAPPING:

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

SEMESTER - II

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

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 (CO₂, CH₄, N₂O, 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

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.

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. McCarty, 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	-	2	1	-	-	-	-	-	-

SEMESTER - II

24EIPC201 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 phase systems 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.

MODULE - VI THREE PHASE CIRCUITS

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

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
C01	3	2	2	2	-	2	-	-	-	-	2	2	2
C02	3	2	2	2	-	2	-	-	-	-	2	2	2
C03	3	2	2	2	-	2	-	-	-	-	2	2	2
C04	3	2	2	2	-	2	-	-	-	-	2	2	2
C05	3	2	2	2	-	2	-	-	-	-	2	2	2
C06	3	2	2	2	-	2	-	-	-	-	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

UNIT - I WEAVING AND CERAMIC TECHNOLOGY**3**

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

UNIT - II DESIGN AND CONSTRUCTION TECHNOLOGY**3**

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

UNIT - III MANUFACTURING TECHNOLOGY**3**

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

UNIT - IV AGRICULTURE AND IRRIGATION TECHNOLOGY**3**

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

UNIT - V SCIENTIFIC TAMIL & TAMIL COMPUTING**3**

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

TOTAL : 15 PERIODS**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the 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.

தமிழர் மரபு

அலகு - I நெசவு மற்றும் பாணைத் தொழில்நுட்பம்: 3
சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் — சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு - III உற்பத்தித் தொழில் நுட்பம்: 3
கப்பல் கட்டும் கலை -உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணொடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு - IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3
அணை, ஏரி, குளங்கள், மதகு -சோழர்காலக் குழுமித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் — பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு - V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநதை - 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.

OUTCOMES:

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

1. Understand Weaving and Ceramic Technology during Sangam Age (K2)
2. Explore about Design & Construction of House and Temples during Sangam Age (K2)
3. Appreciate Manufacturing Technology of Tamils (K2)
4. Perceive Agriculture and Agro-processing during Sangam Age (K2)
5. Comprehend Ancient Knowledge of Ocean & Fisheries (K2)
6. Understand the Scientific Tamil & Tamil Computing (K2)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	-	-	-	-	3	-	-	-	-	-	3	-	-
C02	3	-	-	-	-	3	-	-	-	-	-	3	-	-
C03	3	-	-	-	-	3	-	-	-	-	-	3	-	-
C04	3	-	-	-	-	3	-	-	-	-	-	3	-	-
C05	3	-	-	-	-	3	-	-	-	-	-	3	-	-
C06	3	-	-	-	-	3	-	-	-	-	-	3	-	-

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, Jhansi 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		

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

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

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)
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	PO12	PSO1	PSO2
C01	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C02	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C03	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C04	3	1	1	-	-	-	-	-	-	-	1	-	3	2
C05	2	-	-	-	-	-	-	2	-	-	-	-	2	2
C06	2	-	-	-	-	-	-	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 and implementation strategy of SDGs through SCOUT for SDGs

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
- 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
- Study of IOT protocols
- Demonstration of applications using embedded C
- Demonstration of robotic models
- Demonstration of drone models

MODULE-3	BASICS OF MECHANICAL ENGINEERING	4
	● Study of mechanical modeling using fusion 360 ● Demonstration of 3D scanner ● Demonstration of 3D printer ● Demonstration of laser cutter and RD works software ● Study of slicer software ● Study of master cam software	
MODULE 4	ALIGNMENT AND MAPPING OF IDEAS	4
	● Project Title: Problem Statement, solution and justification for SDG and SAP	
MODULE-5	ENTREPRENEURSHIP SKILLS	4
	● Startup Awareness ● Entrepreneurship Opportunities ● Mock Presentations ● Innovation ● Novelty Feasibility ● Presentation Skills	
MODULE-6	SCOUT for SDGs	4
	History of Scouting and Guiding - Introduction to Rovering and Ranging - Education objectives - Different Sections of Scouting- Bunnies, Cubs-Bulbuls, Scouts-Guides, Rovers-Ranger	
	Promise and Law: Scouting and Guiding with meaning to each point-how a boy and girl implement it on the daily life, saving life, Duties as citizens.	
	Leadership Skills: Mindsets of Leadership, Carrier Council. Community Service: Meaning, Types, duration, difference between community Service and Community Development.	
	Sairam SDG Ideathon	6
	● Preparedness of Ideathon ● 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
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.
8. Scouts Hand Book

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
5. <http://sdgs.scout.org>

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 Basics of Mechanical Modeling (K2)
4. Interpret the mapping of SDGs to ideas. (K2)
5. Comprehend the guidance for the Idea presentation and to Innovate the ideas for market opportunities (K2)
6. Understand the scouting as a way of life for community development and illustrate the ideas for Ideathon event emphatically (K4)

CO-PO, PSO MAPPING:

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

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

MODULE - V DIGITAL NETWORKING

Remote work and virtual teams
 Authenticity in digital interactions
 Engaging content creation
 Tools 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. Demonstrate basic understanding of effective online communication techniques (K1)
2. Show and utilize fundamental computer skills (K1)
3. Comprehend and apply the use of virtual platforms to enhance communication reachability (K2)
4. Understand and implement principles of digital ethics (K2)
5. Use basic technologies for securing data and maintaining information integrity (K1)
6. Understand the importance of standardization and adhere to BIS (K2)

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	-	-	-	-	-	-	-	-	2	-	2	-	-
C02	-	-	-	-	-	-	-	-	2	-	2	-	-
C03	-	-	-	-	-	-	-	-	2	-	2	-	-
C04	-	-	-	-	-	-	-	-	2	-	2	-	-
C05	-	-	-	-	-	-	1	-	2	-	2	-	-
C06	-	-	-	-	-	-	1	-	2	-	2	-	-

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

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>

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. Compute the rank, nullity and matrix of a linear transformation and. (K3)
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. Compute the general, particular, and singular integrals of first-order partial differential equations, including Lagrange's linear equation. (K3)
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
C01	3	2	-	-	-	-	-	-	-	-	-	3	2
C02	3	2	-	-	-	-	-	-	-	-	-	3	3
C03	3	2	-	-	-	-	-	-	-	-	-	3	2
C04	3	2	-	-	-	-	-	-	-	-	-	3	3
C05	3	2	-	-	-	-	-	-	-	-	-	3	2
C06	3	2	-	-	-	-	-	-	-	-	-	3	2

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.

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 - 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.

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. Analyze and measure the current and voltage levels using different potentiometric methods and Instrument transformers.(K4)
4. Demonstrate various measurement techniques and classify transducers while interpreting the impact of error analysis on measurement accuracy. (K3)
5. Implement and model the performance of transducers under static and dynamic conditions for practical measurement applications.(K3)
6. Examine with various types of resistive, capacitive, and inductive transducers, and explore their specific applications across different fields.(K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	-	-	-	-	-	-	-	-	2	2	2
C02	2	2	-	1	2	1	-	-	-	-	2	2	2
C03	2	2	2	-	2	1	-	-	-	-	2	2	2
C04	2	2	-	-	-	-	-	-	-	-	2	2	2
C05	2	2	-	-	-	-	-	-	-	-	2	2	2
C06	2	2	2	1	-	-	-	-	-	-	2	2	2

SEMESTER - III

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

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>

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. Demonstrate an understanding of semiconductor device behavior through practical circuit analysis. (K3)
2. Implement FET and BJT characteristics to design and simulate amplifier circuits that meet specified performance criteria.(K3)
3. Develop feedback amplifier and oscillator circuits by selecting appropriate topologies and verifying performance through simulation or hardware.(K3)
4. Employ operational amplifier principles to design and test linear (e.g., integrators, filters) applications. (K3)
5. Employ operational amplifier principles to design and test nonlinear (e.g., comparators, waveform generators) applications. (K3)
6. Use ICs such as 555 Timers and voltage regulators to construct and analyze timing circuits and power supply modules for practical applications. (K3)

CO – PO, PSO MAPPING:

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

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 Demultiplexers - Encoders and Decoders. VHDL implementation of combinational circuits- Adders- Multiplexers & Demultiplexers.

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

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/>

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

1. Analyze various number systems and simplify logical expressions using Boolean algebra and Karnaugh maps and simulate them in VHDL(K3)
2. Explain the design procedures and characteristics of different logic families, including TTL and CMOS technologies, and simulate them in VHDL (K3)
3. Design combinational circuits such as multiplexers, decoders, and arithmetic units and simulate them using VHDL (K3)
4. Develop and implement synchronous sequential circuits, including flip-flops, counters, and shift registers using VHDL. (K3)
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
C01	3	2	-	-	2	-	-	-	-	-	2	3	2
C02	3	2	-	-	2	-	-	-	-	-	2	3	2
C03	3	2	-	-	2	-	-	-	-	-	2	3	2
C04	3	2	2	2	2	-	-	-	-	-	2	3	2
C05	3	2	2	2	2	-	-	-	-	-	2	3	2
C06	3	2	-	-	2	2	-	-	-	-	2	3	2

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; B-Trees; 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.

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 with C", 2nd Edition, 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. Demonstrate 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. Differentiate between types of tree structures and construct appropriate trees like BSTs, AVL trees, and heaps for various applications. (K4)

- Investigate graph representations and evaluate traversal and shortest-path algorithms for solving real-world problems.(K4)
- Implement various sorting and searching algorithms to determine their efficiency in data organization tasks.(K3)
- 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
C01	2	2	-	2	-	-	-	-	-	-	-	2	2
C02	2	-	2	-	-	-	-	-	-	-	-	2	2
C03	-	3	3	2	-	-	-	-	-	-	-	3	3
C04	2	3	-	2	-	-	-	-	-	-	-	2	2
C05	-	2	3	3	-	-	-	-	-	-	-	2	2
C06	2	3	2	2	-	-	-	-	-	-	-	2	2

SEMESTER - III

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

- Purpose and motivation for the course, recapitulation from Universal Human Values-I

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 of relationship
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 relationship

15. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-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 of resources 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

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)

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
C01	-	-	-	-	-	3	3	2	-	-	3
C02	-	1	-	-	-	3	3	2	-	-	-
C03	-	-	3	-	-	3	3	2	-	-	-
C04	-	-	-	-	-	3	3	2	-	2	3
C05	-	-	-	-	-	3	3	-	-	-	3
C06	-	-	-	-	-	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

L2 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
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GENERAL AWARENESS 4

GA 1	General Knowledge	4
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ARMED FORCES 6

AF 1	Armed Forces, Army, CAPF, Police	6
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ADVENTURE 1

AD 1	Introduction to Adventure Activities	1
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BORDER & COASTAL AREAS 2

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

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 Activities	1
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BORDER & COASTAL AREAS 2

BCA 1 History, Geography & Topography of Border/Coastal areas	2
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TOTAL :45 PERIODS**SEMESTER - III**

24EIP301 - 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

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. Perform measurement of resistance, Inductance and Capacitance (K4)
2. Perform the calibration of voltmeter and ammeter (K4)
3. Analyze the characteristics and step response of various temperature transducers such as RTD and Thermocouple (K4)
4. Analyze the characteristics of resistive and inductive transducers (K4)
5. Implement the operation of various sensors using arduino (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	1	2	2	2	-	-	-	-	-	2	2
C02	2	2	2	1	2	2	-	-	-	-	-	3	3
C03	2	2	1	2	1	2	-	-	-	-	-	3	3
C04	2	2	2	2	2	1	-	-	-	-	-	3	3
C05	2	1	2	2	2	2	-	-	-	-	-	2	2

SEMESTER - III

24EITP301 SDG NO. 4	APTITUDE SKILLS	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.

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.

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
C01	2	-	-	-	-	-	-	-	-	-	1	-	-
C02	-	-	-	-	-	2	-	-	-	-	1	-	-
C03	-	-	-	-	-	-	-	-	2	-	1	-	-
C04	-	2	-	-	-	-	-	-	-	-	1	-	-
C05	-	-	-	-	-	-	-	2	3	-	1	-	-
C06	-	-	-	-	-	3	-	-	-	-	1	-	-

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

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

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.

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>

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
C01	3	2	-	2	-	-	-	-	-	-	-	3	2
C02	3	3	2	2	-	-	-	-	-	-	-	3	2
C03	3	2	-	2	2	-	-	-	-	-	-	3	3
C04	3	2	-	2	2	-	-	-	-	-	-	3	3
C05	3	2	-	2	2	-	-	-	-	-	-	3	3
C06	3	2	-	2	2	-	-	-	-	-	-	3	3

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.

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
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 mathematical modelling techniques to represent Physical, mechanical and electrical Systems.(K3)
2. Analyse time- domain response of control Systems and determine time-domain Specification and Compute steady-state and dynamic errors using error constants and apply PID control actions(K3)
3. Analyze control systems in the frequency domain using Bode and polar plots and relate them to time-domain behavior.(K3)
4. Apply Routh-Hurwitz and Root Locus methods for system stability and gain margin evaluation.(K3)
5. Design Lead, Lag, and Lag-Lead compensators to meet given performance criteria (K3)
6. Formulate state-space models of control systems and evaluate controllability and observability (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	-	-	-	-	-	-	-	-	-	3	2
C02	3	3	-	2	-	-	-	-	-	-	-	3	2
C03	3	3	2	2	-	-	-	-	-	-	-	3	2
C04	3	3	2	2	2	-	-	-	-	-	-	2	3
C05	3	3	2	3	2	-	-	-	-	-	-	2	3
C06	3	3	3	3	3	-	-	-	-	-	-	2	3

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 DCMACHINES

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

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. 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. Bimbhra, 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-blcdc-motor/>

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. Demonstrate a clear understanding of the construction and operating principles of DC generators and DC motors.(K3)
2. Explore the key components of construction of transformers-single phase-three phase (K3)
3. Examine the construction , working and testing methods and different types of Single phase induction motor (K3)
4. Investigate the construction , working of special electrical machines (K3)
5. Design and analyze power electronic circuits, focusing on applications such as rectifiers, inverters, and voltage regulators. (K3)
6. Analyze various control techniques such as open-loop, closed-loop, V/f control, vector control, and direct torque control.(K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	-	1	2	1	-	-	1	1	2	1	1
C02	3	2	-	1	2	1	-	-	1	1	2	-	-
C03	3	2	-	1	2	1	-	-	1	1	2	-	-
C04	3	3	1	-	-	-	-	-	1	1	2	1	3
C05	3	2	-	2	2	2	-	-	1	1	2	2	3
C06	3	1	-	2	1	2	-	-	1	1	2	2	3

SEMESTER - IV

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

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

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", 6th McGraw-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. Alok Barua, "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Kharagpur.
6. Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.

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. Demonstrate the principle and working of viscometer, Humidity and Moisture measurements. (K3)
2. Outline the various methods employed for temperature monitoring in industrial processes. (K3)
3. Provide an overview of pressure measurement techniques used in industry. (K3)
4. Depict different types of industrial instruments used for flow measurement. (K3)
5. Manipulate various types of Electrical Industrial Instruments. (K3)
6. Demonstrate the application of level measurement techniques and operating principle of industrial transmitters. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	2	-	-	-	-	-	-	-	2	3	3
C02	3	2	2	-	-	-	-	-	-	-	2	3	3
C03	3	2	2	-	-	-	-	-	-	-	2	3	3
C04	3	2	2	-	-	-	-	-	-	-	2	3	3
C05	3	2	2	-	-	-	-	-	-	-	2	3	3
C06	3	1	2	-	-	-	-	-	-	-	2	3	3

SEMESTER - IV

24EIPC403 108104091 SDG NO. 4, 11	PRINCIPLES OF COMMUNICATION ENGINEERING	L	T	P	CP	C
		3	1	0	5	4

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.

MODULE - VI WIRELESS COMMUNICATION**8**

Spread Spectrum-DSSS-FHSS-Multiple Access Techniques - 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. Describe the principles of amplitude modulation techniques including AM, DSB-SC, SSB-SC, VSB. (K2)
2. Illustrate the working of frequency and phase modulation systems and differentiate NBFM and WBFM. (K2)
3. Apply Sampling and Quantization techniques to generate pulse modulated signals like PAM, PCM. (K3)
4. Apply Digital Modulation Schemes like ASK, FSK, PSK and analyze their usage in telemetry /RFID. (K3)

5. Apply the basics of information theory to calculate entropy, channel capacity, and perform coding. (K3)
6. Describe Wireless Communication Techniques and Multiple access methods including GSM and Satellite Systems. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	-	-	-	-	-	-	-	1	-	3	-
C02	3	2	-	-	-	-	-	-	-	1	-	3	-
C03	3	2	2	-	2	-	-	-	-	1	-	3	3
C04	3	2	2	-	2	-	-	-	-	1	-	3	3
C05	3	2	2	-	2	-	-	-	-	1	-	3	3
C06	3	2	-	-	2	2	1	-	-	1	-	3	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
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	
L2 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
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
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BASIC FLIGHT INSTRUMENTS 3

FI 1 Basic Flight Instruments	3
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AERO MODELLING 3

AM 1 Aero Modelling Capsule	3
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GENERAL SERVICE KNOWLEDGE 2

GSK 4 Latest Trends & Acquisitions	2
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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

24EIP401 - 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
- 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. Apply standard laboratory calibration methods and gain practical experience in calibrating process and electrical parameters. (K4)
2. Apply laboratory-standard sensors and transducers to measure process variables such as flow, level, and temperature. (K4)
3. Analyze the pH, conductivity, moisture and viscosity of various test solutions. (K4)
4. Operate analytical instruments to determine the absorbance and transmittance characteristics of various solutions. (K4)
5. Measure and analyze physiological parameters such as BP, ECG and pulse rate. (K4)
6. Analyze the measurement and testing of voltmeter, ammeter and wattmeter. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	2	2	2	-	-	-	2	-	-	1	2	2
C02	2	2	2	2	2	-	-	-	2	-	-	1	2	2
C03	2	2	2	2	2	-	-	-	2	-	-	1	2	2
C04	2	2	2	2	2	-	-	-	2	-	-	1	2	2
C05	2	2	2	2	2	-	-	-	2	-	-	1	2	2
C06	2	2	2	2	2	-	-	-	2	-	-	1	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.

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

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.

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. Apply simulation tools to configure and operate timers, interrupts, and I/O ports of the 8051 microcontrollers for executing real-time embedded applications (K3)
3. Design and interface devices like stepper motors and traffic light controllers using the 8051 microcontroller (K3)
4. Simulate embedded C programs targeting the 8051 microcontroller (K3)
5. Apply the simulation tools to program the Raspberry Pi processor for simple applications (K3)
6. Implement real-time interfacing of the Raspberry Pi processor for practical applications (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	-	-	-	-	-	2	2	-	2	2	2
C02	2	2	-	-	2	-	-	2	2	-	2	2	2
C03	2	2	-	-	-	2	-	2	2	-	2	3	2
C04	2	2	-	-	2	-	-	2	2	-	2	3	2
C05	2	2	-	-	2	-	-	2	2	-	2	3	2
C06	2	2	2	-	2	2	-	2	2	-	2	3	2

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

S.No	Equipment	Quantity
1	8086 Microprocessor Trainer Kits	15
2	8051 Microcontroller Trainer Kits	15
3	ADC and DAC Interface Boards	5
4	Stepper Motor Interface Boards with stepper motor	5
5	Traffic Light Interface Boards	5
6	ARM 7 trainer kit	15
7	Temperature sensor LM35	15
8	Standalone desktop PC with MASM, Keil μ Vision, Flash magic and UART driver software installed	15

SEMESTER - IV

24EITP401 NPTEL CODE :- SDG NO. 4	APTITUDE SKILLS	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.
- 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.

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- TOTAL: 45 PERIODS**

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

(BIS STANDARDS, RANGER AND ROVER, LIFE SKILLS)

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

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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 entrepreneurs - 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.

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)

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.

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)
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
C01	3	3	2	-	-	-	-	2	-	-	-	2	2
C02	3	3	2	-	-	-	-	2	-	-	-	2	2
C03	3	3	2	-	-	-	-	2	-	-	-	2	2

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 Mathru

Chairman & CEO - Sairam Institutions

We build a Better nation
through Quality education.



Sri

SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

Accredited by **NBA** and **NAAC "A+"**

ISO 21001 : 2018 (EOMS) Certified by BIS
and **NIRF** ranked institution

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