**IQAC**
Ensuring **Quality**

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
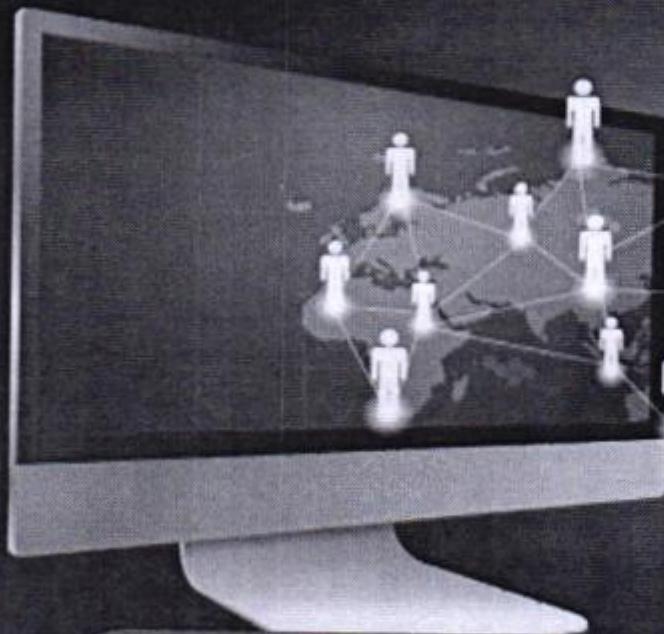
DEPARTMENT OF
COMPUTER AND COMMUNICATION
ENGINEERING

REGULATIONS 2024
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 COMPUTER AND COMMUNICATION ENGINEERING

◉ VISION

To produce globally competent and socially responsible engineers who can address the engineering challenges and excel at an international level, in the advancement of Computer and Communication Engineering through research and academia.

✒ MISSION

M1   To provide a good environment with latest technological infrastructure facilities, teaching-learning ambience and interaction with industry in the area of Computer and Communication Engineering.

M2   To inculcate graduates with high social responsibility, right attitude, discipline and an inclination towards offering their professional expertise in serving the society.

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	24HSTA101	Heritage of Tamils	1	0	0	1	1
PRACTICALS							
1	24ESPL101	Programming in C Laboratory	0	0	2	2	1
2	24ESGE102	Engineering Practices Lab	0	0	4	4	2
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							
		As recommended by BOS					
				Total		27	22

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA201	Discrete Structures	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH201	Physics of Electronic Devices	3	0	0	3	3
4	24BSCY201	Chemistry for Environment and Sustainability	3	0	0	3	3
5	24HSTA201	Tamils and Technology	1	0	0	1	1
6	24HSNC201	NCC Course Level 1*	2	0	0	2	0
7	24ESGE101	Engineering Graphics	1	2	0	3	3
PRACTICALS							
1	24BSPL101	Physics and Chemistry Laboratory	0	0	4	4	2
2	24AIPT201	Python for Data Science Laboratory with Theory	1	0	4	5	3
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
				Total		31	22

*only for NCC cadets

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SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
		THEORY					
1	24BSMA301	Statistics and Linear Algebra	3	1	0	4	4
2	24ECPC301	Signals and Systems	3	0	0	3	3
3	24COPC301	Digital Design and Computer Organization	3	0	0	3	3
4	24COPC302	Algorithms and Data Structures	3	0	0	3	3
5	24HSMC301	Universal Human Values - II Understanding Harmony	3	0	0	3	3
6	24HSNC301	NCC course Level 2*	3	0	0	3	0
		PRACTICALS					
1	24COPL301	Digital Circuits Laboratory	0	0	4	4	2
2	24COPL302	Algorithms and Data Structures Laboratory	0	0	4	4	2
		VALUE ADDITIONS - III					
1	24COTP301	Aptitude Skills - I	0	0	2	2	1
2	24COID301	Innovative Design Lab - I	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
1	24ESMC202	Joy of Computing using Python (Mandatory - NC)					
		Total				31	22

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
		THEORY					
1	24BSMA401	Probability Theory and Random Processes	3	1	0	4	4
2	24ECPC402	Analog and Digital Communication	3	0	0	3	3
3	24ITPW401	Operating systems with Lab	3	0	2	5	4
4	24COPC401	Database Systems	3	0	0	3	3
4	24XXOEXXX	Open Elective - I #	3	0	0	3	3
5	24HSNC401	NCC course Level 3*	3	0	0	3	0
		PRACTICALS					
1	24ECPL401	Communication Systems Laboratory	0	0	4	4	2
2	24COPL401	Database Systems laboratory	0	0	4	4	2
3	24CSPT401	Object Oriented Programming Laboratory with Theory	1	0	4	5	3
		VALUE ADDITIONS - IV					
10	24COTP401	Aptitude Skills - II	0	0	2	2	0
11	24COID401	Innovative Design Lab - II	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
		As recommended by BOS					
		Total				35	25

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Impart strong foundation in basic sciences, mathematics and engineering fundamentals, knowledge and capability.

PEO2 Apply design principles and best practices for developing quality products for scientific and business applications.

PEO3 Inculcate high professionalism among the students by providing technical and soft skills with ethical standards.

PEO4 Promote collaborative learning and spirit of team work through multidisciplinary projects and diverse professional activities.

PEO5 Indoctrinate an attitude in the graduates for life-long learning process.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Apply appropriate technology for the implementation of modern communication systems

PSO2 Develop quality software for scientific and business applications by applying software engineering principles and practices.

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)	27	56	46
Program theory with Lab (PW) / Program Lab With Theory (PT)	5	15	46
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		225	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

11 Life-long learning
Engage in independent lifelong learning and adapt to new technologies with critical thinking.

01 Engineering knowledge
Apply math, science, computing, and engineering knowledge to solve complex engineering problems.

02 Problem Analysis
Identify and analyze complex problems using research to draw valid conclusions.

03 Design / Development of solutions
Design practical and innovative solutions considering safety, cost, culture, and the environment.

10 Project Management and Finance
Apply management and financial principles to plan and execute projects effectively.

04 Investigate complex problems
Use research methods—experiments, modeling, and data analysis—to investigate complex problems.

09 Communication
Communicate clearly in writing and presentations for diverse technical and non-technical audiences.

05 Engineering Tool Usage
Apply modern engineering and IT tools for analysis and problem solving with awareness of their limits.

08 Individual & Teamwork
Work effectively as an individual and as a team member or leader in multidisciplinary groups.

07 Ethics
Follow professional ethics, human values, diversity, inclusion, and legal responsibilities.

06 The Engineer and the World
Assess societal, environmental, legal, health, and cultural impacts of engineering solutions.

ENGINEERING DEGREE PROGRAM OUTCOMES

SEMESTER - I

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

OBJECTIVES:

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

MODULE I MATRICES   12

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

MODULE II FUNCTIONS OF SEVERAL VARIABLES   12

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

MODULE III VECTOR DIFFERENTIATION   4

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

MODULE IV   VECTOR INTEGRATION   8

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

MODULE V   MULTIPLE INTEGRALS   12

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

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MODULE VI   FOURIER SERIES

12

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

TOTAL: 60 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

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Board of Studies of ___H & S___ dept.
Meeting No. _____ Dated: 7|6|24

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COURSE OUTCOMES:

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

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

CO-PO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

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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

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TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

OUTCOMES:

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

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

Recommended by

Board of Studies of H B S dept.

Meeting No. _____ Dated: 7|6|24

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CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I   PROPERTIES OF MATTER   8

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

MODULE - II MECHANICAL WAVES AND LASERS   7

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

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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.

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REFERENCES:

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

OUTCOMES:

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

1. Apply the concepts of stress, torsion, and bending to study the mechanical behavior of structural elements using theoretical and experimental methods. (K3)
2. Analyze wave phenomena and interference to study energy transfer, and evaluate laser principles with their industrial applications. (K4)
3. Examine Maxwell's equations and electromagnetic wave theory to analyze wave propagation, polarization and reflection-transmission phenomena in different media (K4)
4. Utilize the principles of quantum mechanics to explain black body radiation, matter waves, particle confinement in potential wells and tunneling phenomena. (K3)
5. Examine and compare the characteristics of various crystal structures, polymorphic forms, and crystal growth techniques. (K4)
6. Apply the principles of heat transfer to determine the thermal conductivity and explain the role of heat exchangers in refrigerators and solar water heaters. (K3)

Recommended by

Board of Studies of ___HBS___ dept.

Meeting No. _____ Dated: 7/6/24

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Department of Humanities & Sciences

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CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I   POLYMER CHEMISTRY   8

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

Plastics: Definition and Characteristics - Thermoplastics & Thermosets. Preparation, properties and engineering applications of plastics - PVC, Teflon, Kevlar and Bakelite.
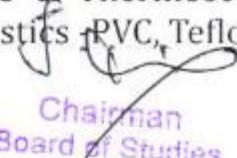
Fibers: Characteristics fibers - Preparation, properties and applications of Nylon and Dacron. Biodegradable polymers & Conducting Polymers: Characteristics, Classification and their applications.

MODULE - II ELECTROCHEMISTRY AND BATTERY TECHNOLOGY   7

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

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

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY   7

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

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

MODULE - IV CHEMICAL THERMODYNAMICS   8

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

MODULE - V FUELS   8

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

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

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MODULE - VI NANOCHEMISTRY

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.
8. Chemical and Electrochemical Energy Systems, R. Narayanan, B. Viswanathan, University Press India Limited.

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)

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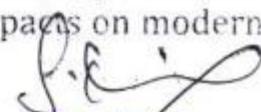
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2. Recognize the basic principles of electrochemistry and describe their application in battery technologies. (K3)
3. Apply the concepts of key photophysical and photochemical processes, as well as spectroscopy, to develop and optimize various applications. (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	-	-	-	-	-	-	-	-
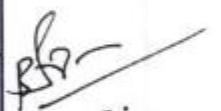
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SEMESTER - I

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.

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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

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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

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OUTCOMES:

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

1. Solve basic problems using algorithms, flowcharts, and pseudo code.(K3)
2. Analyze the various programming constructs for basic computational problems.(K4)
3. Implement simple C programs using arrays and strings. (K3)
4. Use functions, recursion, and pointers to perform calculations, searching, and sorting.(K3)
5. Apply structures and dynamic memory allocation in handling complex programming tasks. (K3)
6. Organize sequential and random file processing techniques to provide solutions for real-world computational problems. (K4)

CO-PO, PSO MAPPING:

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

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SEMESTER - I

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

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

அலகு ஐ   மொழி மற்றும் இலக்கியம்

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

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UNIT I   LANGUAGE AND LITERATURE   5

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural

அலகு II   இடைகால மற்றும் நவீன இலக்கியங்கள்

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

Unit II   MEDIEVAL AND MODERN LITERATURE   5

Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

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

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

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

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

அலகு IV   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

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

UNIT IV   FOLK AND MARTIAL ARTS   5

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

அலகு V   தமிழர்களின் திணைக் கோட்பாடுகள்

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

UNIT V   THINAI CONCEPT OF TAMILS   5

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

அலகு VI   இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு __ இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் __ சுயமரியாதை இயக்கம் __ இந்தியமருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு __ கல்வெட்டுகள், கையெழுத்துப்படிகள் __ தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

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

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

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

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OUTCOMES:

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

1. மொழிக் குடும்பங்களின் வரலாறு மற்றும் தமிழ் இலக்கியங்களை மதிப்பிடுகிறார்கள் Students evaluate the history of language families and Tamil literatures (K3)

2. பக்தி மரபுகளின் தாக்கம் பெற்ற தமிழ் இலக்கியங்களைப் புரிந்துகொள்கிறார்கள் Students understand Tamil literatures influenced by Philosophical and religious traditions (K3)

3. தமிழகத்தின் பாறை, சிற்பம், ஓவியம்- கலை மரபுகளைப் பகுப்பாய்வு செய்கிறார்கள் Students analyze the artistic traditions of Tamil Nadu such as rock art, sculpture, and painting (K3)

4. தமிழக நாட்டுப்புறக் கலைகள் மற்றும் தற்காப்புக் கலைகளின் மாண்புகளை உணர்ந்து கொள்கிறார்கள் Students realize the significance of Tamil Nadu's folk arts and martial arts (K3)

5. பழந்தமிழரின் திணையியல் வாழ்வியலை மீளாய்வு செய்கிறார்கள் Students re-examine the ecological lifestyle (Thinai-based life) of the ancient Tamils (K3)

6. தேசிய இயக்கம் மற்றும் இந்தியப் பண்பாட்டில் தமிழர்களின் பங்களிப்பினை நினைவுகூர்கிறார்கள் Students recall the contribution of Tamils to the National Movement and Indian culture (K3)

CO- PO, PSO MAPPING

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

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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

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(a) Total marks obtained by each student.

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

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

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

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

OUTCOMES:

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

1. Apply basic constructs, arrays, strings,functions and recursion for executing C programming applications.(K3)

2. Analyze C programs involving pointers and structures.(K4)

3. Evaluate applications using sequential and random access files.(K5)

CO-PO, PSO MAPPING:

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

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Meeting No. _7_ Dated: _27/1/24_
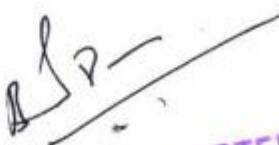
Dr. B. SREEDEVI
HEAD OF THE DEPARTMENT
COMPUTER SCIENCE AND ENGINEERING
SRI SAIRAM INSTITUTE OF TECHNOLOGY
SAI LEO NAGAR, CHENNAI - 600 044

SEMESTER - I

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

OBJECTIVES:

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

ELECTRICAL ENGINEERING PRACTICE

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

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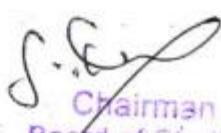
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Plumbing Works:

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

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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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	-	-	-	-	-	-	-	-	-	-	2	2
CO3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO4	3	-		-	-	-	-	-	-	-	-	2	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2
CO6	2	-	-	-	-	-	-	-	-	-	-	2	2

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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

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MODULE - V   PRESENTATION SKILLS   5

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

MODULE - VI   ARTICULATION ASPECTS   5

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

TOTAL : 30 PERIODS

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES:

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

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

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CO-PO, PSO MAPPING:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - 1 United Nations Sustainability and the Sustainable Development Agenda

3

- Introduction to Sustainability
- Indian Rural Environment: Necessity and Sustainability
- Millennium Development Goals (MDGs)
- United Nations Sustainable Development Goals (SDGs) & the Agenda
- Recommended by 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   12

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

TOTAL: 30 PERIODS

REFERENCES:

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

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

OUTCOMES:

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

1. Analyse and apply the concepts of sustainability,Rural environment,Gram panchayat and various government schemes to design innovative practical solutions that address real life rural challenges. (K2)
2. Compare MDG's,SDG's and LSDG's to analyse village topology and identify specific development targets to propose innovative rural solutions. (K4)
3. Analyse the attainment levels of SDG's and write a reflective report on local community.(K4)
4. Formulate problem statement based on local community needs and propose innovative ideas for community development. (K4)
5. Perform an individual presentation of field observation by mapping them with relevant SDG's and justify their significance for rural development. (K4)

CO-PO, PSO MAPPING:

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

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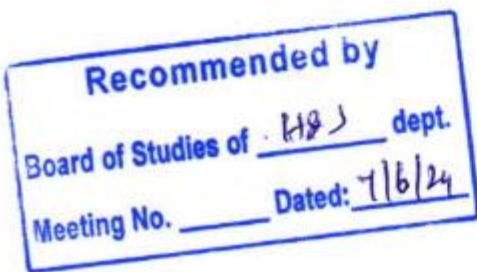
SEMESTER - II

24BSMA201 - SDG NO. 4	DISCRETE STRUCTURES	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To understand the fundamental concepts of logic, rules of inference, and quantifiers.
- To learn the principles of mathematical induction, permutations, and combinations.
- To gain knowledge of groups and normal subgroups in abstract algebra.
- To develop graph algorithms using the foundational concepts of graph theory.
- To understand the concepts of lattices and Boolean algebra and their applications.

MODULE - I LOGICS 9

Basic Connectives – Truth Tables – Logical Equivalence - The Laws of Logic- Logical Implications - Normal Forms – Rules of Inference – The use of Quantifiers.

MODULE - II COMBINATORICS 9

The Principles of Mathematical Induction – Basic counting techniques – Inclusion and exclusion - Pigeonhole principle – Permutation – Combination.

MODULE - III ALGEBRAIC STRUCTURES WITH ONE BINARY OPERATION 12

Semi Groups– Monoids– Groups - Subgroups – Cosets; Normal subgroups –Lagrange's theorem.

MODULE - IV GRAPHS 12

Graphs - Definition -Special types of Graphs- Matrix representation of Graphs - Graph isomorphism- Path, Cycle, Connectivity - Eulerian and Hamiltonian Graphs.

MODULE - V LATTICES 9

Partial ordering - Posets - Lattices as Posets - Properties of lattices - Lattices as algebraic systems - Sub lattices - Direct product and homomorphism - Some special lattices.

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MODULE - VI BOOLEAN ALGEBRA   9

Boolean Algebra – Definition – Identities of Boolean Algebra -Demorgan's laws.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Discrete Mathematics and its Applications: with Combinatorics and Graph Theory, Kenneth H. Rosen, 7th Edition, Tata McGraw --Hill Education Pvt. Ltd., 2015.

2. Discrete Mathematical Structure with Applications to Computer Science", J.P. Tremblay and R. Manohar, Reprint, McGraw-Hill Education (India) Edition 1997.

REFERENCES:

1. Discrete Mathematics with Applications, Susanna S. Epp, 4th edition, Brooks/Cole, Cengage Learning, 2010.

2. Discrete Mathematics, Norman L. Biggs, 2nd Edition, Oxford University Press, 2002.

3. Discrete Mathematics, Seymour Lipschutz, Marc Lipson, Schaum's Outlines Series, 3rd edition, McGraw-Hill Education, 2009.

4. Elements of Discrete Mathematics: A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 4th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2012.

WEB REFERENCES:

1. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf

2. https://www.cs.cornell.edu/~rafael/discmath.pdf

3. http://home.iitk.ac.in/~arlal/book/mth202.pdf

4. https://drive.google.com/file/d/1-PqMUlqDim1-AHQK5_zL34I97z HV3W15/view

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106106183

2. https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D 1A947252D20

3. https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYkSg 4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13

4. https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnziV3 ogoVxVxCTlI45pDVM1aoYoMHf

5. https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9OQ GMqxersk8IIxiIM8Ib9DBqsKZS

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OUTCOMES:

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

1. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables. (K3)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Explain the fundamental concepts of algebraic structures such as groups and Boolean algebra. (K3)
4. Illustrate the concepts of graphs. (K3)
5. Apply the concepts of Lattices in the field of computer science. (K3)
6. Apply the concepts of Boolean algebra in logical circuits. (K3)

CO-PO, MAPPING:

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

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

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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)

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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
CO1	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	1	3	-	3	-	-
CO6	-	-	-	-	-	-	-	1	3	-	3	-	-

SEMESTER - II

24BSPH201 - SDG NO. 4,7,9	PHYSICS OF ELECTRONIC DEVICES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To acquaint the electrical properties of materials.
- To enlighten the basic principles of semiconductor physics.
- To acquaint the applications of semiconductor devices.
- To introduce the optical properties of materials.
- To educate the properties of magnetic and dielectric materials and their uses.
- To illustrate the properties and applications of nano devices.

MODULE - I   ELECTRICAL PROPERTIES OF MATERIALS   8

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - electrons in metals - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential- Energy bands in solids – tight binding approximation - Electron effective mass- concept of hole.

MODULE - II   SEMICONDUCTOR AND TRANSPORT PHYSICS   7

Semiconductors – Energy band diagram – direct and indirect band gap semiconductors- Intrinsic semiconductor– Carrier concentration in intrinsic

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semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors:, Mobility ,Drift and Diffusion Current densities.

MODULE - III SEMICONDUCTOR SWITCHING DEVICES   8

PN Junction Diode - Construction ,Working and Characteristics - Transistor - NPN, PNP working - Early effect - Current equations - Input and Output Characteristics of CB, CE and CC configurations - JFET and its characteristics - MOSFET and its characteristics - Construction and Working of D-MOSFET - UJT, SCR - CCD and Optocoupler. IoT concept and use in industry.

MODULE - IV OPTICAL PROPERTIES OF MATERIALS   7

Classification of optical materials - optical absorption and emission process in materials - charge carrier generation and recombination - optical absorption loss and gain.– Optoelectronic devices - Solar cells – LED – OLED - Nonlinear optics- Modulators, switching devices Plasmonics (Qualitative)

MODULE - V MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS8

Magnetism in materials - Magnetic field and induction - Magnetization - permeability and susceptibility - Types of magnetic materials - microscopic classification of magnetic materials Ferromagnetism - Domain Theory - Hysteresis phenomenon - Dielectric materials – Introduction - Types of Polarization (qualitative) - internal field - Clausius-Mossotti relation – dielectric loss - dielectric breakdown (definitions) - Dielectric constant measurement by Schering bridge method.

MODULE - VI NANO DEVICES   7

Quantum Confinement - Quantum structures - Density of states in quantum well, wires, and dots (Quantitative) - Band Gap of Nano materials - Tunnelling - Single electron phenomena - Single electron transistor - Quantum DOT lasers - Conductivity of metallic nano wires - Carbon Nano Tubes (CNT): Structures, properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition) 2009.
4. Dr.P.Mani. Physics for Electronic Devices, Dhanam Publications, 2024.
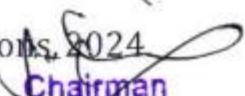
REFERENCES:

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
3. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
4. N.Gershenfeld. The Physics of Information Technology. Cambridge University Press, 2011.

OUTCOMES:

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

1. Explore the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K3)
2. Analyze the band structures and carrier concentrations of semiconductors, study their variations with temperature, and examine carrier transport mechanisms (K4)
3. Apply the working principles of semiconductor devices and use IoT concepts in practical applications (K3)
4. Examine the optical processes in materials and analyze the operation of optoelectronic devices (K4)
5. Demonstrate the magnetic and dielectric properties of materials and their applications (K3)
6. Analyze quantum confinement and quantum structures, examine the working principles of quantum devices, and explore the applications of carbon nanotubes (K4)

CO-PO MAPPING:

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

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SEMESTER - II

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

OBJECTIVES:

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

MODULE - I   INTRODUCTION TO ENVIRONMENTAL SCIENCE   8

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

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

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

MODULE - II ATMOSPHERIC CHEMISTRY   7

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

MODULE - III WATER CHEMISTRY   8

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

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT   7

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

Solid Waste Management System: Sources and types of solid waste, Elements of solid waste management, Methods of residential and commercial 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 H_2O_2 as benign bleaching agents in the paper industry.

Sustainable Development: Definition and concepts of sustainable development, Need for sustainable development; Sustainable development

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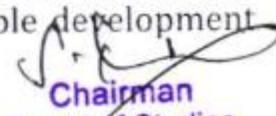
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goals – 17 SDG goals.

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. Mc Carty, Gene F. Parkin, 4th Edition, McGraw-Hill.

OUTCOMES:

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

1. Develop a foundational understanding of environmental science, the interactions within ecosystems, the significance of biodiversity, and the importance of conservation strategies for maintaining ecological balance. (K3)
2. Identify the primary components of the atmosphere, explain the causes of atmospheric pollution, and propose basic strategies to promote a sustainable and clean atmosphere. (K3)
3. Demonstrate complex water quality parameters, and develop innovative methods for producing cost-effective soft water suitable for both industrial use and potable consumption. (K3)
4. Describe the composition and functions of soil components, analyze the sources and characteristics of solid wastes, and evaluate the methods and strategies for recommended solid waste management (SWM). (K3)

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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

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

OBJECTIVES:

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

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

UNIT-I   WEAVING AND POTTERY (CERAMIC) TECHNOLOGY   5
Weaving Industry during Sangam Age - Ceramic technology - Black and Red-ware Potteries (BRW) - Graffiti on Potteries.

அலகு -II   சங்ககாலவடிவமைப்புகள்
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள்ரூசங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும்நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்

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UNIT-II   SANGAM AGE DESIGNS   5

Designing and Structural construction - House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age-   Details of Stage Constructions in Silappathikaram

அலகு -III   பழங்காலகட்டிடத் தொழில்நுட்பம்

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

UNIT-III   ANCIENT CONSTRUCTION TECHNOLOGY   5

Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses> Indo - Saracenic architecture at Madras during British Period.

அலகு- IV   உற்பத்தித் தொழில்நுட்பம்

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

UNIT-IV   MANUFACTURING TECHNOLOGY   5

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

அலகு - V   வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்

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

UNIT-V AGRICULTURE AND IRRIGATION TECHNOLOGY   5

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

அலகு-VI   அறிவியல்தமிழ்மற்றும்கணித்தமிழ்

அறிவியல்தமிழ் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை

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மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக்கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

UNIT-VI SCIENTIFIC TAMIL & TAMIL COMPUTING 5

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

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு —— மக்களும் பண்பாடும் —— கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2. கணினித் தமிழ் —— முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி —— வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை —— ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - „Sangam City Civiiization 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. சங்ககால நெசவு மற்றும் பானைத்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்

   To learn about the weaving and pottery (ceramic) technologies during the Sangam Age.(K2)

2. சங்ககாலவடிவமைப்புகள் மற்றும் கட்டுமானக்கலையைப் புரிந்து கொள்ளுதல்

   To understand the designs and structural constructions during the Sangam period.(K2)

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3. பண்டைய கால கட்டிடக்கலையின் நுட்பங்கள் மற்றும் கட்டிட வடி வமைப்புகளை ஆராய்தல்.
   To explore the techniques and architectural patterns of ancient Tamil structures.(K2)
4. உற்பத்தி மற்றும் உலோகவியல்தொழில்நுட்பங்களைப் பற்றி அறிதல்.
   To gain knowledge on manufacturing and metallurgical technologies of ancient Tamils.(K3)
5. வேளாண்மை, நீர்ப்பாசனம் மற்றும் கடல்சார்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்.
   To understand agricultural> irrigation> and marine technologies of ancient Tamil society.(K3)
6. அறிவியல்தமிழ் மற்றும் கணித்தமிழின்வளர்ச்சியையும் அதன் கணினி பயன்பாடுகளையும் புரிந்து கொள்ளுதல்.
   To understand the development of Scientific Tamil and its applications in Tamil computing.(K3)

CO- PO, PSO MAPPING

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

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

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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

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

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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

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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

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

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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.

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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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	-	-	-	3
CO2	3	-	-	-	-	-	-	-	2	-	-	-	3
CO3	3	-	-	-	-	-	-	-	2	-	-	-	3
CO4	3	-	-	-	-	-	-	-	3	-	-	-	3
CO5	3	-	-	-	-	-	-	-	2	-	-	-	3
CO6	3	-	-	-	-	-	-	-	3	-	-	-	3

SEMESTER - II

24BSPL101	PHYSICS AND CHEMISTRY	L	T	P	CP	C
SDG NO. 6,11,12,17	LABORATORY	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 student with the determination of the molecular weight of a polymer by viscometry.

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● 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, ParikshitGogoi, 2010.

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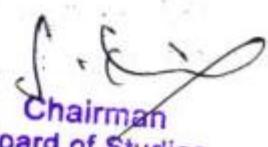
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OUTCOMES:

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
CO1	3	3	-	-	2	-	-	-	-	-	2
CO2	3	3	-	-	2	-	-	-	-	-	2
CO3	3	3	-	-	2	-	-	-	-	-	2
Co4	3	3	-	-	2	-	-	-	-	-	2

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SEMESTER - II

24AIPT201 - SDG NO. 4, 9	PYTHON FOR DATA SCIENCE LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- To learn the core programming basics required for Data Science using Python language.
- To develop simple Python programs with conditionals and loops
- To gain knowledge on Data Science modules NumPy, SciPy and Matplotlib
- To acquire skills in data preparatory and preprocessing steps.

MODULE - I   BASICS OF PYTHON PROGRAMMING   10

Introduction to Python- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.

List of Experiments

1. Implement basic Python programs for reading input from console.
2. Perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, Set

MODULE - II   FILES, EXCEPTIONS,OOPS CONCEPTS   10

User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods - Python Exception Handling. OOPs Concepts - Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance

List of Experiments

1. Create packages and import modules from packages.
2. Write a program to implement OOP concepts like Data hiding and Data Abstraction..

MODULE - III DATA SCIENCE AND DESCRIPTIVE STATISTICS   10

Need for data science-Benefits and uses- Facets of Data - Data science process- Setting the Research goal-Retrieving Data –Cleansing, integrating and transforming data-Exploratory Data analysis- Data measurement scale- Data descriptive statistics (Measures of central tendency, dispersion/variation, measure of location, Shape and symmetry)-Understanding Python's role in data science.

List of Experiments

1. Write a program to handle numerical operations using math and random number functions

2. Create user-defined functions with different types of function arguments.

MODULE - IV INTRODUCTION TO NUMPY   10

NumPy Basics: Arrays and Vectorized Computation - The NumPy ndarray-Creating ndarrays - Data Types for ndarrays - Arithmetic with NumPy Arrays - Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes.

Universal Functions: Fast Element -Wise Array Functions - Mathematical and Statistical Methods-Sorting- Unique and Other Set Logic

List of Experiments

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.

2. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.

MODULE - V DATA MANIPULATION WITH PANDAS   10

Introduction to pandas Data Structures: Series, Data Frame, Essential Functionality: Dropping Entries Indexing, Selection, and Filtering- Function Application and Mapping-Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.

List of Experiments

1. Create Pandas Series and DataFrame from various inputs.

2. Import any CSV file to Pandas DataFrame and perform the following:

a. Visualize the first and last 10 records

b. Get the shape, index and column details

c. Select/Delete the records (rows)/columns based on conditions.

d. Perform ranking and sorting operations.

e. Do required statistical operations on the given columns.

f. Find the count and uniqueness of the given categorical values.

g. Rename single/multiple columns

Module - VI   DATA CLEANING, PREPARATION AND VISUALIZATION   10

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation

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Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

List of Experiments

1. Import any CSV file to Pandas Data Frame and perform the following:
a. Handle missing data by detecting and dropping/ filling missing values.
b. Transform data using apply () and map() method
c. Detect and filter outliers.
d. Perform Vectorized String operations on Pandas Series.
e. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2nd Edition, 2021.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.
4. Davy Cielen,Arno D.B.Meysman and Mohamed Ali,' Introducing Data Science",Manning Publications,2016.

TEXT BOOKS:

REFERENCES:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

WEB REFERENCES:

1. https://www.edx.org/course/python -basics-for-data-science
2. https://www.edx.org/course/analyzing-data-with-python
3. https://www.coursera.org/learn/python -plotting?specialization=data - science- python
4. https://www.programmer-books.com/introducing -data-science-pdf/

OUTCOMES:

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

1. Use Python built-in data types and their methods to solve basic data science problems and demonstrate the need for data-driven approaches. (K3)
2. Develop application with user-defined modules and packages using OOP concept (K3)

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3. Apply knowledge of data acquisition, cleaning, and transformation in practical tasks. (K3)
4. Use NumPy arrays to perform data manipulation tasks such as slicing, indexing, and reshaping.(K3)
5. Apply powerful data manipulations using Pandas. (K3)
6. Implement data preprocessing and visualization using Pandas.(K3)

CO-PO, PSO MAPPING:

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

Dr. P. SREEDEVI
HEAD OF THE DEPARTMENT
COMPUTER SCIENCE AND ENGINEERING

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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   7
Remote work and virtual teams
Authenticity in digital interactions
Engaging content creation
Tools and and techniques for insightful usage
Balancing online and offline interactions
Collaboration for research and innovation

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

Basic concepts of standardization

Purpose of standardization, marking and certification of articles and processes

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

Standards Formulation Process and Challenges:
Objectives, roles and functions of BIS; Bureau of Indian Standards Act, ISO / IEC Directives

WTO Good Practices for Standardization

World of Standards:

Important Indian and International Standards

TOTAL: 30 PERIODS

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES:

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

1. Apply online communication techniques and collaboration skills (K3)
2. Enumerate the principles of digital ethics in online interactions (K2)
3. Understand the importance of Bureau of Indian Standards (BIS). (K2)

CO-PO, PSO Mapping:

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

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.

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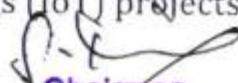
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- To Upskill learners through practical experience with 3D printing and scanning technologies.
- To prepare the learners to correctly align the ideas to SDGs
- To comprehensive knowledge on entrepreneurship and effective idea presentation techniques.
- To evaluate the effectiveness of SDGs and implementation strategy

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

- Awareness Session on Basics of Design Thinking
- Study of Active & Passive Electronic Components
- Study of Basic AC & DC Electrical Circuits
- Study of Microprocessors & Microcontrollers
- Demonstration of Arduino Board, ESP 32 Board ,Raspberry Pi Board &
- PCB design software-Eagle
- Demonstration of PCB design using the software's Orcad, Eagle etc.

MODULE-2   EMBEDDED SYSTEMS, IOT AND ROBOTICS   4

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

MODULE-3   BASICS OF MECHANICAL ENGINEERING   4

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

MODULE 4   ALIGNMENT AND MAPPING OF IDEAS   4

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

MODULE-5   ENTREPRENEURSHIP SKILLS   4

- Startup Awareness
- Entrepreneurship Opportunities
- Mock Presentations
-      Innovation
-      Novelty

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- Feasibility
- Presentation Skills

MODULE-6   SCOUT for SDG IDEATHON   12
Evaluation Stages:

- First Round
- Second Round
- Idea Pitching

TOTAL: 30 PERIODS

REFERENCES:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
4. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
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. JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.

WEB REFERENCES

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

OUTCOMES:

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

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

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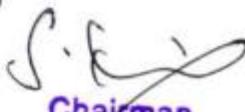
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CO-PO, PSO MAPPING:

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

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SEMESTER - III

24BSMA301 SDG NO. 4	STATISTICS AND LINEAR ALGEBRA	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- The main objective of this course is to provide students with the foundations of statistics and linear algebra mostly used in varied applications in engineering.

MODULE - I BASIC STATISTICS   9

Measures of Central tendency – Dispersion - Moments, Skewness and Kurtosis - Correlation and regression – Rank correlation

MODULE - II TESTS OF SIGNIFICANCE FOR LARGE SAMPLES   9

Sampling distributions - Statistical hypothesis - large sample test for single proportion, difference of proportions, single mean, difference of means.

MODULE - III TESTS OF SIGNIFICANCE FOR SMALL SAMPLES   9

Tests based on t-distribution - single mean, Difference of means -paired t test, F test -Chi-square test for independence of attributes and Goodness of fit.

MODULE - IV 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 - V LINEAR TRANSFORMATION AND DIAGONALIZATION 12

Linear transformation - Null spaces and ranges - Dimension theorem (Statement only) - Matrix of a linear transformation - Eigenvalues and eigenvectors - Diagonalizability- Test for Diagonalization.

MODULE - VI INNER PRODUCT SPACES   12

Inner product- norms - Gram Schmidt orthogonalization process - Adjoint of linear operator - Least square approximation.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Basic Statistics, Agarwal B. L., 5th Edition, New Age International (P) Ltd., 2022.

2. Linear Algebra, Stephen Friedberg, Arnold Insel and Lawrence Spence, 5th Edition, Pearson, 2018..

3. Elementary Linear Algebra, Howard Anton and Chris Rorres, 11th Edition, Wiley Publications, 2014 (Units - IV, V & VI).

4. Linear Algebra and Learning from Data, Gilbert Strang, 1st Edition, Wellesley-Cambridge Press, 2019

REFERENCES:

1. Schaum's Outline on Probability and Statistics, Spiegel M. R., Schiller J. and Srinivasan R. A., 2nd Edition, McGraw-Hill Education, 2000.

2. 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.

3. Linear Algebra - A Geometric Approach, Kumaresan S., Reprint, Prentice Hall of India, New Delhi, 2010.

4. Advanced Engineering Mathematics, Kreyszig E. , 8th Edition, John Wiley, 1999.

WEB REFERENCES:

1. https://nptel.ac.in/courses/111105041/

2. https://www.imsc.res.in/~svis/Algebra/Sunder-LinearAlg-notes.pdf

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/

2. https://www.khanacademy.org/math/statistics-probability/significance-tests-one-sample/more-significance-testing-videos/v/hypothesis-testing-and-p-values

COURSE OUTCOMES

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

1. Compute measures of central tendency, dispersion, moments, skewness, kurtosis, correlation, regression, and rank correlation for given data sets using appropriate statistical methods. (K3)

2. Formulate and analyze the null and alternative hypothesis for large samples using proportions and means of samples. (K4)

3. Analyze the null and alternative hypothesis for small samples using t-tests, F-test, and Chi-square tests. (K4)

4. Determine the bases and dimension of vector spaces and subspaces . (K3)

5. Analyze the matrix of a linear transformation for its rank, nullity and diagonalizability. (K4)

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6. Apply the Gram-Schmidt orthogonalization process to construct an orthonormal basis from a given set of vectors and solve least squares approximation problems. (K3)

CO – PO, PSO MAPPING:

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

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SEMESTER - III

24ECPC301 108104100 SDG NO. 3, 4, 11	SIGNALS AND SYSTEMS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To apply the fundamental concepts and properties of signal & systems.
- To examine the continuous-time signals in the frequency domain using the Fourier transform and the Laplace transform.
- To characterize continuous-time linear time-invariant systems in the time domain and frequency domain.
- To examine the discrete-time signals in the frequency domain using the Fourier transform and Z transform.
- To characterize discrete-time linear time-invariant systems in the time domain and the frequency domain.
- To realize the real-time signals and systems.

MODULE - I CLASSIFICATION OF SIGNALS AND SYSTEMS   8

Standard signals - step, ramp, pulse, impulse, real and complex exponentials and si **Recommended by** tation of continuous and discrete time signals; Classification of signals – Continuous-time (CT) and Discrete Time (DT)

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signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, Classification of systems - CT systems and DT systems, Linear & Non-linear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

MODULE - II FREQUENCY TRANSFORMATION OF CONTINUOUS-TIME SIGNALS 7

Fourier Transform of continuous-time aperiodic signals and periodic signals - properties of continuous-time Fourier transform - Laplace Transforms and properties.

MODULE - III LINEAR TIME INVARIANT CONTINUOUS-TIME SYSTEMS 8

Impulse response - Convolution Integrals, Properties of continuous-time linear time-invariant system, Differential Equation - Causal continuous time linear time-invariant system described by differential equations - Analysis of continuous-time systems using Fourier and Laplace transforms.

MODULE - IV FREQUENCY TRANSFORMATION OF DISCRETE-TIME SIGNALS 7

Baseband signal sampling, Fourier Transform of discrete-time signals – Properties of discrete-time Fourier transform - Z Transform & Properties.

MODULE - V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 8

Impulse response – Convolution Sum Properties of discrete-time LTI system, Difference equations - Causal discrete-time LTI system described by differential equations - Analysis of discrete-time systems using Discrete time Fourier Transform and Z Transform.

MODULE - VI REALIZATION OF SIGNALS AND SYSTEMS 7

Interconnection of CT and DT systems connected in series and parallel. Recursive & Non-Recursive systems. Structural Realization of continuous time and discrete time systems- Direct Form I, Direct form II, Cascade and parallel - Case Study: Acquisition and analysis of real-time signals.

TOTAL : 45 PERIODS

TEXT BOOKS:

1.   Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2015.

2.   Haykin, S. & Van Veen, B. (2007). Signals and systems. John Wiley & Sons.

REFERENCES:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R. E. Zeimer, W. H. Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

WEB RESOURCES:

1. https://www.tutorialspoint.com/signals_and_systems/index.htm
2. https://www.khanacademy.org/science/electrical-engineering/signals-and-systems
3. https://www.geeksforgeeks.org/signals-and-systems/

ONLINE RESOURCES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
2. https://onlinecourses.nptel.ac.in/noc20_ee15/preview
3. https://onlinecourses.nptel.ac.in/noc21_ee28/preview

OUTCOMES

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

1. Examine the continuous and discrete time signals to classify as periodic & aperiodic signals, deterministic & random signals, energy & power signals, and determine the linearity, time-invariance, causality and stability of a system. (K3)
2. Apply the Fourier and Laplace transforms to continuous-time signals and characterize the properties of these transforms in signal analysis. (K3)
3. Analyse the continuous time signals in the time and frequency domain and obtain the response of the system. (K4)
4. Apply the Fourier and Z transforms to discrete-time signals and characterize the properties of these transforms in signal analysis. (K3)
5. Analyse the discrete-time signals in the time and frequency domain and obtain the response of the system. (K4)
6. Realize the systems using direct form I, direct form II, cascade, parallel and analyze the real-time signals to identify the signal behavior using signal processing techniques. (K4)

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Chennai - 600 044.

CO – PO, PSO MAPPING:

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

SEMESTER - III

24COPC301 - SDG NO. 4, 9	DIGITAL DESIGN AND COMPUTER ORGANIZATION	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Understand the principles of number systems, Boolean algebra, and logic simplification techniques.
- Design and analyze combinational and sequential digital circuits.
- Explore the structure and function of a basic computer system from a hardware design perspective.
- Understand instruction set architecture and the functioning of processor components.

MODULE - I   NUMBER SYSTEMS & BOOLEAN ALGEBRA   6

Number Systems and Base Conversions - Signed and Unsigned Numbers – 1's and 2's Complements - Boolean Algebra – Basic Theorems and Properties - Logic Gates – Truth Tables - Simplification using Karnaugh Maps (K-Map)

MODULE - II   COMBINATIONAL LOGIC DESIGN   8

Arithmetic Circuits – Half/Full Adders, Subtractors - Multiplexers, Demultiplexers - Encoders, Decoders - Code Converters – BCD, Excess-3, Gray Code

MODULE - III SEQUENTIAL LOGIC DESIGN   8

Flip-Flops – SR, D, JK, T - Counters – Synchronous and Asynchronous - Shift Registers - Sequential Circuit Analysis and Design

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MODULE - IV BASIC COMPUTER ORGANIZATION 8

Introduction to Computer Architecture - Instruction Formats, Addressing Modes - ALU Design, Register File, Instruction Cycle - Micro-Operations and Control Signals - Hardwired and Microprogrammed Control Units

MODULE - V MEMORY AND I/O ORGANIZATION 7

Memory Classification and Hierarchy - Cache Memory – Mapping Techniques - Virtual Memory, Paging - I/O Techniques – Programmed I/O, Interrupts, DMA

MODULE - VI PIPELINING AND PERFORMANCE ENHANCEMENT 8

Basic Concepts of Pipelining - Data Hazards, Control Hazards, and Solutions - Instruction-Level Parallelism - RISC vs. CISC - Introduction to Multi-core and GPU Architectures

TOTAL : 45 PERIODS

TEXT BOOKS:

1. David Harris & Sarah Harris, Digital Design and Computer Architecture, Morgan Kaufmann, 2nd or 3rd Edition.

REFERENCE BOOKS:

1. M. Morris Mano & Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization and Embedded Systems, McGraw Hill, 6th Edition.
3. William Stallings, Computer Organization and Architecture, Pearson, 10th Edition.

WEB REFERENCE:

1. https://nptel.ac.in/courses/117105135
2. http://nptel.ac.in/courses/108105132
3. https://nptel.ac.in/courses/106102062
4. https://nptel.ac.in/courses/117106086

OUTCOMES

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

1. Apply Boolean algebra and logic simplification techniques to design basic combinational circuits. (K3)
2. Analyze the design of combinational logic systems such as adders, encoders and multiplexers. (K4)

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3. Apply the concepts of flip-flops to design and implement sequential circuits like counters and shift registers. (K3)
4. Analyze the structure of a basic computer organization including ALU, control unit, and registers. (K4)
5. Apply instruction execution cycle, addressing modes, and memory mapping concepts in CPU design. (K3)
6. Analyze the effects of pipelining and memory hierarchy on processor performance. (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24COPC302 - SDG NO. 4, 9	ALGORITHMS AND DATA STRUCTURES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To critically analyze the efficiency of algorithmic, sorting, searching, and hashing techniques.
- To design and apply linear data structures like lists, stacks, and queues in real-world applications.
- To design and implement tree-based data structures and algorithms.
- To apply graph-based algorithms to solve complex problems.
- To implement algorithmic problem-solving paradigms: Greedy, Dynamic Programming, and Backtracking.
- To explore computational complexity and limitations of algorithms through NP-Completeness concepts.

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MODULE - I   INTRODUCTION TO ALGORITHMS   9

Introduction to Algorithms - Asymptotic Notations - Time Complexity -Space Complexity- recursion – analyzing recursive algorithms. Searching Algorithms: Linear Search, Divide and Conquer Methodology -Binary Search,Merge Sort and Quicksort- Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort-hashing – hash functions – collision handling

MODULE - II LINEAR DATA STRUCTURES - STACKS, QUEUES, AND LINKED LISTS   9

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists (Polynomial Representation, Memory Management)– Stack ADT : Operations - Applications (Expression Evaluation, Infix to Postfix Conversion). Queue ADT : Operations - Circular Queue

MODULE - III TREES AND TREE-BASED ALGORITHMS   8

Binary Trees: Traversals (In-order, Pre-order, Post-order) - Binary Search Trees:- Operations - AVL Trees, Red-Black Trees - Heaps: Min-Heap, Max-Heap, Priority Queue

MODULE - IV GRAPHS AND GRAPH ALGORITHMS   7

Graph Representation: Adjacency Matrix, Adjacency List- Graph Traversal: Breadth-First Search (BFS), Depth-First Search (DFS)- Shortest Path Algorithms: Dijkstra's, Bellman-Ford- Minimum Spanning Tree: Kruskal's and Prim's Algorithm

MODULE - V ALGORITHM DESIGN TECHNIQUES   6

Backtracking: n-Queens problem,Branch and Bound: Solving 15-Puzzle problem - Knapsack Problem - Travelling Salesman Problem, Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- Huffman Coding.

MODULE - VI NP COMPLETE AND NP HARD   6

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems

TOTAL : 45 PERIODS

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TEXT BOOKS:

1. Alfred V. Aho, "Data Structures and Algorithms", Bell Laboratories, Murray Hill, New Jersey,2013.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
3. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, —Data Structures & Algorithms in Python, John Wiley & Sons Inc., 2021.
4. Anany Levitin, "Introduction to design and analysis of algorithms",3rd Edition,Pearson Education,2017.

REFERENCES:

1. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
3. "Introduction to Algorithms" by Thomas H. Cormen,•Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein (CLRS)
4. "Data Structures and Algorithm Analysis in C" by Mark Allen Weiss

WEB REFERENCES:

1. https://www.geeksforgeeks.org/c-language-set-1-introduction/
2. https://www.codechef.com/certification/data-structures-and-algorithms/prepare
3. https://www.w3schools.in/data-structures-tutorial/intro/
4. https://www.coursera.org/specializations/data-structures-algorithms
5. https://www.topcoder.com/community/competitive-programming/tutorials

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106102064
2. https://www.w3schools.in/data-structures-tutorial/
3. https://www.tutorialspoint.com/data_structures_algorithms/

OUTCOMES

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

1. Analyze and implement basic algorithms and data structures for solving problems. (K4)
2. Design and implement linear data structures (arrays, linked lists, stacks, queues) Recommended byrelevant applications. (K3)
3. Implement and perform operations on tree-based structures. (K4)

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4. Apply graph traversal and path-finding algorithms to solve problems using graphs (K3)

5. Apply design strategies like Dynamic Programming, Greedy, Backtracking and Branch & Bound to solve optimization problems.(K4)

6. Apply the concepts of algorithmic complexity classes (P, NP, NP-Complete) to classify problems and identify NP-Complete problems through appropriate reductions. (K3)

CO – PO, PSO MAPPING:

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

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:

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

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

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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

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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)

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

CO – PO, PSO MAPPING:

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

SEMESTER - III

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

ARMY WING
PERSONALITY DEVELOPMENT   9

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

PD 5   Public Speaking   3

LEADERSHIP   7

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

DISASTER MANAGEMENT 13

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

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1	Environmental Awareness and Conservation	3

GENERAL AWARENESS 4

GA 1	General Knowledge	4

ARMED FORCES 6

AF 1	Armed Forces, Army, CAPF, Police	6

ADVENTURE 1

AD 1	Introduction to Adventure Activities	1

BORDER & COASTAL AREAS 2

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

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT 9

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

LEADERSHIP 7

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

DISASTER MANAGEMENT 13

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

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AIR FORCE WING

PERSONALITY DEVELOPMENT 9

LEADERSHIP   7

DISASTER MANAGEMENT   13

ENVIRONMENTAL AWARENESS & CONSERVATION   3

GENERAL AWARENESS   4

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GENERAL SERVICE KNOWLEDGE 6

GSK 1	Armed Forces & IAF Capsule	2
GSK 2	Modes of Entry in IAF, Civil Aviation	2
GSK 3	Aircrafts - Types, Capabilities & Role	2

ADVENTURE 1

AD 1	Introduction to Adventure Actitivities	1

BORDER & COASTAL AREAS 2

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

TOTAL : 45 PERIODS

SEMESTER - III

24COPL301	DIGITAL CIRCUITS LABORATORY	L	T	P	CP	C
SDG NO. 3, 4, 11		0	0	4	4	2

OBJECTIVES:

- To implement and verify the basic logic gates and Boolean expressions.
- To design and analyze combinational logic circuits such as adders, multiplexers, and decoders.
- To construct and test sequential circuits like flip-flops, counters, and shift registers.
- To simulate and verify digital circuits using HDL tools like Verilog or VHDL.

LIST OF EXPERIMENTS

S. No   Experiment Title

1. Verification of basic logic gates and realization of Boolean expressions using logic gates
2. Implementation of Boolean functions using universal gates
3. Simplification and implementation of Boolean expressions using Karnaugh Maps (K-Map)
4. Design and implementation of Half Adder and Full Adder using logic gates
5. Design and implementation of 4-bit binary adder/subtractor using ICs
6. Design and implementation of multiplexers and demultiplexers
7. Design and implementation of encoders and decoders
8. Design and implementation of 4-bit magnitude comparator

9. Implementation of flip-flops – SR, D, JK, T using logic gates
10. Design of shift registers (Serial-In Serial-Out, Serial-In Parallel-Out)
11. Design and implementation of asynchronous and synchronous counters
12. Design of sequence detector using Mealy and Moore machines
13. Implementation of digital circuits using Verilog HDL: gates, multiplexers, adders
14. Implementation of flip-flops and counters using Verilog HDL

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

1. Design and realize basic logic gates and Boolean expressions using hardware and simulation tools. (K4)
2. Design and simulate combinational circuits like adders, subtractors, multiplexers, and decoders using digital ICs. (K4)
3. Implement and test sequential circuits such as flip-flops, counters, and shift registers using standard logic ICs. (K5)
4. Design and evaluate synchronous and asynchronous sequential circuits for given specifications. (K5)
5. Develop and simulate logic circuits using HDL tools (e.g., VHDL/Verilog) for combinational and sequential logic. (K6)
6. Evaluate the performance of digital circuits through timing analysis and identify potential hazards or glitches. (K5)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24COPL302 - SDG NO. 4, 9	ALGORITHMS AND DATA STRUCTURES LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To implement fundamental data structures like linked lists, stacks, queues, trees, and graphs
- Implement and Manage Basic Data Structures
- Analyze and Implement Searching and Sorting Algorithms
- Implement and Manipulate Tree-based Data Structures
- Implement Graph Algorithms and Solve Graph Problems
- Solve Optimization Problems Using Dynamic Programming, Greedy Algorithms, and Backtracking

LIST OF PROGRAMS

1. Analyze and implement a recursive algorithm (like factorial or Fibonacci)
2. Implementation of searching and sorting algorithms
3. Implement Merge Sort using recursion. (Divide and Conquer).
4. Implement Array and Linked list implementation of List ADT
5. Implement Array and Linked list implementation of Stack ADT
6. Implement Array and Linked list implementation of Queue ADT
7. Implement Applications of List, Stack and Queue ADTs.
8. Implementation of Binary trees and operations of Binary trees.
9. Implementation of Binary Search Trees.
10. Implementation of AVL Trees
11. Represent graphs using adjacency matrix/list; implement DFS and BFS.
12. Implement Dijkstra's algorithms.
13. Solve N-Queens Problem using backtracking
14. Implement the 0/1 Knapsack Problem using the Greedy technique
15. Simulate Branch and Bound for 15-puzzle

TOTAL: 45 PERIODS

HARDWARE

Standalone desktops 30 Nos

SOFTWARE

C / C++ / Python / Turbo C / Equivalent Software

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OUTCOMES

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

1. Analyze and implement basic algorithms and data structures for solving problems.(K3)
2. Implement linear data structures such as stacks, queues using arrays and linked lists. (K3)
3. Develop and perform operations on Binary Trees, Binary Search Trees, and AVL Trees to demonstrate understanding of hierarchical data structures. (K6)
4. Implement graph algorithms and solve various graph-related problems including traversal, pathfinding, and shortest path(K4)
5. Solve optimization problems using dynamic programming, greedy algorithms, and backtracking techniques(K3)
6. Simulate and solve optimization problems using Greedy (e.g., 0/1 Knapsack) and Branch & Bound techniques (e.g., 15-Puzzle), demonstrating efficient problem-solving strategies. (K6)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24COTP301 - SDG NO. 4	APTITUDE SKILLS - I	L	T	P	CP	C
		0	0	2	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

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

MODULE - I   QUANTITATIVE ABILITY   22

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

MODULE - II   QUANTITATIVE ABILITY REASONING ABILITY   16

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

MODULE - III   VERBAL ABILITY   7

- Subject-Verb Agreement, Tenses, Prepositions - Concepts, Error Spotting, Sentence Correction, Fill in the Blanks

TOTAL: 45 PERIODS

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

LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS – PHASE 2
OBJECTIVES:
- Understand team building and acquire leadership skills.
- Gain Scouting spirit.
- Familiarize with the standards relevant to CCE.

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

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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 ELECTROMAGNETIC COMPATIBILITY (EMC) AND ELECTROMAGNETIC INTERFERENCE 8

Introduction to the concept of Electromagnetic compatibility of electrical and/or electronic equipment, between themselves and with electrical power networks including electromagnetic interference and measurement and calculation methods to assess human exposure to electric, magnetic and electromagnetic fields. Discussion on IS 14700/ IEC 61000 series of Standards.

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]

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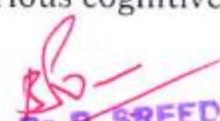
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5. Interpret language nuances in diversified situations and exhibit scouting spirits amidst communities. [K2]

6. Explain the basic principle of BIS Standards relevant to EMC and EMI. [K2]

CO – PO, PSO MAPPING:

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

SEMESTER - III

24COID301 - 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.
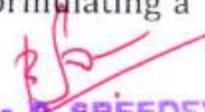
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- To inculcate ethical research practices, foster a commitment to lifelong learning, and promote the development of socially responsible and sustainable innovations aligned with relevant Sustainable Development Goals (SDGs).
- To prepare students to 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.

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TOTAL: 45 PERIODS

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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	2	-	-	-	-	2	-	-	-	2	2

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SEMESTER - IV

24BSMA401 - SDG NO. 4	PROBABILITY THEORY AND RANDOM PROCESSES	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To understand and obtain the knowledge of Random variables.
- To provide understanding of standard discrete and continuous distributions.
- To familiarize the students with the concepts of covariance, correlation and regression.
- To impart the knowledge of classification of random processes, properties of Markov, Poisson processes.
- To understand and gain the knowledge of spectral densities.
- To acquaint the students with the concepts of linear random input and output.

MODULE I   RANDOM VARIABLES   9

Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions.

MODULE II   STANDARD DISTRIBUTIONS   12

Binomial, Poisson, Geometric, Uniform, Exponential and Normal Distributions - Functions of Random variables.

MODULE III   TWO - DIMENSIONAL RANDOM VARIABLES   12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

MODULE - IV   RANDOM PROCESSES   9

Classification – Stationary process – Markov process - Markov chain - Poisson process.

MODULE - V   CORRELATION AND SPECTRAL DENSITIES   9

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

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MODULE - VI   LINEAR SYSTEMS WITH RANDOM INPUTS   9

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Fundamentals of Applied Probability and Random Processes, Ibe O.C., 1st Indian   Reprint, Elsevier, 2007. Module I (Sections 1.3,1.7) Module II Chapter-2, Chapter-3 (Sections 3.1 - 3.5), Chapter-4 (Sections 4.1 -4.8, 4.10 & 4.11), Chapter 6 (sec 6.2); Module III Chapter 5 (Sections 5.1 - 5.7), Chapter 6 (6.8 & 6.10); Module IV Chapter-8 (8.1 - 8.6, 10.5 - 10.5.4, 10.5.5, 10.5.6, 10.6, 10.7); Module V Chapter 10 (Section 10.2, 10.4, 10.5 (10.5.1 - 10.5.6), 10.6, 10.7); Module VI Chapter 9 (Sections 9.1 - 9.3).

2. Probability and Random Processes With Applications to Signal Processing and Communications, Scott Miller & Donald Childers, 2nd edition, Elsevier Science, 2004.

REFERENCES:

1. Probability, Random Variables and Random Signal Principles, Peebles P. Z., 4th Edition, Tata Mc Graw Hill, New Delhi, 2002.

2. Probability and Statistics, Random Processes and Queueing theory, Veerarajan T., 3rd edition, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2018.

3. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.

4. Probability and Random Processes for Scientists and Engineers, Davenport, 1st edition, McGraw-Hill, 1970.

5. Probability, Random Processes and Estimations Theory for Engineers, H. Stark & J.W. Woods, 2nd edition, Prentice Hall, 1994.

6. Introduction to Random Processes, E. Wong, 1st edition, Springer Verlag, 1983.

7. Introduction to Random Processes, W. A. Gardner, 2nd edition, McGraw Hill, 1990.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_ma30/preview
2. https://nptel.ac.in/courses/111102111/
3. https://archive.nptel.ac.in/courses/111/103/111103158/
4. https://archive.nptel.ac.in/courses/111/102/111102014/
5. https://www.ee.iitb.ac.in/~bsraj/courses/ee325/

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ONLINE RESOURCES:

1. https://freevideolectures.com/course/2324/probability-and-random-processes
2. http://www.nptelvideos.com/course.php?id=572
3. https://archive.nptel.ac.in/courses/117/105/117105085

COURSE OUTCOMES:

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

1. Apply the concepts of probability and random variables to solve engineering problems involving uncertainty.(K3)
2. Analyze and interpret the characteristics of standard discrete and continuous probability distributions for practical applications. (K4)
3. Apply the concepts of joint, marginal, and conditional distributions to analyze relationships between random variables, and interpret correlation and regression.(K3)
4. Classify the different types of random processes (stationary, Markov, Poisson) and apply them to real-world systems. (K3)
5. Examine correlation functions and spectral density measures to understand the frequency-domain behaviour of random signals.(K4)
6. Analyse the response of linear systems to random inputs using autocorrelation, cross-correlation, and system transfer functions.(K4)

CO – PO, PSO MAPPING:

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

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SEMESTER - IV

24ECPC402	ANALOG AND DIGITAL COMMUNICATION	L	T	P	CP	C
SDG NO. 4,8,9		3	0	0	3	3

OBJECTIVES:

- To introduce Amplitude Modulation Schemes
- To impart knowledge in Angle modulation methods.
- To impart knowledge in Demodulation techniques
- To introduce the importance of Sampling & Quantization
- To compare the performance of Digital modulation techniques.
- To familiarize the concept of Information theory and Coding techniques

Pre-Requisites: Basic tools for communication, Fourier Series/Transform, and Properties. Autocorrelation, Energy Spectral Density, Parseval's Relation

MODULE - I AMPLITUDE MODULATION   9

Elements of Communication systems – Need for Modulation - Amplitude Modulation- DSBSC, DSBFC, SSB, ISB, VSB - Modulation index, Spectra, Power relations and Bandwidth of AM – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift, VSB Generation – Filter Method. Comparison of different AM techniques.

MODULE - II ANGLE MODULATION   7

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth of FM – PM to FM Conversion – and FM to PM Conversion – FM Generation: Direct and Indirect methods.

MODULE - III ANALOG DEMODULATORS   7

AM Demodulators: Envelope Detector, Coherent Detection of DSB – SC, SSB – SC – Costas Receiver – Frequency Translation - Super Heterodyne Receiver. FM Demodulation – FM to AM conversion, FM Discriminator – Balanced Slope Detector, Foster Seeley Discriminator, Ratio Detector.

MODULE - IV SAMPLING AND QUANTIZATION   6

Introduction to Sampling, Spectrum of Sampled Signal, Aliasing, Nyquist Criterion, Signal Reconstruction from Sampled Signal, Quantization, Uniform Quantizers - Mid rise and Midtread, Quantization noise, Lloyd Max Quantization Algorithm, Non uniform Quantizers.

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Chennai - 600 044.

MODULE - V DIGITAL MODULATION SCHEMES   10

PAM, PTM – Line coding – PCM, DPCM, DM & ADM Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift keying – BPSK, QPSK, 8 PSK, QAM-8 QAM, 16 QAM – Comparison of various digital communication systems, Inter Symbol Interference – Eye pattern.

MODULE - VI INFORMATION THEORY AND SOURCE CODING
TECHNIQUES   6

Measure of information, entropy, Channel capacity and Shannon's theorems; Source Coding Techniques - Shannon Fano coding and Huffman Coding.

TOTAL : 45 PERIODS

REFERENCES:

1. S.Haykin, "Digital Communications", John Wiley, 2005
2. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems", Pearson Education, 2014
3. Simon Haykin, "Communication Systems", Fourth Edition, Wiley, 2014.
4. B. Sklar, "Digital Communication Fundamentals and Applications", Second Edition, Pearson Education, 2009
5. B.P.Lathi, "Modern Digital and Analog Communication Systems", Third Edition, Oxford University Press, 2007 .
6. H P Hsu, "Schaum Outline Series — Analog and Digital Communications", Tata McGraw Hill Company, 2006
7. Proakis, J.G., Salehi, M., "Digital Communications", 5th 2008 Ed., McGraw-Hill International
8. Roden, M.S., "Analog and Digital Communication Systems", 5th 2005 Ed., Discovery Press.
9. Couch II, L.W., "Modern Communication Systems: Principles and Applications", Prentice-Hall 1998
10. Couch II, L.W., "Digital and Analog Communication Systems", 7th 2009 Ed., Pearson
11. Carlson, A.B., Crilly, P.B. and Rutledge, J.C., "Communication Systems: An Introduction to Signals and Noise in Electrical Communication", 4th 2002 Ed., McGraw-Hill

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_ee16/preview
2. https://nptel.ac.in/courses/117102059/
3. https://onlinecourses.nptel.ac.in/noc25_ee68/preview

ONLINE RESOURCES

1. https://freevideolectures.com/course/2590/introduction-to-communication-theory

OUTCOMES

On completion of this course, the student should be able to

1. Analyze the Performance of various Amplitude Modulation Schemes for specific applications.(K4)
2. Estimate the performance metrics of Angular Modulation schemes correlating FM and PM.(K4)
3. Illustrate the concept of Heterodyning in the AM and FM receivers.(K4)
4. Evaluate the conditions for perfect reconstruction of signal in sampling process and minimum quantization error using Lloyd Max Quantization Algorithm.(K4)
5. Interpret the digital transmission using Pulse Modulation and Shift Keying Variants.(K3)
6. Estimate the impact of Source and Channel coding schemes on efficiency of transmission in digital communication.(K4)

CO – PO, PSO MAPPING:

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

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Board of Studies of ___ECE___ dept.

Meeting No. _____ Dated:_____

Dr. G. THAMARAI SELVI
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Dept. of Electronics & Communication Engg.
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Chennai - 600 044.

SEMESTER - IV

24ITPW401	OPERATING SYSTEM WITH LABORATORY	L	T	P	CP	C
- SDG NO. 4 & 9		3	0	2	5	4

OBJECTIVES:

- To understand the basic concepts, functions of Operating Systems, Processes and Threads
- To analyze Scheduling algorithm and understand the concept of Deadlock
- To analyze various memory management schemes
- To Understand I/O systems basics and various file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

MODULE - I   OPERATING SYSTEM OVERVIEW   7

Introduction – Computer System Organization – Computer System Architecture - Operating System Overview- Objectives and Functions - Evolution of Operating System - Computer System Organization Operating System Structure and Operations - System Calls - System Programs - OS Generation and System Boot

MODULE - II   PROCESS MANAGEMENT   8

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication - CPU Scheduling - Scheduling Criteria - Scheduling Algorithms- Multiple - Processor Scheduling   - Threads - Multithreading Models - Threading Issues - Process Synchronization - The Critical - Section Problem - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization - Critical Regions

MODULE - III   DEAD LOCK   7

Monitors - Deadlock – System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock

MODULE - IV   MEMORY MANAGEMENT   8

Main Memory – Background, Swapping, Contiguous Memory Allocation - Paging - Segmentation - Segmentation with Paging - Virtual Memory – Background - Demand Paging - Page Replacement - Allocation of Frames- Thrashing - Allocating Kernel Memory

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MODULE - V   FILE SYSTEMS AND I/O SYSTEMS   8

Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management - Swap Space Management - File-System Interface - File Concept - Access Methods - Directory Structure - Directory Organization - File System Mounting - File Sharing and Protection - File System Implementation- File System Structure - Directory Implementation - Allocation Methods - Free Space Management - I/O Systems – I/O Hardware - Application I/O Interface - Kernel I/O Subsystem.

MODULE - VI   CASE STUDY   7

Linux System - Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management - Input-Output Management - File System - Inter-Process Communication - Mobile OS - iOS and Android.

LIST OF EXPERIMENTS :   15

1. Study UNIX Commands & Utilities.
2. Process Management using System Calls.
3. Implement the various CPU Scheduling Algorithms.
4. Implementation of Semaphore and Multi-threading
5. Implementation of Deadlock avoidance using Banker's Algorithm.
6. Implementation of Deadlock Detection Algorithm.
7. Implementation of First-fit, Best-fit and Worst-fit memory allocation strategies.
8. Implementation of page replacement algorithms.
9. Implementation of disk scheduling algorithms.
10. Implementation of the following File Allocation Strategies
    a) Sequential b) Indexed c) Linked

TOTAL: 60 PERIODS

LAB REQUIREMENTS

1. Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos. with Linux OS

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011

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REFERENCES:
1. Ramez Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. AchyutS.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.

WEB REFERENCES:
1. https://nptel.ac.in/courses/106/106/106106144/.
2. https://www.coursera.org/courses?query=operating%20system
3. https://www.computerhope.com/jargon/o/os.html
4. https://www.os-book.com/OS9/slide-dir/
5. http://web.iitd.ac.in/~minati/MTL458.html

ONLINE RESOURCES:
1. https://onlinecourses.swayam2.ac.in/ntr25_ed41/preview
2. https://www.udacity.com/course/introduction-to-operating-systems--ud923
3. https://freevideolectures.com/course/3670/introduction-tooperating-systems

OUTCOMES:

Upon the completion of the course, the students should be able to
1. Articulate the basic concepts and functions of the operating system. (K3)
2. Apply process management and CPU scheduling techniques to solve problems. (K3)
3. Experiment deadlock concepts and prevention strategies(K4)
4. Examine memory management problems and segmentation. (K4)
5. Interpret the functionality of file systems and I/O systems. (K3)
6. Make use of various administrative tasks in linux environment (K3)

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CO – PO, PSO MAPPING:

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

SEMESTER - IV

24COPC401 - SDG NO. 4, 8	DATABASE SYSTEMS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Understand fundamental concepts of database systems and data models.
- Design and develop relational databases using ER diagrams and normalization techniques.
- Write and optimize SQL queries for database manipulation and retrieval.
- Understand transaction management, concurrency control, and recovery techniques.
- Learn about database architectures, indexing, and emerging database technologies.

MODULE - I   INTRODUCTION TO DATABASES SYSTEMS   6

Database System Applications - Purpose of Database Systems – Comparison with File Systems - View of Data – Data Abstraction – Instances and Schemas - Database Languages – DDL – DML – DCL - Database Users – System Structure- DBMS architecture -Data models: Hierarchical, Network, Relational- Object Oriented.

MODULE - II ER MODEL AND RELATIONAL MODEL   7

Entity Sets - Attributes - Relationships - Mapping Cardinality - Participation Constraints - ER Model – Generalization – Specialization –

Aggregation - ER Diagram Notations – Design Principles- Mapping ER Model to Relational Model Relational algebra: select, project, union, set difference, Cartesian product, join, rename

MODULE - III SQL AND QUERY PROCESSING   10

Basics of SQL: DDL, DML, DCL commands- Constraints: Domain - Key, Referential - SQL Operators : IN, LIKE, BETWEEN, EXISTS - Joins, Subqueries, Nested Queries, Aggregation, Views- Functions, Triggers, Stored Procedures- Query Processing – Query Evaluation-Integration of SQL with procedural programming (PL/SQL basics)

MODULE - IV DATABASE DESIGN AND NORMALIZATION   8

Functional Dependency - Normal Forms – 1NF – 2NF – 3NF – BCNF- Decomposition – Lossless Join – Dependency Preservation- Use Case – Normalization for Sensor Data Storage

MODULE - V TRANSACTION MANAGEMENT AND CONCURRENCY
CONTROL   7

Transactions: ACID properties- Serializability: Conflict & View - Concurrency control: locking protocols, deadlocks- Transaction recovery: log-based recovery, checkpoints

MODULE - VI STORAGE, INDEXING, AND EMERGING TECHNOLOGIES 7

File Organization – Heap – Sequential – Hashed - Indexing Techniques – Single-level Index – Multi-level Index – B+ Tree - Basics of RAID - NoSQL Databases – Need – Advantages Types of NoSQL – Key-Value – Document – Column-family – Graph - Case Study – NoSQL in Messaging – Social Media Platforms

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B.Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education,2016.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan,"An Introduction to Database Systems",Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems ", Fourth Edition, McGraw-Hill Education,2015.
3. G.K Gupta,"Database Management Systems",Tata McGrawHill,2011.

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WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs46/
2. http://www.nptelvideos.in/2012/11/database-management-system.html
3. https://www.classcentral.com/course/swayam-database-management-system-9914
4. http://learnsql.com
5. https://www.w3schools.com/sql/default.asp
6. https://www.khanacademy.org/computing/computer-programming/sql
7. https://www.w3schools.com/sql
8. https://www.geeksforgeeks.org/dbms/
9. https://www.tutorialspoint.com/dbms/index.htm
10. https://www.mongodb.com/docs/manual/

OUTCOMES

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

1. Analyze the fundamental concepts of database systems, architectures, and data models, and apply them to real-world scenarios. (K3)
2. Develop Entity-Relationship (ER) diagrams and translate them into relational schemas. (K3)
3. Construct SQL queries for data definition, manipulation, and transaction control. (K3)
4. Utilize normalization techniques and functional dependency analysis to enhance database design efficiency. (K4)
5. Evaluate and implement transaction management, concurrency control, and recovery strategies. (K4)
6. Evaluate and compare the strengths and limitations of relational databases and NoSQL systems, and select the appropriate database model for modern application requirements. (K3)

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CO – PO, PSO MAPPING:

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

SEMESTER - IV

24HSNC401 - 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 |

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

TOTAL: 45 PERIODS

NAVAL WING
PERSONALITY DEVELOPMENT 9

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

LEADERSHIP 7

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

DISASTER MANAGEMENT 13

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

ENVIRONMENTAL AWARENESS & CONSERVATION 3

| EA 1 Environmental Awareness and Conservation | 3 |
GENERAL AWARENESS 4
| GA 1 | General Knowledge | 4 |

NAVAL ORIENTATION 6

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

ADVENTURE 1

| AD 1 | Introduction to Adventure Activities | 1 |

BORDER & COASTAL AREAS 2

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

TOTAL: 45 PERIODS

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AIR FORCE WING

TOTAL :45 PERIODS

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SEMESTER - IV

24ECPL401 - SDG NO. 4 & 9	COMMUNICATION SYSTEMS LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To visualize the effects of sampling and TDM
- To implement AM & FM modulation and demodulation
- To implement PCM & DM
- To simulate Digital Modulation schemes
- To simulate Error control coding schemes

LIST OF EXPERIMENTS:

1. Signal Sampling and Reconstruction.
2. Time Division Multiplexing.
3. AM Modulator and Demodulator.
4. FM Modulator and Demodulator.
5. Pulse Code Modulation and Demodulation.
6. Delta Modulation and Demodulation.
7. Line coding schemes.
8. Simulation of ASK, FSK and BPSK generation schemes.
9. Simulation of QPSK and QAM generation schemes.
10. Simulation of signal constellations of BPSK, QPSK and QAM.
11. Simulation of ASK, FSK and BPSK detection schemes.
12. Simulation of Linear Block and Cyclic error control coding schemes.
13. Simulation of Convolutional coding scheme.

TOTAL: 45 PERIODS

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 3 STUDENTS PER EXPERIMENT

1. Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes.
2. CROs / DSOs – 15Nos.
3. Function Generators – 15 Nos.
4. MATLAB or equivalent software package for simulation experiments
5. PCs - 15 Nos.

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Sri Sai Ram Institute of Technology
Chennai - 600 044.

OUTCOMES:

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

1. Perform signal sampling and multiplexing schemes for baseband signals and reconstruct the signals.(K3)
2. Construct, test and simulate the Analog and Digital modulation and demodulation circuits.(K3)
3. Generate various line coding schemes using PCM and DM techniques and implement channel coding schemes.(K3)

CO – PO, PSO MAPPING:

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

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SEMESTER - IV

24COPL401 - SDG NO. 4	DATABASE SYSTEMS LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To provide hands-on experience in designing and implementing relational databases.
- To develop skills in writing SQL queries for data manipulation and retrieval.
- To implement concepts like normalization, indexing, transactions, and stored procedures.
- To understand NoSQL databases and basic data modeling.

LIST OF EXPERIMENTS

1. Implement DDL and DML operations (CREATE, INSERT, UPDATE, DELETE)
2. Write SQL queries using WHERE, ORDER BY, BETWEEN, IN, LIKE clauses
3. Implement different types of joins (INNER, OUTER, LEFT, RIGHT, SELF JOIN).
4. Use aggregate functions (COUNT, SUM, AVG, MAX, MIN) with GROUP BY and HAVING clauses.

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5. Design an ER diagram and convert it to a relational schema. Implement the schema in SQL.

6. Apply normalization (up to 3NF) to a given dataset with redundant data

7. Create and manipulate views; demonstrate the use of indexes for query optimization

8. Simulate transactions and demonstrate ACID properties

9. Demonstrate concurrency using lock-based mechanisms (via SQL scripts)

10. Create and execute PL/SQL procedures, functions, and triggers

11. Case study: Design a database schema for a real-world application (e.g., library, hospital, e-commerce)

12. Compare relational and NoSQL models: Implement a small use case in both (e.g., student management)

13. Mini-project: Design and implement a complete database for a real-world application (e.g., Library, e-Shop).

TOOLS REQUIRED

- MySQL / PostgreSQL / SQLite
- MongoDB
- DBMS client tools (MySQL Workbench, pgAdmin)
- Command line / GUI-based query execution environment

TOTAL: 45 PERIODS

OUTCOMES

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

1. Design and implement efficient data manipulation and definition operations to model and manage real-world databases, ensuring data integrity and consistency. (K4)

2. Formulate complex queries involving multiple clauses for comprehensive data extraction, filtering, and aggregation, and optimize query performance. (K4)

3. Create detailed ER models and translate them into normalized relational schemas, then implement the schemas using SQL to ensure data integrity and efficient access.(K4)

4. Evaluate and apply normalization techniques up to 3NF to eliminate redundancy, reduce anomalies, and optimize database design for improved data integrity. (K5)

5. Develop and manage views and indexes for improved query performance, and optimize databases for scalability and efficiency through advanced indexing and query tuning techniques. (K5)

6. implement use cases in both relational and NoSQL models (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CSPT401 - SDG NO. 4 & 9	OBJECT ORIENTED PROGRAMMING LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- To understand Object Oriented Programming concepts and principles of Packages, Inheritance and Interfaces
- To have the understanding of Exceptions and to make use I/O streams
- To develop a Java application with threads and generic classes.
- To design and build simple Graphical User Interfaces
- To build interactive applications using Lambda and Reactive

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SRI SAIRAM INSTITUTE

MODULE - I   INTRODUCTION TO OOP AND JAVA FUNDAMENTALS   8

Object Oriented Programming – Abstraction – Objects and Classes –Encapsulation– Inheritance – Polymorphism– Characteristics of Java – The Java Environment – Java Source File – Compilation – Fundamental Programming Structures in Java – Defining Classes in Java – Constructors Methods -Access Specifiers– Static Members – Comments - Data Types –Variables – Operators - Control Flow - Arrays - Packages – Javadoc Comment

LIST OF EXPERIMENTS

1. Write a program to find the sum of individual digits of a positive integer.
2. Write a program to generate the first n terms of the sequence.
3. Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a program to find both the largest and smallest number in a list of integers.
5. Write a Java program to implement a package for currency, distance and time converter.

MODULE - II   INHERITANCE AND INTERFACES   8

Inheritance – Superclasses– Subclasses –Protected Members – Constructors in SubClasses– The Object Class – Abstract Classes and Methods– FinalMethods and Classes – Interfaces – Defining an Interface – ImplementingInterface - Differences Between Classes and Interfaces - Extending interfaces –Object Cloning - Inner Classes - Strings.

LIST OF EXPERIMENTS

1. Write a Java program that creates a class hierarchy for employees of a company. The base class should be Employee, with subclasses Manager, Developer, and Programmer. Each subclass should have properties such as name, address, salary, and job title. Implement methods for calculating bonuses, generating performance reports, and managing projects.
2. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape. Use interface Concept.
3. Write a Java program to perform the following operations.
a. Find the string index.
b. Compare two strings.
c. Retrieve the single character from sting.
d. Find the substring of the given string.
e. Split the string.

MODULE - III EXCEPTION HANDLING AND I/O 8

Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – BuiltIn Exceptions - Creating Own Exceptions - Stack Trace Elements - Input /Output Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files.

LIST OF EXPERIMENTS

1. Create a Custom Exception for Invalid Age Input in a Voting System.
2. Design a Java interface for ADT Stack. Implement this interface using an array. Provide necessary exception handling in both the implementations.
3. Write a Java Program that opens a file using FileReader and handles FileNotFoundException and IOException.
4. Write a Java program that reads the contents of a text file named input.txt and creates a new file named output.txt that contains the same contents in uppercase letters.
5. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

MODULE - IV MULTI-THREADING AND GENERIC PROGRAMING 7

Differences between Multithreading and Multitasking - Thread Life Cycle - Creating Threads - Synchronizing Threads - Inter-Thread Communication - Daemon Threads - Thread Groups - Java Concurrency Packages - Generic Programming – Generic Classes – Generic Methods – Bounded Types – Restrictions and Limitations.

LIST OF EXPERIMENTS

1. Write a Java Program to calculate the sum of the array using Multi threading.
2. Write a Java program to create a producer-consumer scenario using the wait() and notify() methods for thread synchronization.
3. Write a Java Program to implement to create multiple threads which prints the message alternatively.
4. Write a Java Program to create a generic method that takes a list of any type and returns it as a new list with the elements in reverse order.
5. Write a Java Program using Generic Classes to count the number of occurrences of the element in a list.

MODULE - V GUI PROGRAMMING WITH SWINGS 7

Swing – Jframe, Jlabel, Jbutton, Jpanel – Handling Events – ActionListener – Layouts – Swing Components - JTextField, JCheckBox, JRadioButton, JcomboBox – Menu and Menubar – Dialog Box – Model –View Controller (MVC) – File Handling – Creating applications.

LIST OF EXPERIMENTS

1. Create a simple GUI that changes the background color of a panel based on button clicks using Swing components.
2. Write a Java Program to build a Calculator in Swings
3. Write a Java program to design student registration form using Swing controls.
4. Write a Java Program to display Digital Watch using Swings.
5. Write a Java Program using Swings to develop a simple inventory management system that allows users to add, remove, and update inventory items.

MODULE – VI LAMBDA EXPRESSIONS AND REACTIVE PROGRAMMING   7

Lambda expressions – Library Enhancements to Support Lambdas – No Parameter-Single Parameter - Multiple Parameters – With or Without Return Keyword-Comparator– Filter Collection Data-Streams-Generating Streams-Java Stream Interface Methods – For each Map-Filter-Limit-Sorted.

LIST OF EXPERIMENTS

1. Write a Java Program to sort a list of Strings using Lambda function.
2. Write a Java Program to use map () to double each element in a list using Lambda.
3. Write a Java Program to filter even numbers from an ArrayList using Collections.
4. Write a Java program that concatenates all strings in a list into a single string using lambda expression.
5. Write a Java Program to create a stream that emits a sequence of numbers (e.g., 1 to 5) using a transformation operator.

LAB REQUIREMENTS:

1. Standalone desktops with Systems with either Netbeans or Eclipse / Windows operating system / JDK 1.8, 30 Nos.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "Java - The Complete Reference", 8th Edition, McGrawHill Education, 2011.
2. E.Balagursamy- "Programming with Java", 6th Edition, McGrawHill Education, 2019.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015.

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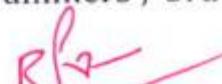
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2. Steven Holzner, "Java 2 Blackbook", Dream Tech Press, 2011.
3. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000.
4. Kathy Sierra, Bert Bates, Trisha Gee, "Head First Java", 3rd Edition, O'Reilly, 2022.
5. Joshua Bloch, "Effective Java", 3rd Edition, Addison Wesley, 2018.

WEB REFERENCES:
1. https://www.w3schools.com/java/java_oop.asp
2. https://www.edureka.co/blog/object-oriented-programming/
3. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html

OUTCOMES
Upon completion of the course, the student will be able to:
1. Implement Object-Oriented Programming concepts in Java to develop solutions using packages and inheritance.(K3)
2. Construct Java applications using exceptions, I/O streams, multithreading, and generic classes.(K3)
3. Examine real-time applications using the concepts of Swing, lambda expressions, streams, and reactive programming.(K4)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24COTP401 - SDG NO. 4	APTITUDE SKILLS - II	L	T	P	CP	C
		0	0	2	2	0

PROBLEM SOLVING TECHNIQUES USING C PROGRAMMING – PHASE 1
OBJECTIVES:
- Build a strong foundation in C programming concepts and problem-solving techniques.
- Develop the ability to write efficient and modular code.
- Enhance understanding of data structures, memory management, and algorithms for optimized solutions.

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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.

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

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

TOTAL: 45 PERIODS

REFERENCES:

1. Let Us C – Yashavant Kanetkar
2. Programming in ANSI C – E. Balagurusamy

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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

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

OBJECTIVES:

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

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

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

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

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

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

MODULE - II   RANGER AND ROVER   10

Scouting for Boys: Scout Craft, Campaigning.

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

Growing Together: Understanding the growth context.

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

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MODULE - III INFORMATION SECURITY & ARTIFICIAL INTELLIGENCE
6

Information security, network security and privacy protection: Introduction to the standards and concepts related to security [CIA (Confidentiality, Integrity, and Availability)] and privacy.

Software - Quality Assurance, Life Cycle & Testing: Introduction to Software life cycle processes and Software Testing (IS 16124 and IS 11291).

Artificial Intelligence: Introduction to the concepts of Artificial Intelligence and related standards:

- Overview of trustworthiness in artificial intelligence.
- Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML).
- AI system life cycle processes.
- Data life cycle framework.

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)

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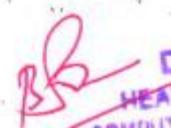
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	1	-	-	-	1	-	2	-	-
CO3	2	2	2	2	-	-	-	-	1	-	2	-	-
CO4	2	2	2	2	1	-	-	-	1	-	2	-	-
CO5	-	-	-	-	-	3	-	-	1	-	2	2	2
CO6	-	-	-	-	-	3	-	-	1	-	2	2	2

SEMESTER - IV

24COID401 - 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.

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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
CO1	3	3	2	-	-	-	-	2	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	-	-	-	2	2
Co3	3	3	2	-	-	-	-	2	-	-	-	2	2

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Imagine the Future and
Make it happen!

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

Sairam
SDG ACTION PROGRAM

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...

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