



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 SCIENCE &
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 SCIENCE & ENGINEERING



VISION

To excel in the field of Computer Science and contribute to the research, shaping Technical professionals to outshine as entrepreneurs and enable the students to serve as a valuable resource for industry and society.



MISSION

Department of Computer Science & Engineering, Sri Sai Ram Engineering College is committed to

- M1** To provide quality education that empowers students to excel in the field of computer science and engineering.
- M2** To foster a culture of innovation among students to help them become successful innovators and Researchers.
- M3** To provide students with incubation facilities that nurtures their journey to become successful entrepreneurs.
- M4** To encourage students to take up SDG-aligned projects and emerge as responsible contributors to society and industry.

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	24ESGE102	Engineering Practices Laboratory	0	0	4	4	2
3	24ESPL101	Programming in C Laboratory	0	0	2	2	1
VALUE ADDITIONS - I							
1	24ESID101	Idea Engineering Lab - I	0	0	2	2	1
2	24ENTP101	Functional Life Skills	1	0	1	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	24BSPH203	Physics for Information Science	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	24ESGE101	Engineering Graphics	1	2	0	3	3
7	24HSNC201	NCC Course Level 1*	2	0	0	2	0
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	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
2	24ENTP201	Digital Dynamics	1	0	1	2	0
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
only for NCC cadets			Total			31	22

Approved by

Academic Council Meeting

No. 8 Dated: 03.09.2024

CHAIRMAN

Board of Studies

Department of Computer Science and Engineering
Sri Sairam Engineering College

[DR. B. LATHA]

AUTONOMOUS CURRICULA AND SYLLABI**SEMESTER III****Regulations 2024**

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	24CSPC301	Database Management Systems	3	0	0	3	3
3	24CSPC302	Data Structures	3	0	0	3	3
4	24ITPC302	Software Engineering	3	0	0	3	3
5	24CSPW301	Digital Design and Computer Organization with Laboratory	3	0	2	5	4
6	24HSMC301	Universal Human Values - II Understanding Harmony	2	1	0	3	3
7	24HSNC301	NCC course Level 2*	3	0	0	3	0
PRACTICALS							
1	24CSPL301	Database Management Systems Laboratory	0	0	4	4	2
2	24CSPL302	Data Structures Laboratory	0	0	4	4	2
VALUE ADDITIONS - III							
1	24CSTP301	Aptitude Skills - I	0	0	2	2	1
2	24CSID301	Innovative Design Lab – I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC301	Joy of Computing using Python (Mandatory - NC)	2	0	0	2	0
*only for NCC cadets			Total			36	26

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA402	Probability and Queueing Theory	3	1	0	4	4
2	24CSPC401	Theoretical Computer Science	3	0	0	3	3
3	24CSPC402	Design and Analysis of Algorithms	3	0	0	3	3
4	24ITPW401	Operating Systems with Laboratory	3	0	2	5	4
5	24ESEC401	Microprocessors and Microcontrollers	3	0	0	3	3
6	24MGOExxx	Open Elective – I	3	0	0	3	3
7	24HSNC401	NCC course Level 3*	3	0	0	3	0
PRACTICALS							
1	24CSPT401	Object Oriented Programming Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - IV							
1	24CSTP401	Aptitude Skills - II	0	0	2	2	0
2	24CSID401	Innovative Design Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
Approved by			Total			33	24

Approved by

*only for NCC cadets

Academic Council Meeting

No. 8 Dated: 03.09.2024

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Logistics Information System

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1** Graduates will have a strong foundation in Mathematics, Science, and Engineering fundamentals to analyze and solve real world problems.
- PEO 2** Graduates will have the capability to succeed in diverse roles in their chosen fields.
- PEO 3** Graduates will actively pursue lifelong learning through higher education, certifications or continuous professional development.
- PEO 4** Graduates will have the ability to apply gained knowledge to uplift the society.

PROGRAM SPECIFIC OUTCOMES (PSOs)

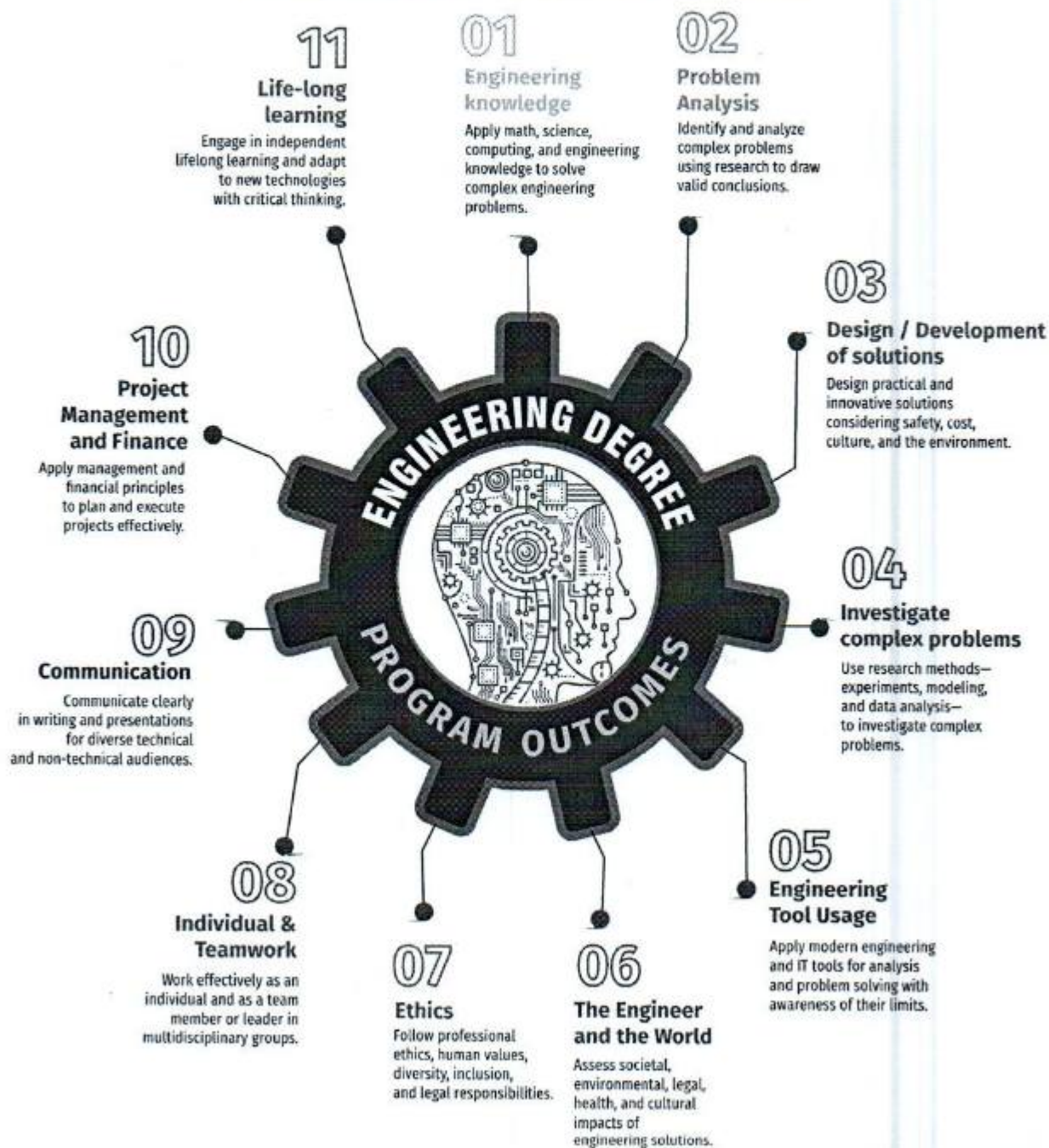
- PSO 1** Graduates will develop advanced networking and system administration skills with a focus on industry-standard tools and technologies.
- PSO 2** Graduates will be skilled in designing, developing, and automating business solutions through internships, hackathons, and coding platforms.

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)	5	12	09
Humanities and Social Sciences (HS)	8	13	13
Professional Electives (EL)	15	26	26
Program Core + Program Lab (PC+PL)	22	47	37
Program theory with Lab (PW) / Program Lab With Theory (PT)	11	25	18
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		226	168

PROGRAMME OUTCOMES(POs)

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



SEMESTER - I

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

OBJECTIVES:

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

MODULE I MATRICES**12**

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

MODULE II FUNCTIONS OF SEVERAL VARIABLES**12**

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

MODULE III VECTOR DIFFERENTIATION**4**

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

MODULE IV VECTOR INTEGRATION**8**

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

MODULE V MULTIPLE INTEGRALS**12**

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

Recommended by
Board of Studies of HK5 dept.

Meeting No. 6 Dated: 31/05/2024

| 1 |

S. Harshad May
Chairman
Board of Studies
Department of Humanities & Sciences

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:

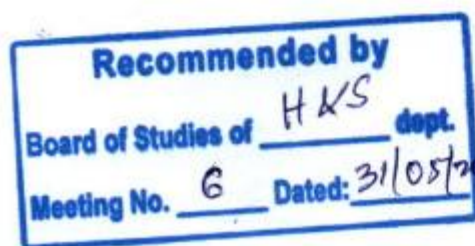
1. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
2. Engineering Mathematics for first year, T. Veerarajan, Tata McGraw-Hill, New Delhi, 2008.
3. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, 9th Edition, Laxmi Publications, Reprint,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



S. Narayanaiah
Chairman
Board of Studies
Department of Humanities & Sciences

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

SEMESTER - I

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

OBJECTIVES:

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

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

S. Narasimha
 Chairman
 Board of Studies
 Department of Humanities & Sciences

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**

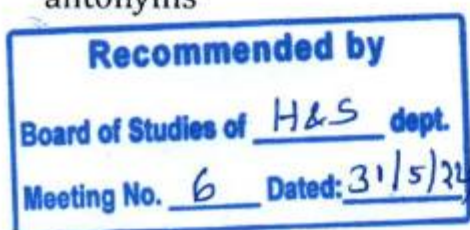
Listening - debates and discussions – practicing multiple tasks – Speaking - self introduction about friends/ places/ hobbies - Reading - Making inference from the reading passage – Predicting the content of the reading passage - Writing – informal letters, e-mails - accuracy, coherence, brevity – Language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



TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

1. <https://www.pearson.com/english/catalogue/business-english/technical-english.html>
2. <https://www.cambridgeenglish.org/learning-english/free-resources/>

OUTCOMES:

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

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

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

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.

Board of Studies of HKS dept.

Meeting No. 6 Dated: 31/10/2024

S. Ramakrishna
Chairman
Board of Studies
Department of Humanities & Sciences

MODULE - III ELECTROMAGNETIC WAVES**8**

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

MODULE - IV BASIC AND APPLIED QUANTUM MECHANICS**7**

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

MODULE - V CRYSTAL PHYSICS**8**

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

MODULE - VI THERMAL PHYSICS**7**

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

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

Recommended by	
Board of Studies of <u>HKS</u> dept.	
Meeting No. <u>6</u>	Dated: <u>31/08/2024</u>

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S. Nandkishore
Chairman
Board of Studies
Department of Humanities & Sciences

REFERENCES:

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

OUTCOMES:

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

1. 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)



S. Karaneshmay
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Board of Studies
Department of Humanities & Sciences

CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

Board of Studies of HVS dept.

Meeting No. 6 Dated: 31/05/2024

MODULE - I POLYMER CHEMISTRY**8**

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

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

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

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

Electrochemistry: Types of Cells (Electrochemical and Electrolytic cell) - Redox reaction - Single and Standard electrode potential, Reference electrodes - SHE, Calomel electrode, Measurement of Single Electrode Potential, Nernst's equation (Derivation & Problems), Electrochemical series and its significance.

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

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY**7**

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

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

MODULE - IV CHEMICAL THERMODYNAMICS**8**

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

MODULE - V FUELS**8**

Fuels: Introduction - Classification of fuels - Coal - Analysis of coal (proximate and ultimate). Carbonization - manufacture of metallurgical coke (Otto

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Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – Octane number and Cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gas (LPG). Biofuels – Gobar gas and Biodiesel.

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

MODULE - VI NANOCHEMISTRY

7

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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

CO-PO, Mapping:

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

SEMESTER - I

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

OBJECTIVES:

- Interpret Mathematical problems using algorithms, flowchart and

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

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

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

MODULE -II BASICS OF C PROGRAMMING 7

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

MODULE - III ARRAYS AND STRINGS 8

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

MODULE - IV FUNCTIONS AND POINTERS 9

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

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MODULE - V STRUCTURES

7

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

MODULE - VI FILE PROCESSING

7

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

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

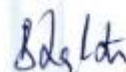
REFERENCES:

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

WEB REFERENCES:

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

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ONLINE RESOURCES:

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

OUTCOMES:

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

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

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SEMESTER - I

24HSTA101	HERITAGE OF TAMILS	L	T	P	CP	C
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OBJECTIVES:

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

அலகு ஐ மொழி மற்றும் இலக்கியம்

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

UNIT I LANGUAGE AND LITERATURE

5

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

அலகு II இடைகால மற்றும் நவீன இலக்கியங்கள்

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

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.

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அலகு IV நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

UNIT IV FOLK AND MARTIAL ARTS

5

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

அலகு V தமிழர்களின் திணைக் கோட்பாடுகள்

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

UNIT V THINAI CONCEPT OF TAMILS

5

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

அலகு VI இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு — இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் — சுயமரியாதை இயக்கம் — இந்தியமருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு — கல்வெட்டுகள், கையெழுத்துப்படிிகள் — தமிழ்ப் புத்தகங்களின் அச்ச 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. பொருளை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in

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6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

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

1. 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)

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CO- PO, PSO MAPPING

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

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

- Residential house wiring using switches, fuse, indicator, lamp, and energy meter.
- Fluorescent lamp wiring.
- Staircase wiring.
- Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
- Measurement of energy using single phase energy meter.
- Measurement of resistance to earth of electrical equipment.

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Board of Studies of Mech dept.
8 Dated: 1.6.24

ELECTRONICS ENGINEERING PRACTICE

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

CIVIL ENGINEERING PRACTICE**Buildings:**

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

Plumbing Works:

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

Carpentry using Power Tools only:

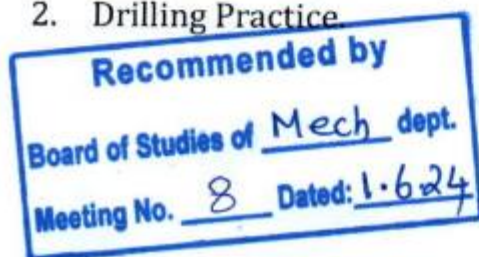
1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE**Welding:**

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

Basic Machining:

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



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Mechanical Engineering

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 |

Recommended by

Board of Studies of Mech dept.
Meeting No. 8 Dated: 1.6.24

Demolition Hammer	2 Nos
Circular Saw	2 Nos
Planner 2 Nos	
Hand Drilling Machine	2 Nos
Jigsaw 2 Nos	

Mechanical

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

OUTCOMES:

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

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

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CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	3	-	-	-	-	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	-	-	-	-	-	2	2
C04	3	-	-	-	-	-	-	-	-	-	-	2	2
C05	2	-	-	-	-	-	-	-	-	-	-	2	2
C06	2	-	-	-	-	-	-	-	-	-	-	2	2

SEMESTER - I

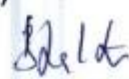
24ESPL101 - SDG NO. 4 & 9	PROGRAMMING IN CLABORATORY	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

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

Recommended by

Board of Studies of CSE dept.
Meeting No. 7 Dated: 30.05.24


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Department of Computer Science and Engineering
Sri Sairam Engineering College

LIST OF EXPERIMENTS

1. 1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is a leap year or not?
(Hint: not every century is a leap. For example 1700, 1800 and 1900 is not a leap year).
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is an Armstrong number or not.
6. Write a program to check whether a given number is odd or even.
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to print half pyramid of *.
10. Write a program to display array elements using two dimensional arrays.
11. Write a program to perform swapping using a function.
12. Write a program to display all prime numbers between two intervals using functions.
13. Write a program to solve towers of Hanoi using recursion.
14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.
19. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
 - (a) Total marks obtained by each student.
 - (b) The highest marks in each subject and the marks of the student who secured it.
 - (c) The student who obtained the highest total marks.
20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 45 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

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

Recommended by
Board of Studies of CSE dept.

Meeting No. 7 Dated: 30.05.24

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Sri Sairam Engineering College

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - 1 United Nations Sustainability and the Sustainable Development Agenda

3

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

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Meeting No. 7 Dated: 20.3.25

| 25 |

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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", Sri Sairam Engineering College.

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Meeting No. 7 Dated: 20/3/2025

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>

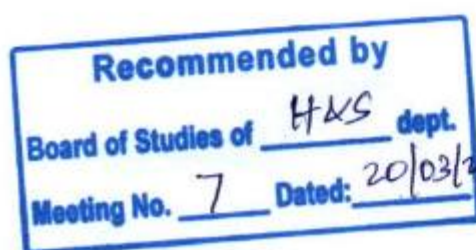
OUTCOMES:

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



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:**

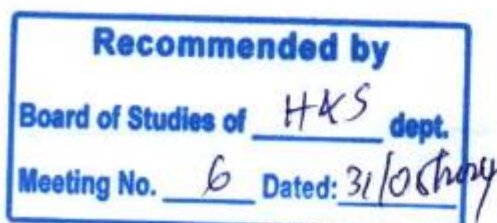
1. Sen, Madhuchanda.2010, An Introduction to Critical Thinking, Delhi, Pearson.
2. Effective Communication Skills Strategies for Success. Edited by Nitin Bhatnager and Mamta Bhatnager. 2023, Pearson
3. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma. Oxford University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



CO-PO, PSO MAPPING:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	-	-	-	-	-	-	-	-	3	-	2	-	-
C02	-	-	-	-	-	-	-	-	3	-	2	-	-
C03	-	-	-	-	-	-	-	3	2	-	2	-	-

Recommended by

Board of Studies of HAS dept.Meeting No. 6 Dated: 31/08/2024

S. Ramakrishnan
 Chairman
 Board of Studies
 Department of Humanities & Sciences

SEMESTER - II

24BSMA201 - SDG NO. 4	DISCRETE STRUCTURES	L	T	P	CP	C
		3	1	0	5	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.

MODUL - 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), 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/~aralal/book/mth202.pdf>
4. https://drive.google.com/file/d/1-PqMUIqDim1-AHQK5_zL34I97zHV3W15/view

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/106106183>
2. <https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20>
3. https://www.youtube.com/watch?v=4LITmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4. <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3og0VxVxCTII45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ90QG>

COURSE OUTCOMES:

Upon completion of the course, the student should 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:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	3	-	-	-	-	-	-	-	-	-	-	2	3
C02	3	-	-	-	-	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	-	-	-	-	-	2	3
C04	3	-	-	-	-	-	-	-	-	-	-	3	2
C05	3	-	-	-	-	-	-	-	-	-	-	2	3
C06	3	-	-	-	-	-	-	-	-	-	-	3	3

SEMESTER - II

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

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Meeting No. 6 Dated: 31/05/2025

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Chairman
Board of Studies
Department of Humanities & Sciences

MODULE - I EFFECTIVE COMMUNICATION**6**

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

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

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

MODULE - III REPORT WRITING**4**

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

MODULE - IV DIVERSE WRITING SKILLS**5**

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

MODULE - V CAREER COMPETENCIES**6**

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

MODULE - VI LEXICAL ENHANCEMENT**4**

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

TOTAL: 30 PERIODS**Recommended by**Board of Studies of HAS dept.Meeting No. 6 Dated: 31/05/2025 | 34 |*S. Harshad May*

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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.

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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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Board of Studies of HKS dept.

Meeting No. 6 Dated: 31/05/2025

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Department of Humanities & Sciences

5. Compose job applications and technical proposals (K3)
6. Demonstrate the ability to express opinions in both oral and written forms of communication (K2)

CO-PO, PSO MAPPING:

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

SEMESTER - II

24BSPH203	PHYSICS FOR INFORMATION SCIENCE	L	T	P	CP	C
SDG NO. 4,7,9		3	0	0	3	3

OBJECTIVES:

- To understand the essential principles of physics of conducting materials, superconducting and optical properties of materials
- To educate the basic principles of semiconductor device and electron transport properties
- To become proficient in magnetic materials
- To acquaint the basics of superconducting and optical materials
- To acquire the basic working of nanoelectronic devices
- To understand the basics of quantum computing

MODULE - I CONDUCTING MATERIALS**8**

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

MODULE - II SEMICONDUCTOR MATERIALS**7**

Direct and indirect band gap semiconductors - Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Extrinsic semiconductors

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- Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Variation of Fermi level with temperature and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices.

MODULE - III MAGNETIC PROPERTIES OF MATERIALS

8

Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Ferromagnetism: Domain Theory - M versus H behaviour - Hard and soft magnetic materials - applications - Magnetic principle in computer data storage - Magnetic hard disc - GMR sensor.

MODULE-IV SUPERCONDUCTING & OPTICAL PROPERTIES OF MATERIALS

7

Superconductivity - Type-I and Type-II superconductors - Properties and applications - Classification of optical materials - Absorption and emission of light in metals, semiconductors and insulators - Carrier generation and recombination processes - Photo current in a P-N diode - Solar cell - LED - Organic LED - Optical data storage techniques and devices.

MODULE - V NANO DEVICES

8

Introduction - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser - Carbon nanotubes: Properties and applications.

MODULE - VI QUANTUM COMPUTING

7

Quantum system for information processing - quantum states - classical bits - quantum bits or qubits - multiple qubits - Bloch sphere - Superposition - Entanglement - quantum gates - CNOT gate - Types of Quantum Computer: Quantum Annealer- Analog Quantum- Universal Quantum.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.
2. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw- Hill Education, 2017.
3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2018.

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4. S.O.Pillai, "Solid State Physics, New Academic Science", 2017.
5. D.K.Bhattacharya & Poonam Tandon., "Physics for Information Science and Electronics Engineering", Oxford Higher Education", 2017.

REFERENCES:

1. Garcia, N. & Damask, A., "Physics for Computer Science Students", Springer-Verlag, 2012.
2. Hanson, G.W., "Fundamentals of Nanoelectronics", Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S., "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

OUTCOMES:

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

1. Explore the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K3)
2. Analyze the band structures and carrier concentrations of semiconductors, study their variations with temperature, and examine carrier transport mechanisms (K4)
3. Have an insight into the different types of magnetic materials and magnetic data storage device (K3)
4. Analyze the properties of superconductors and optical interactions in materials and explain the working of optoelectronic and optical storage devices (K4)
5. Examine quantum confinement and quantum structures, analyze the working principles of quantum devices, and explore the applications of carbon nanotubes (K4)
6. Apply the basic concepts of quantum computing to demonstrate the operation of quantum gates and the formation of entangled states (K3)

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CO-PO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

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.

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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

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biomass, biofuels, Nuclear energy - fission and fusion, Nuclear fuels, Nuclear reactor – principles and types. Need for energy efficiency, Energy conservation and sustainability - action strategies for sustainable energy management from a future perspective.

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY

7

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

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Chemistry for Environmental Engineering, Clair N. Sawyer, Perry L. McCarty, Gene F. Parkin, 4th Edition, McGraw-Hill.

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OUTCOMES:

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

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

CO-PO MAPPING:

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

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SEMESTER - II

24HSTA201	TAMILS AND TECHNOLOGY	L	T	P	CP	C
SDG NO. 4		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 கட்டுமானங்கள்/சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும்/நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்.

UNIT-II SANGAM AGE DESIGNS

5

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

அலகு -III பழங்காலகட்டிடத் தொழில்நுட்பம்

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

UNIT-III ANCIENT CONSTRUCTION TECHNOLOGY

5

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

அலகு- IV உற்பத்தித் தொழில்நுட்பம்

கப்பல் கட்டும் கலை -உலோகவியல் -இரும்புத் 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.

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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 - சோழர்காலக்குழுமித்தூம்பின் 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

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

UNIT-VI SCIENTIFIC TAMIL & TAMIL COMPUTING

5

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

TOTAL: 30 PERIODS**TEXT-CUM-REFERENCE BOOKS**

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

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9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

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

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

SEMESTER - II

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

ARMY WING**NCC GENERAL**

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

NATIONAL INTEGRATION AND AWARENESS

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

PERSONALITY DEVELOPMENT

		7
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP

		5
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

		8
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

Recommended by	
Board of Studies of <u>H&S</u> dept.	
Meeting No. <u>7</u>	Dated: <u>20.3.25</u>

S. Lakshmi
 Chairman
 Board of Studies
 Department of Humanities & Sciences

NAVAL WING**NCC GENERAL**

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

NATIONAL INTEGRATION AND AWARENESS

NI 1	National Integration: Importance & Necessity	4
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

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	7
PD 2	Communication Skills	2
PD 3	Group Discussion: Stress & Emotions	3
		2

LEADERSHIP

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	5
		3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	8
		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**

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

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

Recommended byBoard of Studies of AI&DS dept.Meeting No. 6 Dated: 30.5.2024*S. Sankar*
CHAIRMAN
Board of Studies
 Artificial Intelligence and Data Science

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

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Board of Studies of AIDS dept.Meeting No. 6 Dated: 30.5.2024

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: 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**Recommended by**Board of Studies of AIDS dept.Meeting No. 6 Dated: 30.05.2024

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G. Somnath
CHAIRMAN
 Board of Studies
 Artificial Intelligence and Data Science

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.

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 an application with user-defined modules and packages using OOP concept (K3)
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)

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CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	3	2	-	-	-	-	-	-	-	-	-	3	2
C02	3	3	3	-	-	-	-	-	-	-	-	-	-
C03	2	2	-	-	-	-	-	-	-	-	2	2	2
C04	3	2	-	-	3	-	-	-	-	-	-	2	2
C05	3	2	-	2	3	-	-	-	-	-	-	-	-
C06	3	3	2	2	3	-	-	-	-	-	2	-	-

SEMESTER - II

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

OBJECTIVES:

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

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

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

4

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

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MODULE-2 EMBEDDED SYSTEMS, IOT AND ROBOTICS 4

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

MODULE-3 BASICS OF MECHANICAL ENGINEERING 4

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

MODULE 4 ALIGNMENT AND MAPPING OF IDEAS 4

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

MODULE-5 ENTREPRENEURSHIP SKILLS 4

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

MODULE-6 SCOUT for SDG IDEATHON 12**Evaluation Stages:**

- First Round
- Second Round
- Idea Pitching

TOTAL: 30 PERIODS**REFERENCES:**

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

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6. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2017.
7. John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.

WEB REFERENCES

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

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Meeting No. 7 Dated: 20/3/25

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Board of Studies
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MODULE - I DIGITAL CULTURE AND SOCIETY**6**

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

MODULE - II DIGITAL LITERACY AND ACCESS TO TECHNOLOGY**5**

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

MODULE - III DIGITAL ETHICS**3**

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

MODULE - IV CYBER SECURITY**3**

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

MODULE - V DIGITAL NETWORKING**7**

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

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

Basic concepts of standardization

Purpose of standardization, marking and certification of articles and processes

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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	-	-

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Meeting No. 7 Dated: 20/8/25

SEMESTER - III

24BSMA301 - SDG NO. 4	STATISTICS AND LINEAR ALGEBRA	L	T	P	CP	C
		3	1	0	5	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 : 60 PERIODS

TEXT BOOKS:

- Basic Statistics, Agarwal B. L., 5th Edition, New Age International (P) Ltd.,

2024 Recommended by
Board of Studies of H&S dept.
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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/~svs/Algebra/Sunder-LinearAlg-notes.pdf>

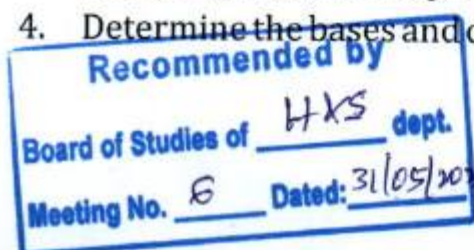
ONLINE RESOURCES:

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

SEMESTER - III

24CSPC301 106104135 SDG NO. 4	DATABASE MANAGEMENT SYSTEMS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing-concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

MODULE -I CONCEPTUAL DATA MODELLING

6

Database environment – Purpose of Database System – Views of data – Data Models – Database System Architecture – Database design – Entity-Relationship model – Enhanced-ER model.

Recommended by

Board of Studies of CSE dept.
Meeting No. 8 Dated: 09.04.25

MODULE - II DATABASE DESIGN**8**

ER and EER-to-Relational Mapping – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multivalued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

MODULE - III RELATIONAL DATABASES**8**

Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL.

MODULE - IV TRANSACTIONS**8**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

MODULE - V IMPLEMENTATION TECHNIQUES**7**

File Organization – Organization of Records in Files – Indexing and Hashing – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT operations – Query optimization.

MODULE - VI ADVANCED TOPICS**8**

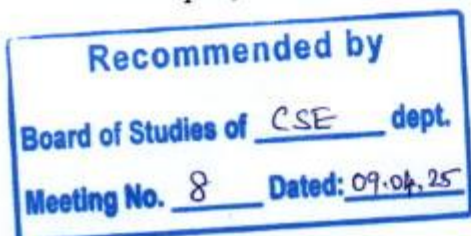
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2011.

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 College Publications, 2015.
3. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011.



OUTCOMES

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

1. Apply different data models and database architectures to design efficient database systems. (K3)
2. Build relational databases by applying normalization techniques to ensure data integrity and reduce redundancy. (K3)
3. Construct SQL queries to perform data definition, manipulation, and retrieval operations on relational databases. (K3)
4. Analyze transaction schedules and concurrency control mechanisms to assess their impact on database correctness and performance. (K4)
5. Identify file organization methods, hashing techniques, and query processing strategies to optimize database access. (K3)
6. Distinguish various database models, comparing their characteristics and applicability in different scenarios. (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24CSPC302 106106130 SDG NO. 4	DATA STRUCTURES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the concepts of List ADT's
- To learn Linear Data Structures – Stacks, and Queues
- To apply the Concept of Tree data Structures
- To learn and apply Dynamic Data Structures - Graph
- To understand and Analyze Sorting, Searching and Hashing Algorithms

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MODULE - I LINEAR DATA STRUCTURES - I 9

Linked List: Introduction - Abstract Data Types (ADT) - Basic concept of Data Structures - Performance measures for Data Structures - List ADT - Array-Based Implementation - Linked List Implementation -- Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists - Applications of Lists -Polynomial Manipulation - All Operations (Insertion, Deletion, Merge, Traversal).

MODULE - II LINEAR DATA STRUCTURES - II 9

Stacks and Queues: Stack ADT - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression - Queue ADT - Implementations: Array and Linked list - Double ended queue(DeQUEUE) - Circular Queue - Applications of queues.

MODULE - III NON LINEAR DATA STRUCTURES - I 8

Trees : Tree ADT - Tree Traversals - Binary Tree ADT - Expression Trees -Applications of Trees - Binary Search Tree ADT - AVL Trees - B-Tree - B+ Tree - Priority Queue (Heaps) - Binary Heap - Leftist Heap - Applications of Heap.

MODULE - IV NON LINEAR DATA STRUCTURES - II 9

Graphs : Definition - Representation of Graph - Types of Graph - Breadth First Traversal - Depth First Traversal - Topological Sort - Dijkstra's algorithm - Floyd's Algorithm - Minimum spanning tree - Prim's and Kruskal's algorithms - Applications of Graphs.

MODULE - V SEARCHING, SORTING 5

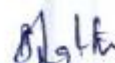
Searching: Definition - Linear Search - Binary Search - Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort - Radix Sort - Bucket Sort - Merge Sort - Quick Sort - Counting Sort - Amortized Sorting.

MODULE - VI HASHING TECHNIQUES 5

Hashing - Hash Table - Hash functions - Properties of good hash function - Division Method, Multiplication Method, Mid-Square Method, Folding Method - Universal hashing - Collision resolution and overflow handling techniques - Open Hashing (Separate Chaining) - Open Addressing / Closed Hashing - Linear Probing, Quadratic Probing, Double Hashing, Rehashing - Extendible Hashing.

TOTAL : 45 PERIODS**Recommended by**Board of Studies of CSE dept.Meeting No. 8 Dated: 09.04.25

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TEXT BOOKS:

1. Alfred V. Aho, "Data Structures and Algorithms", Bell Laboratories, Murray Hill, New Jersey, 2013.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011.

REFERENCES:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
5. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

WEB REFERENCES:

1. <https://www.programiz.com/dsa>
2. <http://masterraghu.com/subjects/Datastructures/ebooks/remathareja.pdf>

OUTCOMES

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

1. Implement programs using arrays and linked lists for various applications (K3).
2. Build programs using stacks and queues (K3).
3. Use operations on both unbalanced and balanced trees to devise solutions for various problems (K3).
4. Solve problems using graph (K3)
5. Apply sorting and searching in algorithmic problem-solving and competitive programming. (K3)
6. Compare hash functions and collision methods to obtain the best approach for efficient data storage and retrieval. (K4).

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CO – PO, PSO MAPPING:

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

SEMESTER - III

24ITPC302 106105182 SDG NO. 4 & 9	SOFTWARE ENGINEERING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To address the real time complex engineering problems using innovative approaches with strong core computing skills
- To apply core-analytical knowledge and appropriate techniques and provide solutions to real time challenges of national and global society
- Apply ethical knowledge for professional excellence & leadership for the betterment of the society
- Use software design principles and tools to create modular, maintainable and scalable software architectures
- Develop life-long learning skills needed for better employment and entrepreneurship

MODULE -I SOFTWARE PROCESS AND AGILE DEVELOPMENT 7

Introduction to Software Engineering - Software Process Model - Agile Model- Waterfall Model- V-Model- Incremental Model- RAD Model- Iterative Model- Spiral Model- Prototype Model- Perspective and Specialized Process Models – Introduction to Agility - Agile process - Extreme Programming -XPProcess

MODULE -II REQUIREMENTS ANALYSIS AND SPECIFICATION 8

Software Requirements: Functional and Non-Functional -User requirements - System requirements - Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and

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analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, PetriNets-DataDictionary

MODULE - III SOFTWARE DESIGN

8

Design process - Design Concepts - Design Model - Design Heuristic - Architectural Design - Architectural styles - Architectural Design - Architectural Mapping using Data Flow - User Interface Design: Interface analysis, Interface Design - Component level Design: Designing Class based components, traditional Components

MODULE - IV TESTING AND MAINTENANCE

8

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing-Regression Testing - Unit Testing - Integration Testing - Validation Testing -System Testing And Debugging -Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering

MODULE - V PROJECT MANAGEMENT

7

Software Project Management: Estimation - LOC, FP Based Estimation, Make/Buy Decision, Uncertainties in Effort Estimation, Building Effort Estimation Models, A Bottom-Up Estimation Approach, COCOMO I & II Model - Project Scheduling - Scheduling, Earned Value Analysis Planning - Project Plan, Planning Process, RFP

MODULE - VI RISK MANAGEMENT

7

Risk Management - Identification, Projection - Risk Management-Risk Identification - RMMM Plan (Risk Mitigation, Monitoring, and Management Plan) - CASE TOOLS: CASE Tools, Scope, Benefits of CASE Tool, support in Software Life Cycle, Architecture of CASE Environment, Types of CASE Tools

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Software Engineering A Practitioner's Approach, Roger S Pressman, 6th edition. McGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.
3. Gene Kim, Jez Humble, Patrick Debois, and John Willis, The DevOps Handbook- How to Create World-Class Agility, Reliability, & Security in Technology Organizations, IT Revolution Press, 2nd Edition, 2016

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REFERENCES:

1. Rajib Mall, —Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited, 2009
2. Pankaj Jalote, —Software Engineering, A Precise Approach, Wiley India, 2010.
3. Kelkar S.A., —Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, —Software Engineering, Tata McGraw-Hill Publishing Company Limited, 2007

ONLINE RESOURCES:

1. http://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf
2. <https://freevideolectures.com/course/2318/software-engineering>
3. <https://courses.cs.washington.edu/courses/cse403/01au/lectures/>
4. <https://www.ece.rutgers.edu/~marsic/books/SE/instructor/slides/>
5. https://swayam.gov.in/nd1_noc19_cs69/preview
6. <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs69>
7. <https://nptel.ac.in/courses/106/105/106105182/>

OUTCOMES

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

1. Apply Agile Practices and Software Process Models (K3)
2. Identify the various Requirement Analysis and Documentation Techniques (K3)
3. Apply Software Design Principles and Models (K3)
4. Analyze Software Testing Strategies and Debugging Techniques (K4)
5. Make use of the Project Management Techniques for Effort Estimation and Scheduling (K3)
6. Examine the ways of mitigating Risks in Software Development (K4)

CO – PO, PSO MAPPING:

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

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SEMESTER - III

24CSPW301 117105078 SDG NO. 4	DIGITAL DESIGN AND COMPUTER ORGANIZATION WITH LABORATORY	L	T	P	CP	C
		3	0	2	5	4

OBJECTIVES:

- To acquire the knowledge in digital fundamentals and its simplification methods.
- To familiarize the design of various combinational digital circuits using logic gates.
- To realize various sequential circuits using flip flops.
- To understand the basic structure, operations along with implementation of fixed point and floating-point arithmetic operations.
- To study the design of data path unit and control unit for processors and introduce the parallel processing techniques.
- To understand the concept of various memories and interfacing.

MODULE - I BOOLEAN ALGEBRA AND LOGIC GATES

8

Digital Systems – Number-base conversions – Complements of Numbers – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Digital Logic Gates – Gate-Level Minimization – The Map Method – Four-Variable K-Map - NAND and NOR Implementations.

MODULE - II COMBINATIONAL LOGIC

7

Combinational Circuits – Analysis and Design Procedures – Binary Adder Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers.

MODULE - III SYNCHRONOUS SEQUENTIAL LOGIC

8

Sequential Circuits – Storage Elements: Latches, Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters

MODULE - IV BASIC STRUCTURE AND ARITHMETIC OPERATIONS

7

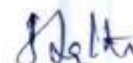
Functional Units – Basic Operational Concepts – Performance- MIPS Addressing-Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations

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MODULE - V PROCESSOR, CONTROL UNIT AND PARALLELISM 8

Building a Datapath- Pipelining-Pipelined datapath and control – Handling Data Hazards & Control Hazards-Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading- Multi-core processors-Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

MODULE - VI MEMORY & I/O SYSTEMS 7

Memory Hierarchy - memory technologies – cache memory – Measuring and Improving Cache Performance – Virtual memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB

List of Experiments: 15

1. Implementation of Boolean expression using logic gates.
2. Design of Adders
3. Design of Subtractors.
4. Design of Multiplexers & Demultiplexers.
5. Design of Encoders and Decoders.
6. Implementation of a boolean function using a multiplexer.
7. Verification of truth-tables of different types of flip-flops
8. Design and implementation of shift registers
9. Design and implementation of counters

TOTAL: 60 PERIODS**LAB REQUIREMENTS:****HARDWARE:**

DIGITAL TRAINER KITS

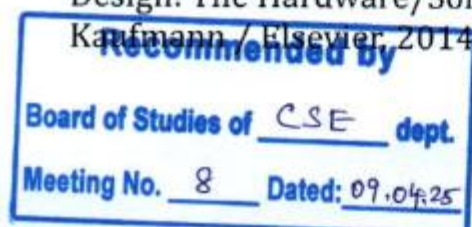
DIGITAL IC's required for the experiments in sufficient numbers

SOFTWARE:

HDL, Verilog simulator

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.



3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
4. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann, Elsevier Publishers, Fifth Edition, 2012.

OUTCOMES

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

1. Make use of Boolean algebra and number systems to simplify Boolean expressions through Karnaugh Maps (K-Map). (K3)
2. Construct various combinational logic circuits based on given functional requirements. (K3)
3. Analyze the operation and behavior of synchronous sequential logic circuits under different input conditions. (K4)
4. Implement arithmetic operations and floating-point computations using the basic structural units and operational concepts of a computer system. (K3)
5. Demonstrate the roles of hardware components and memory units in a computer system. (K3)
6. Utilize knowledge of computer hardware and memory organization to relate components to their specific functions. (K3)

CO – PO, PSO MAPPING:

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

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SEMESTER - III

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

OBJECTIVES:

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

SYLLABUS:

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

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

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

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

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

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

12. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
13. Understanding the meaning of Trust; Difference between intention and competence
14. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
15. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

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

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

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

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

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

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

MODULE - VI UNIVERSAL HUMAN ORDER (4+3)

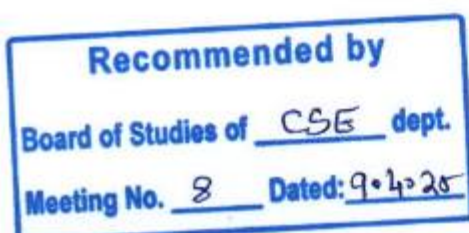
25. Programs to ensure Sanyam and Health
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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



REFERENCES:

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

OUTCOMES

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

1. Express the harmony of relationship among human being, family, society, nature and existence with right understanding and right feeling. (K2)
2. Develop the responsibility of handling problems by finding holistic and sustainable solutions based on the natural acceptance for maintaining mutual human relationships. (K2)
3. Develop a holistic perspective of life based on self-exploration about self, family, society and nature/existence. (K2)
4. Elucidate a critical ability for dedicative commitment towards human values, relationships and society. (K2)
5. Implement the process of verification and validation of learning in daily life. (K2)
6. Develop self reflection, commitment and courage to act in life challenging situations. (K2)

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CO – PO, PSO MAPPING:

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

SEMESTER - III

24HSNC301 - 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**

GA 1 General Knowledge

4

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ARMED FORCES 6

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

AD 1	Introduction to Adventure Activities	1
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BORDER & COASTAL AREAS

BCA 1	History, Geography & Topography of Border/Coastal areas	2
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TOTAL: 45 PERIODS**NAVAL WING****PERSONALITY DEVELOPMENT**

PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	9
PD 5	Public Speaking	3

LEADERSHIP 7

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

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	13
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	3
DM 3	Fire Service & Fire Fighting	9

ENVIRONMENTAL AWARENESS & CONSERVATION

EA 1	Environmental Awareness and Conservation	3
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GENERAL AWARENESS

GA 1	General Knowledge	4
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NAVAL ORIENTATION 6

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

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ADVENTURE 1

AD 1	Introduction to Adventure Activities	1
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BORDER & COASTAL AREAS

BCA 1	History, Geography & Topography of Border/Coastal areas	2
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TOTAL: 45 PERIODS**AIR FORCE WING****PERSONALITY DEVELOPMENT 9**

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

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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DISASTER MANAGEMENT**13**

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

ENVIRONMENTAL AWARENESS & CONSERVATION**3**

EA 1	Environmental Awareness and Conservation	3
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GENERAL AWARENESS**4**

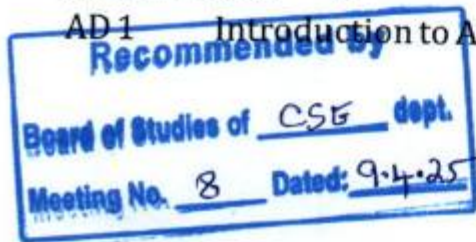
GA 1	General Knowledge	4
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GENERAL SERVICE KNOWLEDGE**6**

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 Activities	1
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BORDER & COASTAL AREAS

2

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

TOTAL :45 PERIODS**SEMESTER - III**

24CSPL301 - SDG NO. 4	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To learn the use of Data Definition, Data Manipulation Commands, Nested and Join queries.
- To learn PL/SQL Programming
- To understand Functions, Procedures and Procedural extensions of databases.
- To be familiar with the use of a Front End Tool
- To understand the design and implementation of typical Database applications.

LIST OF EXPERIMENTS:

1. Create an Employee Database management system and perform Data Manipulation commands.
2. Create a Student Database management system and perform Transactional Control Statements on the database.
3. Use Student Database and perform Simple queries, nested queries and subqueries to display relevant information.
4. Use Employee Database and perform Joins using relational databases.
5. Create a view for the student id, first name, last name and phone number using the student database.
6. Write a PL/SQL program to find the sum & average marks of all the students using procedures.
7. Write a function and pass a department number to it. If the DEPT table does not contain that department number, return a FALSE value, otherwise return a TRUE value. Print the appropriate message in the calling program based on the result.
8. Write a PL/SQL function to display the details of the employee when Employee number is given as input. Handle Exceptions.
9. Create the following tables with given attributes having appropriate data type and specify the necessary primary and foreign key constraints:
Customer (Custid, Custname, phone number, pan, DOB)

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HomeLoan (HLoanid, Amount, Custid)

VehicleLoan (VLoanid, Amount, Custid)

- Create a view with customerid, Customer name and total loan amount (HomeLoan and VehicleLoan)
 - Write a trigger which displays the Home Loan details whenever the values are inserted in the respective table.
10. Database Design using ER Modeling, Normalization Implementation for any application.
 11. Develop an application for Employee payroll processing System to add, delete, update employee particulars and generate payslip with the employee table created.

TOTAL : 45 PERIODS

LAB REQUIREMENTS:

Front end: VB/VC ++/JAVA or Equivalent

Back end: Oracle 11 / SQL / MySQL/Postgres / DB2 or Equivalent
Oracle Server

OUTCOMES

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

1. Apply SQL commands to create relational databases, perform data manipulation and implement transaction control for real-world scenarios.(K3)
2. Analyze and implement advanced SQL operations such as joins, subqueries, views, triggers and PL/SQL programming to retrieve, manipulate and maintain data efficiently.(K4)
3. Evaluate database design principles through ER modeling, normalization, exception handling and develop applications to solve real-world problems.(K5)

CO - PO, PSO MAPPING:

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

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SEMESTER - III

24CSPL302 - SDG NO. 4	DATA STRUCTURES LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To design and Implement the operations in linked list data structure
- To Implement the stack and queue functionality for suitable applications
- To solve problems using tree and graph structures
- To Understand and performing the searching operations
- To Analyze various Internal and External sorting techniques

LIST OF EXPERIMENTS:

1. Create a linked list with nodes having information about a student and perform I. Insert a new node at specified position. II. Delete of a node with the roll number of student specified. III. Reversal of that linked list.
2. Implement a Student Record System using a Linked List, supporting Insertion, Deletion, and Search operations.
3. Create a doubly linked list with nodes having information about an employee and perform Insertion at front of doubly linked list and perform deletion at end of that doubly linked list.
4. Create a circular linked list having information about a college and perform Insertion at front perform Deletion at end.
5. Create a stack and perform Pop, Push, and Traverse operations on the stack using array.
6. Design and implement a stack using linked list, and demonstrate Insertion (Push), Deletion (Pop), and Display (Traversal) operations with proper memory management.
7. Implement a Queue ADT using a linked list and Support Enqueue (Insertion), Dequeue (Deletion), and Traverse (Display) operations. Ensure proper memory management. Handle underflow and overflow conditions effectively.
8. Design a Queue ADT using an array and Implement Enqueue, Dequeue, and Traverse operations. Handle overflow and underflow conditions effectively. Maintain efficient front and rear pointers for optimal performance.
9. Design a Stack-based Infix to Postfix Converter in C. Implement operator precedence, associativity, and parenthesis handling. Convert valid infix expressions into postfix notation. Ensure proper input validation and error handling.

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10. Develop an Expression Evaluator using a Stack, handling Postfix Expression Conversion and Evaluation.
11. Write a program to implement Quick Sort. Discuss how the choice of pivot affects the performance of the algorithm.
12. Create a program for Selection Sort. Implement it recursively and explain how the merging process works.
13. Implement Insertion Sort and compare its efficiency with Bubble Sort for small-sized arrays.
14. Implement the Insertion Sort algorithm and analyze its performance for different input sizes.
15. Implement a Binary Search Tree (BST) with insert, search, and delete operations and Write traversal methods (in-order, pre-order, post-order) and functions to find the minimum and maximum values.
16. Implement Dijkstra's algorithm to find the shortest path from a source node to all other nodes in a graph with non-negative edge weights.

TOTAL: 45 PERIODS

LAB REQUIREMENTS:

Systems with Linux Operating System with GNU compiler / PC with Windows, Turbo C/Dev C++, Borland C, 30 Nos.

OUTCOMES

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

1. Implement various linear and non-linear data structures with fundamental operations.(K3)
2. Solve the real-world computational problems.using suitable data structures(K3)
3. Analyze the performance of different data structures in terms of time and space complexity (K4)

CO – PO, PSO MAPPING:

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

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SEMESTER - III

24CSTP301 - SDG NO. 4	APTITUDE SKILLS - I	L	T	P	CP	C
		0	0	2	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1**OBJECTIVES:**

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

MODULE -I QUANTITATIVE ABILITY**22**

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

MODULE -II QUANTITATIVE ABILITY AND REASONING ABILITY 16

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

MODULE -III VERBAL ABILITY**7**

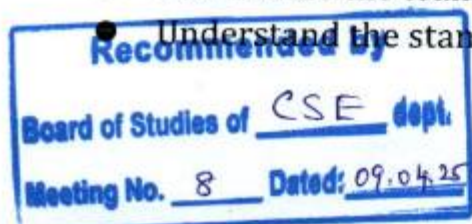
Verbal Analogy – Vocabulary building – Sentence Structures - Comprehension – correct usage of words – Error deduction

TOTAL: 45 PERIODS**REFERENCES:**

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

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

- Familiarize the team and leadership skills.
- Understand the standards relevant to ECE.



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

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

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

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

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

MODULE - II RANGER AND ROVER**10**

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

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

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

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

Activating the Earth Tribe Initiative in your Community.

MODULE - III 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: 45 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.

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ONLINE RESOURCES

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

OUTCOMES

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

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

CO – PO, PSO MAPPING:

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

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SEMESTER - III

24CSID301 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

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

COURSE METHODOLOGY:

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

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

EVALUATION:

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

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

CO – PO, PSO MAPPING:

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

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SEMESTER - IV

24BSMA402 - SDG NO. 4	PROBABILITY AND QUEUEING THEORY	L	T	P	CP	C
		3	1	0	5	4

OBJECTIVES:

- To impart necessary basic knowledge in Probability theory, Random Processes and Queueing models which are invariably used in Computer science courses

MODULE -I PROBABILITY AND RANDOM VARIABLES 9

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

MODULE -II DISCRETE AND CONTINUOUS DISTRIBUTIONS 9

Binomial, Poisson, Geometric, Uniform, Exponential, Erlang and Normal distributions.

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 12

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

MODULE -V QUEUEING MODELS 9

Markovian queues – Birth and Death processes – Single and multiple server Queueing models – Little's formula - Queues with finite waiting rooms.

MODULE -VI ADVANCED QUEUEING MODELS 9

Finite source models - M/G/1 queue – Pollaczek-Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL: 60 PERIODS

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TEXT BOOKS:

1. Fundamentals of Applied Probability and Random Processes, Ibe, O. C., 2nd edition, Elsevier, 2019. (1.1, 1.3, 1.6, 1.7 (1.7.1), 1.8, 1.13 - exercise problems in the these sections ; 2.1 – 2.8, 3.1 – 3.5, 3.9, 4.1 - 4.3, 4.4 - 4.4.2, 4.7 – 4.11, 5.1 - 5.7, 6.1 – 6.3, 6.8, 6.10, 8.1 - 8.5, 10.5 (10.5.1 - 10.5.6), 10.6, 10.7 (10.7.1 - 10.7.5)) (Module I, II, III & IV).
2. Fundamentals of Queueing Theory, Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., 4th Edition, Wiley Student, 2014. (1.1 – 1.5, 1.7, 2.1 - 2.7, 4.1, 4.2, 5.1 (5.1.1) (Module V & VI).

REFERENCES:

1. Schaum's Outline Theory and Problems of Probability, Random variables and Random Processes, Hwei Hsu, 1st Edition, Tata McGraw Hill Edition, New Delhi, 2004.
2. Operations Research, Taha, H. A., 10th Edition, Pearson India Education Services, Delhi, 2019.
3. Probability and Statistics with Reliability, Queueing and Computer Science Applications, Trivedi, K. S., 2nd Edition, John Wiley and Sons, 2002.
4. Probability and Stochastic Processes, Yates, R. D. and Goodman. D. J., 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5. Probability and Statistics, Random Processes and Queueing Theory, Veerarajan T., 4th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2015.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/117103017/>
2. <https://archive.nptel.ac.in/courses/111/102/111102111/>
3. Lecture Notes | Probability and Random Variables | Mathematics | MIT OpenCourseWare
4. <https://diposit.ub.edu/dspace/bitstream/2445/127366/3/memoria.pdf>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/111105041/>
2. <https://archive.nptel.ac.in/courses/111/102/111102111/>
3. <https://archive.nptel.ac.in/courses/111/104/111104079/>
4. <https://archive.nptel.ac.in/courses/111/102/111102160/>

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COURSE OUTCOMES

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

1. Apply probability concepts, random variables, and moment-generating functions to solve engineering problems involving uncertainty. (K3)
2. Apply discrete and continuous probability distributions to model and solve engineering problems involving random phenomena. (K3)
3. Apply joint, marginal, and conditional distributions along with correlation and regression concepts to analyze relationships between two random variables in engineering problems. (K4)
4. Apply concepts of random processes, including Markov and Poisson processes, to model and analyze stochastic systems evolving over time. (K4)
5. Apply Markovian queueing models and related concepts to analyze and solve problems involving service systems with waiting lines. (K4)
6. Apply advanced queueing models and network theories to analyze complex service systems and their performance. (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CSPC401 106104028 SDG NO. 4	THEORETICAL COMPUTER SCIENCE	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To construct Automata for any given pattern and its equivalent regular expressions
- To design a context free grammar for any given language and push down automata for the language

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- To understand Turing machines and undecidable problems
- To learn about the various phases of the Compiler
- To learn various Parsing techniques
- To understand Intermediate code generation, code optimization & code generation.

MODULE - I AUTOMATA FUNDAMENTALS & FINITE AUTOMATA 7

Introduction to formal proof - Inductive Proofs-Finite Automata-Deterministic Finite Automata - Non- deterministic Finite Automata -Finite Automata with Epsilon Transitions-Equivalence and Minimization of Automata-Table Filling Algorithm.

MODULE - II REGULAR EXPRESSIONS & CONTEXT FREE GRAMMAR 8

Regular Expressions-FA and Regular Expressions-State Elimination Method-CFG -Parse Trees -Ambiguity in Grammars and Languages - Normal Forms for CFG.

MODULE - III PUSHDOWN AUTOMATA & TURNING MACHINE 8

Definition of the Pushdown Automata -Equivalence of Pushdown Automata and CFG - Deterministic Pushdown Automata - Turing Machines - Programming Techniques for Turing Machine - Non Recursive Enumerable (RE) Language - Undecidable Problem with RE.

MODULE - IV INTRODUCTION TO COMPILERS & LEXICAL ANALYSIS 7

Compilation and Interpretation-Phases of a compiler -Lexical Analysis - Role of Lexical Analyzer- Recognition of Tokens - LEX tool.

MODULE - V SYNTAX ANALYSIS 7

Role of the parser- Top Down parsing - Recursive Descent Parsing - Predictive LL(1) Parsing - Bottom-up parsing - Shift Reduce Parsing - LR Parsers - SLR Parser - LALR -Error Handling and Recovery in Syntax Analyzer-YACC.

MODULE - VI CODE GENERATION & CODE OPTIMIZATION 8

Intermediate languages - Declarations - Assignment Statements - Boolean Expressions - Case Statements -BackPatching - Procedure calls.-Issues in the design of code generator - The target machine - Basic Blocks and Flow Graphs - DAG Representation of Basic Blocks.- Principal Sources of Optimization - Peep-hole optimization - DAG Optimization of Basic Blocks

TOTAL : 45 PERIODS

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TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2011.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2009.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2010.
2. J.Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, TMH, 2019.
3. Micheal Sipser, "Introduction of the Theory and Computation", 4th Edition, Thomson Brokecole, 2014.
4. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.
5. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/106/104/106104148>
2. https://swayam.gov.in/nd1_noc19_cs79/
3. <http://www.holub.com/software/compiler.design.in.c.docs.pdf>
4. <http://www.cs.usfca.edu/~galles/compilerdesign/x86.pdf>

ONLINE RESOURCES:

1. <http://www.youtube.com/watch?v=eqCkkC9A0Q4>
2. <https://online.stanford.edu/courses/soe-ycsautomata-automata-theory>
3. <https://www.javatpoint.com/compiler-tutorial>

OUTCOMES

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

1. Apply models of computation to construct automata. (K3)
2. Build the Regular Expression and Context Free Grammar for any given language (K3)
3. Construct the PushDown Automata and Turing machine for the regular language (K3)

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4. Identify the role of each phase of a compiler and Lexical Analyzer (K3)
5. Analyse the top-down and bottom-up parser for a given grammar (K4)
6. Develop semantic analyzer, code generation and code optimization to generate the optimized code (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CSPC402 106101059 SDG NO. 4	DESIGN AND ANALYSIS OF ALGORITHM	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand and apply the algorithm analysis techniques
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand different algorithm design techniques
- To understand the limitations of Algorithmic power

MODULE-I INTRODUCTION**8**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties - Analysis Framework – Empirical analysis – Mathematical analysis for Recursive and Non-recursive algorithms.

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MODULE - II BRUTE FORCE AND DIVIDE-AND-CONQUER 8

Brute Force – Computing an- String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment Problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

MODULE - III DYNAMIC PROGRAMMING 7

Dynamic programming – Principle of optimality - Coin Changing Problem - Computing a Binomial Coefficient – Floyd's Algorithm – Multi Stage Graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions.

MODULE - IV GREEDY TECHNIQUES 7

Greedy Technique – Container Loading Problem - Prim's Algorithm and Kruskal's Algorithm – 0/1 Knapsack Problem - Optimal Merge pattern - Huffman Trees.

MODULE - V ITERATIVE IMPROVEMENT 7

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs - Stable Marriage problem.

MODULE - VI COPING WITH THE LIMITATIONS OF ALGORITHM POWER 8

Lower - Bound Arguments - P, NP, NP - Complete and NP-Hard Problems Backtracking – n-Queen Problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound -Assignment Problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman Problem – Knapsack Problem.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest and Clifford Stein, " Introduction to Algorithms", Third Edition, PH1 Learning Private Limited,2012

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2. Alfred V.Aho, John E.Hopcroft and Jeffrey D.Ullman, " Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Harsh Bhasin, "Algorithms Design and Analysis", Oxford University press, 2016
4. S.Sridhar, " Design and Analysis of Algorithms", Oxford University press, 2014.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/106101060/#>
2. <http://www.learnalgorithms.in/>
3. <https://courses.cs.vt.edu/csonline/Algorithms/Lessons/>

OUTCOMES

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

1. Analyze the efficiency of algorithms using various frameworks (K4)
2. Make use of algorithm design techniques like brute force and divide and conquer techniques to solve problems (K3)
3. Use Dynamic programming techniques for solving problems. (K3)
4. Implement Greedy technique concept to solve various problems (K3)
5. Apply iterative improvement techniques to formulate and solve complex optimization and matching problems (K3)
6. Solve problems using approximation algorithms and randomized algorithms (K3)

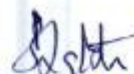
CO – PO, PSO MAPPING:

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

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Department of Computer Science and Engineering
Sri Sairam Engineering College

SEMESTER - IV

24ITPW401 106106144 SDG NO. 4 & 9	OPERATING SYSTEM WITH LABORATORY	L	T	P	CP	C
		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 DEADLOCK

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:

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. Achyut S. 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 completion of the course, the student will be able to:

1. Identify the concepts and functions of the operating system. (K3)
2. Apply process management and CPU scheduling techniques (K3)
3. Analyze deadlock concepts and prevention strategies (K4)
4. Examine memory management problems and segmentation. (K4)
5. Organize the functionalities of file 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
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	-	3	-	-	-	-	-	-	-	-	-	2	2
C03	-	-	-	3	-	-	-	-	-	-	-	2	2
C04	-	-	3	-	-	-	-	-	-	-	-	2	2
C05	-	-	-	-	3	-	-	-	-	-	-	2	2
C06	-	-	-	-	3	-	-	-	-	-	-	2	2

SEMESTER - IV

24ESEC401	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	CP	C
SDG NO. 4		3	0	0	3	3

OBJECTIVES:

- To explore the architecture, instruction set, and programming of the 8086 microprocessor and 8051 microcontroller.
- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.
- To study memory and I/O interfacing techniques for connecting peripheral devices.
- To design and develop Microprocessor/ microcontroller based systems for real time applications using low level language like ALP.
- To understand the concepts of ARM processors.

MODULE -I THE 8086 ARCHITECTURE

7

Architecture of 8086, Register Organization, Programming Model, Memory addresses, Memory Segmentation, Physical Memory Organization, Signal descriptions of 8086- Common Function Signals, Minimum and Maximum mode signals, Timing diagrams.

MODULE - II INSTRUCTION SET AND ASSEMBLY LANGUAGE
PROGRAMMING OF 8086

9

Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Procedures, Macros, Simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

Recommended by
Board of Studies of ECE dept.
Meeting No. 8 Dated: 17.2.25

|100|

J. R. Reddy
CHAIRMAN
Board of Studies
Electronics and Communication Engineering

MODULE - III I/O INTERFACE**9**

8255 PPI, Various Modes of Operation and Interfacing to 8086, D/A and A/D Converter, Stepper motor, Interfacing of DMA controller 8257, Memory Interfacing to 8086, Interrupt Service Routine, Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

MODULE - IV INTRODUCTION TO MICROCONTROLLERS**8**

Overview of 8051 Microcontroller, Architecture, I/O Pin Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs, memory interfacing to 8051.

MODULE - V 8051 REAL TIME CONTROL**6**

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

MODULE - VI ARM PROCESSOR**6**

Fundamentals, Registers, Current program status register, Pipeline, Interrupt and the vector table.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. D. V. Hall, Microprocessors and Interfacing, TMGH, 2nd Edition 2006.
2. Nagoor Kani, "Microprocessors and Microcontrollers", McGraw Hill education (India) Private Limited, 2013.
3. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier Inc., 2007.

REFERENCES:

1. N.Senthilkumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2011.
2. A.K.Ray and K.M.Bhurchandi, "Advanced Microprocessor and Peripherals", Tata McGraw Hill, 3rd Edition, 2013.
3. Kenneth J Ayala, "The 8086 Microprocessor: Programming and Interfacing the PC", Cengage Learning, Reprint 2014.
4. K.Uma Rao, Andhe Pallavi, "The 8051 Microcontrollers, Architecture and Programming and Applications - Pearson, 2009.
5. Ajay V. Deshpande, "Microcontrollers and Application", TMGH, 2005.

ONLINE RESOURCES:

1. <http://read.pudn.com/downloads165/ebook/754892/micro.pdf>
2. [http://www.openloop.com/education/classes/sjsu_engr/engr_comp.Org/spring2002/student Projects/Truc_Tran/Eng120.html](http://www.openloop.com/education/classes/sjsu_engr/engr_comp.Org/spring2002/student%20Projects/Truc_Tran/Eng120.html)
3. <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf>
4. <http://ecerelatedbooks.blogspot.com/2018/01/microprocessor-and-microcontroller.html>

OUTCOMES

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

1. Analyze the architecture, instruction set, and programming of the 8086 Microprocessor. (K4)
2. Develop an understanding of the 8086 instruction set and assembly language programming. (K6)
3. Design and implement peripheral interfacing for LCD, keyboard, ADC, DAC and Sensors, along with I/O techniques using DMA, interrupt controllers, and timers.(K6)
4. Explain the 8051 microcontroller architecture, instruction set and programming. (K5)
5. Examine hardware and software interaction and integration.(K4)
6. Conclude about the essentials of registers, current program status registers, pipelines, interrupts and the vector table in computer architecture.(K5)

CO – PO, PSO MAPPING:

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

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SEMESTER - IV

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

ARMY WING

PERSONALITY DEVELOPMENT

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

BORDER & COASTAL AREAS

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
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COMMUNICATION

C 1	Introduction to Communication & Latest Trends	3
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INFANTRY

INF 1	Organisation of Infantry Battalion & its weapons	3
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MILITARY HISTORY

MH 1	Biographies of Renowned Generals	4
MH 2	War Heroes - PVC Awardees	4
MH 3	Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4	War Movies	6

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT

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

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Meeting No. 8 Dated: 09.04.25

LEADERSHIP 7

- L2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT**13**

- DM1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3
- DM2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters 9
- DM3 Fire Service & Fire Fighting 1

ENVIRONMENTAL AWARENESS & CONSERVATION**3**

- EA1 Environmental Awareness and Conservation 3

GENERAL AWARENESS**4**

- GA1 General Knowledge 4

NAVAL ORIENTATION 6

- AF1 Armed Forces and Navy Capsule 3
- EEZ1 EEZ Maritime Security and ICG 3

ADVENTURE 1

- AD1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS**2**

- BCA1 History, Geography & Topography of Border/Coastal areas 2

TOTAL: 45 PERIODS**AIR FORCE WING****PERSONALITY DEVELOPMENT****9**

- PD3 Group Discussion: Team Work 2
- PD4 Career Counselling, SSB Procedure & Interview Skills 3
- PD5 Public Speaking 4

BORDER & COASTAL AREAS**4**

- BCA2 Security Setup and Border/Coastal management in the area 2
- BCA3 Security Challenges & Role of cadets in Border management 2

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AIRMANSHIP	1
A 1 Airmanship	1
BASIC FLIGHT INSTRUMENTS	3
FI 1 Basic Flight Instruments	3
AERO MODELLING	3
AM 1 Aero Modelling Capsule	3
GENERAL SERVICE KNOWLEDGE	2
GSK 4 Latest Trends & Acquisitions	2
AIR CAMPAIGNS	6
AC 1 Air Campaigns	6
PRINCIPLES OF FLIGHT	6
PF 1 Principles of Flight	3
PF 2 Forces acting on Aircraft	3
NAVIGATION	5
NM 1 Navigation	2
NM 2 Introduction to Met and Atmosphere	3

TOTAL :45 PERIODS

SEMESTER - IV

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

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 Programming.

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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.

Split the string
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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,



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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	PS01	PS02
C01	-	-	3	-	-	-	-	2	-	-	-	3	3
C02	3	-	-	-	-	-	-		2	-	-	3	3
C03	-	-	-	3	-	-	-	2	-	-	-	3	3

SEMESTER - IV

24CSTP401 - SDG NO. 4	APTITUDE SKILLS - II					L	T	P	CP	C
						0	0	2	2	0

PROBLEM SOLVING USING JAVA - PHASE 1**OBJECTIVES:**

- Develop strong algorithmic problem-solving skills using Java
- Enable students to analyze problems and design efficient solutions
- Familiarize students with coding patterns used in technical interviews and prepare students for competitive programming and placement coding rounds

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MODULE - I FOUNDATIONS OF JAVA PROBLEM SOLVING 16

Competitive programming mindset, Understanding problem statements and constraints, Java input and output handling, Time and space complexity, Asymptotic notations, Loop and recursion analysis, Arrays and strings problem patterns, Prefix sum, Sliding window, Two-pointer techniques.

MODULE - II SEARCHING, SORTING AND ADVANCED TECHNIQUES 15

Binary search patterns, Search on answer technique, Sorting-based problem solving, Stack and queue applications, Monotonic stack, Simulation problems, Recursion templates, Backtracking framework, Constraint-based problem solving.

MODULE - III DYNAMIC PROGRAMMING, GREEDY AND GRAPH BASICS 14

Dynamic programming principles, Memorization and tabulation, One-dimensional and two-dimensional DP problems, Greedy strategies, Interval problems, Graph traversal basics - BFS and DFS, Competitive coding strategies.

TOTAL: 45 PERIODS

REFERENCES:

1. Herbert Schildt, Java: The Complete Reference, McGraw Hill.
2. E. Balagurusamy, Programming with Java, McGraw Hill Education

ONLINE RESOURCES

1. LeetCode - <https://leetcode.com>
2. HackerRank - <https://www.hackerrank.com>
3. GeeksforGeeks - Java and DSA Track

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.

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

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

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

MODULE - II RANGER AND ROVER

10

Scouting for Boys: Scout Craft, Campaigning.

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

Growing Together: Understanding the growth context.

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

MODULE - III 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

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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. Interpret problem statements and develop Java programs with appropriate complexity analysis.
2. Apply array, string, searching, sorting, stack, and queue based problem-solving techniques.
3. Design solutions using recursion, backtracking, and dynamic programming approaches.
4. Solve real-time and placement-oriented problems using greedy techniques and graph traversal basics.
5. Demonstrate career and managerial skills. (K2)
6. Understand BIS standards for Information security and AI domain. (K2)

CO - PO, PSO MAPPING:

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

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5. Demonstrate career and managerial skills. (K2)
6. Understand BIS standards for Information security and AI domain. (K2)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CSID401 - 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.

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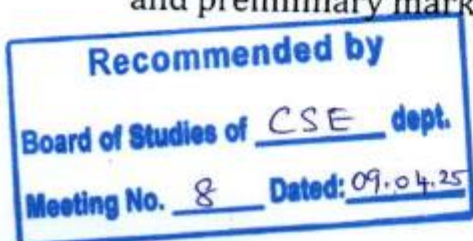
- To instill a foundation of ethical entrepreneurship by integrating inclusive design principles, sustainability values, and responsible leadership.
- To enable data-driven innovation by leveraging field research, applying performance analytics, and integrating emerging technologies for solution optimization.
- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, focusing on the practical execution and refinement of entrepreneurial ventures.
2. The project work must involve the continuous development, iterative enhancement, and potential launch of an entrepreneurial solution. It must also include appropriate elements of the following: compliance with advanced engineering standards, iterative design analysis, enhanced prototyping, robust experimentation, real-world user feedback collection, data correlation, and advanced software/hardware development for the solution.
3. Projects can be individual work or group projects, with a maximum of Three students. In case of a group project, each student must submit an individual project report clearly specifying their unique contributions to the collective work.
4. On completion of the project, the student shall submit a detailed project report encompassing the evolution of their venture, technical implementation, market validation, and future roadmap. The project shall undergo a formal review process, after which the report will be evaluated. Students shall appear for a mandatory viva-voce examination on the project, approved jointly by the Coordinator and the respective project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination): 20 marks (Focus on refined problem statement, advanced MVP design, and detailed development plan)
2. Second evaluation (Immediately after second internal examination): 30 marks (Focus on prototype/MVP implementation, initial testing, and preliminary market validation results)



3. Final evaluation (Last week of the semester): 50 marks (Focus on the complete refined solution, comprehensive market validation, growth strategy, final project report, and viva-voce)

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

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Apply structured entrepreneurial exploration to convert innovative ideas into venture blueprints, incorporating user-centric and iterative design approaches. (K4)
2. Assess customer behavior and market traction to align product strategies with ethical and sustainable entrepreneurship principles. (K5)
3. Integrate multidisciplinary knowledge, field data, and emerging technologies to optimize and validate engineered solutions. (K6)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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



Together let's build a better world where there is **NO POVERTY** and **ZERO HUNGER**.

We have **GOOD HEALTH AND WELL BEING**, **QUALITY EDUCATION** and full **GENDER EQUALITY** everywhere.

There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY**

which will help to create **DECENT WORK AND ECONOMIC GROWTH**. Our prosperity shall be fuelled

by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to

REDUCE INEQUALITIES by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES**.

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant,

flourishing **LIFE BELOW WATER**, rich and diverse **LIFE ON LAND**.

We will enjoy **PEACE AND JUSTICE** through **STRONG INSTITUTIONS**

and will build long term **PARTNERSHIPS FOR THE GOALS**.



For the goals to be reached,
everyone needs to do their part:
governments, the private sector,
civil society and **People like you.**

Together we can...

Sai Prakash Leo Mathu

Chairman & CEO - Sairam Institutions

We build a Better nation
through Quality education.

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SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

*Accredited by NBA and NAAC "A+"
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