



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

Approved by AICTE, New Delhi
Affiliated to Anna University



**B.E - COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

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

B.E - COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)



VISION

To emerge as a "Centre of Excellence" in the field of Artificial Intelligence and Machine Learning by providing required skill sets, domain expertise and interactive industry interface for students and shape them to be a socially conscious and responsible citizen.



MISSION

Computer Science and Engineering (Artificial Intelligence and Machine Learning), Sri Sairam Engineering College is committed to

- M1 Nurture students with a sound understanding of fundamentals, theory and practice of AI & ML.
- M2 Develop students with the required skill sets and enable them to take up assignments in the field of AI & ML
- M3 Facilitate Industry Academia interface to update the recent trends in AI & ML
- M4 Create an appropriate environment to bring out the latent talents, creativity and innovation among students to contribute to the society.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024
SEMESTER I

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

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	24HSNC201	NCC Course Level 1*	2	0	0	2	0
PRACTICALS							
1	24ESGE102	Engineering Practices Laboratory	0	0	4	4	2
2	24AMPT201	Python Programming Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - II							
1	24ENTP201	Digital Dynamics	1	0	1	2	0
2	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
						Total	26
							19

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Academic Council Meeting

08

Dated: 03.09.2024

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Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

E.M

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024
SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA303	Probability and Statistical Modeling	3	1	0	4	4
2	24AMPC301	Fundamentals of Artificial Intelligence	3	0	0	3	3
3	24AMPC302	Foundations of Data Structures and Algorithm Design	3	0	0	3	3
4	24AMPC303	Operating System	3	0	0	3	3
5	24HSMC301	Universal Human Values - II Understanding Harmony	3	0	0	3	3
6	24HSNC301	NCC Course Level 2*	3	0	0	3	0
PRACTICALS							
1	24AMPL302	Data Structures and Algorithm Design Laboratory	0	0	4	4	2
2	24AMPT301	Database Management Systems Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - III							
1	24AMTP301	Aptitude Skills - I	0	0	2	2	1
2	24AMID301	Innovative Design Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC302	Programming in JAVA (Mandatory - NC)	0	2	0	2	0
Total					31	23	

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SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA407	Linear Algebra and its Applications	3	1	0	4	4
2	24AMPC401	Nature Inspired Computing Techniques	3	0	0	3	3
3	24AMPC402	Computer Networks and Security	3	0	0	3	3
4	24AMPW401	Machine Learning Techniques with Laboratory	3	0	2	5	4
5	24xxOExxx	Open Elective - I #	3	0	0	3	3
6	24HSNC401	NCC Course Level 3*	3	0	0	3	0
PRACTICALS							
1	24AMPT401	Web Development Framework Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - IV							
1	24AMTP401	Aptitude Skills - II	0	0	2	2	0
2	24AMID401	Innovative Design Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1		As recommended by BOS					
Total					27	21	

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Academic Council Meeting

No. 08 Dated: 03.09.2024

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Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1** Graduates imbibe fundamental knowledge in Artificial Intelligence, Programming, Mathematical modelling and Machine Learning
- PEO2** Graduates will be trained to gain domain expertise by applying the theory basics into practical situation through simulation and modelling techniques.
- PEO3** Graduates will enhance the capability through skill development and make them industry ready by inculcating leadership and multitasking abilities
- PEO4** Graduates will apply the gained knowledge of AI & ML in Research & Development, Innovation and contribute to the society in making things simpler.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1** The graduates will be in a position to design, develop, test and deploy appropriate mathematical and programming algorithms required for practical applications.
- PSO2** The graduates will have the required skills and domain expertise to provide solutions in the field of Artificial Intelligence and Machine Learning for the Industry and society at large.

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)	6	12	09
Humanities and Social Sciences (HS)	8	13	13
Professional Electives (EL)	14	23	23
Program Core + Program Lab (PC+PL)	23	42	36
Program theory with Lab (PW) / Program Lab With Theory (PT)	12	35	22
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		228	168

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No. 8

Dated: 03.09.2024

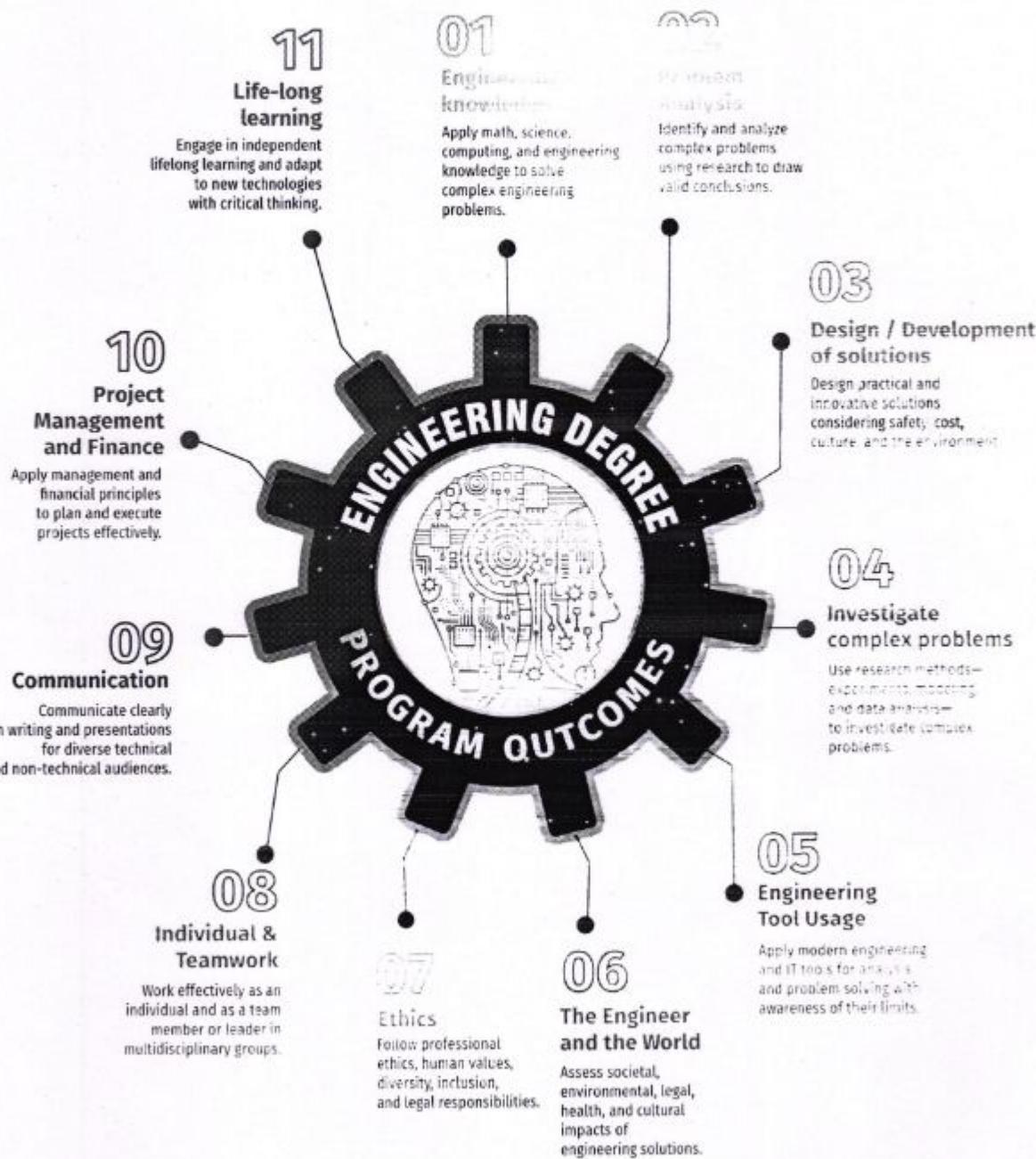
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Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

PROGRAMME OUTCOMES(POs)

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



SEMESTER - I

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

OBJECTIVES:

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

MODULE I MATRICES

12

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

MODULE II FUNCTIONS OF SEVERAL VARIABLES

12

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

MODULE III VECTOR DIFFERENTIATION

4

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

MODULE IV VECTOR INTEGRATION

8

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

MODULE V MULTIPLE INTEGRALS

12

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

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Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/8/2024

| 1 |

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

ONLINE RESOURCES:

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

Recommended by

Board of Studies of HLS dept.
Meeting No. 6 Dated: 30/5/2024

| 2 |

S. Narayanasamy
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
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-

SEMESTER - I

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

OBJECTIVES:

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

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Meeting No. 6 Dated: 31/5/2014

MODULE - I COMMUNICATION PROCESS 8

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

MODULE - II LANGUAGE BARRIERS, LEVELS AND CHANNELS 8

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

MODULE - III NARRATION AND SUMMATION 8

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

MODULE - IV WRITING MECHANICS 7

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

MODULE - V INTERPRETATION SKILLS 7

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

MODULE - VI COGENT EXPOSITIONS 7

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

TOTAL: 45 PERIODS

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Meeting No. 6 dated: 31/08/2014

| 4 |

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Board of Studies
Department of Humanities & Sciences

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://wwwPearson.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)

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H&S dept.

Meeting No. 6Dated: 21/05/2024

| 5 |

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Department of Humanities & Sciences

CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I PROPERTIES OF MATTER

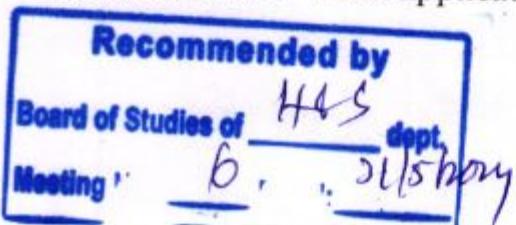
8

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

MODULE - II MECHANICAL WAVES AND LASERS

7

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



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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 HSS dept.
Meeting No. 6 Dated: 21/8/2014

| 7 |

S. Narasimha
Chairman
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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)

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Meeting No. 6 Dated: 31/5/2024

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CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I POLYMER CHEMISTRY

8

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

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

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Meeting No. 6 Dated: 31/8/2024

| 9 |

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

MODULE - II ELECTROCHEMISTRY AND BATTERY TECHNOLOGY 7

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

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

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY 7

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

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

MODULE - IV CHEMICAL THERMODYNAMICS 8

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

MODULE - V FUELS 8

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

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

MODULE - VI NANO CHEMISTRY

7

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

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

REFERENCES:

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

OUTCOMES:

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

1. Explain the importance of polymers in science and technology, describe their roles in different applications and discuss their impacts on modern advancements. (K3)
2. Recognize the basic principles of electrochemistry and describe their application in battery technologies. (K3)

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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 3	T 0	P 0	CP 3	C 3
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OBJECTIVES:

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

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

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

MODULE - II BASICS OF C PROGRAMMING 7

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

MODULE - III ARRAYS AND STRINGS 8

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

MODULE - IV FUNCTIONS AND POINTERS 9

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

MODULE - V STRUCTURES 7

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

MODULE - VI FILE PROCESSING 7

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program:

Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

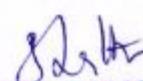
ONLINE RESOURCES:

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

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 Sri Sairam Engineering College

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

SEMESTER - I

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

OBJECTIVES:

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

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Board of Studies of MECH dept.
Meeting No. 08 Dated: 01.06.2024

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

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

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

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

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

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

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

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

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

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

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

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

TOTAL: 60 PERIODS**TEXT BOOKS:**

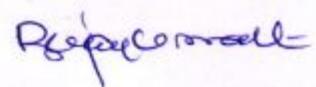
1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University Press, New Delhi, 2015.

Recommended byBoard of Studies of MECH dept.Meeting No. 08 Dated: 01.06.2024

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2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

WEB REFERENCES:

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

ONLINE RESOURCES:

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

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SEMESTER - I

24HSTA101 - SDG NO. 4	HERITAGE OF TAMILS	L 1	T 0	P 0	CP 1	C 1
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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 பகிரதல் 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 பெளத்த 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 Bharathiyan and Bharathidhasan.

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

நடுகல் முதல் நவீன சிற்பங்கள் வரை — ஜம்பொன் 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 > Veena > Yazh and Nadhaswaram > Role of temples in Social and Economic Life of Tamils.

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Meeting No. 6 Dated: 31/5/2024

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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 தினைக் 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,
கையெழுத்துப்படிகள் — தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

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

5

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

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

- தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு
தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
- கணினித் தமிழ் — முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
- கீழடி — வைகை நதிக்கணரயில் சங்ககால நகர நாகரிகம் (தொல்லியல்
துறை வெளியீடு)
- பொருநை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- 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. பழந்தமிழின் 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
CO1	2	3	3	-	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	-	-	-	-	-	-	2	2	2
CO3	2	3	3	-	-	-	-	-	-	-	2	2	2
CO4	2	3	3	-	-	-	-	-	-	-	2	2	2
CO5	2	3	3	-	-	-	-	-	-	-	2	2	2
CO6	2	3	3	-	-	-	-	-	-	-	2	2	2

SEMESTER - I

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

PHYSICS LABORATORY (Any Five Experiments to be conducted)**OBJECTIVES:**

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

Sl.No. Name of the Experiment

- 1 (a) Determination of wavelength of Laser
(b) Determination of numerical aperture and acceptance angle in an optical fiber:
(c) Determination of particle size using laser source.
- 2 Determination of thermal conductivity of a bad conductor - Lee's Disc method.

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- 3 Determination of Young's modulus by non-uniform bending method.
- 4 Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.
- 5 Find out the thickness of the given wire by air wedge method.
- 6 Calculation of lattice cell parameter – X-ray diffraction method.
- 7 Determination of Planck's constant.
- 8 Determination of wavelength of mercury spectrum – spectrometer grating.
- 9 Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
- 10 Determination of band gap of a semiconductor.
- 11 Determination of Hall coefficient by Hall Effect experiment.
- 12 Determination of solar cell characteristics.

CHEMISTRY LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

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

Sl.No. Name of the Experiment

- 1 Conductometric titration of strong acid vs strong base.
- 2 Determination of chloride content of water sample by Argentometric method.
- 3 Determination of strength of acids in a mixture of acids using conductivity meter.
- 4 Determination of total, temporary & permanent hardness of water by EDTA method.
- 5 Estimation of iron content of the given solution using potentiometer.
- 6 Determination of DO content of water sample by Winkler's method.
- 7 Determination of strength of given hydrochloric acid using pH meter.

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

TOTAL: 30 PERIODS

TEXT BOOKS:

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

TEXTBOOK:

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

OUTCOMES:

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

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

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CO-PO MAPPING:

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

CSE

SEMESTER - I

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

OBJECTIVES:

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

LIST OF EXPERIMENTS

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

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Sri Sairam Engineering College

14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.
19. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
 - (a) Total marks obtained by each student.
 - (b) The highest marks in each subject and the marks of the student who secured it.
 - (c) The student who obtained the highest total marks.
20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

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Meeting No. 1 Dated: 30.5.2017

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SEMESTER - I

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

OBJECTIVES:

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

MODULE - I LISTENING

5

Techniques of effective listening

Listening and comprehending

Probing questions

Barriers to listening

Reflection from listening

MODULE - II SPEECH MECHANICS

5

Pronunciation

Enunciation

Vocabulary

Fluency

Common errors

MODULE - III READING SKILLS

5

Techniques of effective reading

Kinds of reading

Gathering ideas and information from the text

Evaluating the ideas and information

Interpreting the text from multiple angles

MODULE - IV WRITING ASPECTS

5

Writing process

Effective writing strategies

Different modes of writing

Optimizing the use of resources

Editing

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MODULE - V PRESENTATION SKILLS

5

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

MODULE - VI ARTICULATION ASPECTS

5

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

TOTAL : 30 PERIODS**REFERENCES:**

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

WEB REFERENCES:

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

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

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

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CO-PO, PSO MAPPING:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - 1 United Nations Sustainability and the Sustainable Development Agenda

3

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

Recommended by
Overview of the Sustainable Development Goals (SDGs)

MODULE - 2 Universal SDG Targets

4

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

MODULE-3 SDG and Indian Gram Panchayat

3

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

MODULE-4 Government Schemes

4

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

MODULE-5 Community Engagement

4

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

MODULE-6 Idea Generation

12

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

TOTAL: 30 PERIODS**REFERENCES:**

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

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WEB REFERENCES

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

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SEMESTER - II

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

OBJECTIVES:

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

MODULE - I LOGICS 9

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

MODULE - II COMBINATORICS 9

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

MODULE - III ALGEBRAIC STRUCTURES WITH ONE BINARY OPERATION 12

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

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/~arlal/book/mth202.pdf>
4. https://drive.google.com/file/d/1-PqMULqDim1-AHQK5_zL34197zHV3W15/view

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/106106183>
2. <https://www.youtube.com/watch?v=xIUFkMKSB3Y&list=PL0862D1A947252D20>
3. https://www.youtube.com/watch?v=4LITmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4. <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3og0VxVxCTlI45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ90QGMqxeSK8UR0MSy0DBqsKZS>

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. (CO1) (K3)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (CO2) (K3)
3. Explain the fundamental concepts of algebraic structures such as groups and Boolean algebra. (CO3) (K3)
4. Illustrate the concepts of graphs. (CO4) (K3)
5. Apply the concepts of Lattices in the field of computer science. (CO5) (K3)
6. Apply the concepts of Boolean algebra in logical circuits. (CO6) (K3)

CO-PO, MAPPING:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	3	2
CO6	3	-	-	-	-	-	-	-	-	-	-	3	2

SEMESTER - II

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

OBJECTIVES:

- Acquire techniques for comprehending and critically analyzing passages
- Improve the communicative competence
- Enhance learners' ability to read and write complex texts, summaries, definitions and reports
- Write effective formal letters and reports
- **Recommended by** *S. Narasimha*
• Develop skills for preparing effective job application

MODULE - I EFFECTIVE COMMUNICATION

6

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

MODULE - II BASICS OF TECHNICAL WRITING

5

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

MODULE - III REPORT WRITING

4

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

MODULE - IV DIVERSE WRITING SKILLS

5

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

MODULE - V CAREER COMPETENCIES

6

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

MODULE - VI LEXICAL ENHANCEMENT

4

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

TOTAL: 30 PERIODS**Recommended by**

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dept.

Meeting No. 6

Dated: 31/8/2014

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TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

OUTCOMES:

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

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

- To understand the essential principles of physics of conducting materials.
- To educate the basic principles of semiconductor device and electron transport properties.
- To become proficient in magnetic materials.
- To acquaint the basics of 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.

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MODULE - II SEMICONDUCTOR MATERIALS

7

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

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

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.
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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Meeting No. 6 Dated: 31/8/2019

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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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Meeting No. 6 Dated: 31/1/2024

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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 (CO₂, CH₄, N₂O, CFCs) on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures).

MODULE - III WATER CHEMISTRY

8

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

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT

7

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

Solid Waste Management System: Sources and types of solid waste, Elements of solid waste management, Methods of residential and commercial waste collection, Treatment / processing - Incineration, Composting, Landfill - Dumpsite rehabilitation.

MODULE - V ENERGY AND ENVIRONMENT

8

Energy sources - Renewable and non-renewable energy sources. Principle and generation of solar energy (solar collectors, photo-voltaic modules, solar ponds), wind energy, geothermal energy; tidal energy, OTEC energy from

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

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY

7

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

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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Meeting No. 6 Dated: 31/8/2024

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S. Namakasthaya
Chairman
Board of Studies
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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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S. Namitha May

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SEMESTER - II

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

OBJECTIVES:

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

அலகு-I நெசவு மற்றும் பாணைத் தொழில்நுட்பம்

சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் 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 ரூசங்க 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, கண்ணாடு, மணிகள் - கடுமணி மணிகள் சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

Recommended by *HLS*

Board of Studies of *HLS* dept.

Meeting No. *6* Dated: *31/12/2014*

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S. Namakkal
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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 - அறிவிசார் சமூகம்.

UNIT-V AGRICULTURE AND IRRIGATION TECHNOLOGY

5

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

அலகு-VI அறிவியல்தமிழ்மற்றும்கணித்தமிழ்

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தயிழ் 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. **Reference contributed by** 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. சங்ககால நெசவு மற்றும் பாணைத்தொழில்நுட்பங்களைப் 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. அறிவியல்துறை மற்றும் கணிதத்தமிழின்வளர்ச்சியையும் அதன் கணினி பயன்பாடுகளையும் புரிந்து கொள்ளுதல்.
To understand the development of Scientific Tamil and its applications in Tamil computing.(K3)

Recommended by

Board of Studies of

HAS dept.

Meeting No.

Dated: 21/5/2024

CO-PO, PSO MAPPING

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

SEMESTER - II

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

ARMY WING

NCC GENERAL 6

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

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

Recommended by

Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/5/2024

PERSONALITY DEVELOPMENT	7
PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2 Communication Skills	3
PD 3 Group Discussion: Stress & Emotions	2
LEADERSHIP	5
L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2 Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT	8
SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4 Protection of Children and Women Safety	1
SS 5 Road / Rail Travel Safety	1
SS 6 New Initiatives	2
SS 7 Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

NAVAL WING	
NCC GENERAL	6
NCC 1 Aims, Objectives & Organization of NCC	1
NCC 2 Incentives	2
NCC 3 Duties of NCC Cadet	1
NCC 4 NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS	4
NI 1 National Integration: Importance & Necessity	1
NI 2 Factors Affecting National Integration	1
NI 3 Unity in Diversity & Role of NCC in Nation Building	1
NI 4 Threats to National Security	1
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

Recommended by

Board of Studies of 14A/S dept.
Meeting No. 6 Dated: 31/5/2024

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

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

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

TOTAL: 30 PERIODS

ARMY WING

NCC GENERAL	6
NCC 1 Aims, Objectives & Organization of NCC	1
NCC 2 Incentives	2
NCC 3 Duties of NCC Cadet	1
NCC 4 NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS	4
NI 1 National Integration: Importance & Necessity	1
NI 2 Factors Affecting National Integration	1
NI 3 Unity in Diversity & Role of NCC in Nation Building	1
NI 4 Threats to National Security	1

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

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

Recommended by

Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/10/2014

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

TOTAL: 30 PERIODS**SEMESTER - II**

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

OBJECTIVES:

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

ELECTRICAL ENGINEERING PRACTICE

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

ELECTRONICS ENGINEERING PRACTICE

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

Recommended by

Board of Studies of MECH dept.
Meeting No. 08 Dated: 01.06.2024



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Board of Studies
Mechanical Engineering

CIVIL ENGINEERING PRACTICE

Buildings:

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

Plumbing Works:

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

Carpentry using Power Tools only:

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

MECHANICAL ENGINEERING PRACTICE

Welding:

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

Basic Machining:

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

Sheet Metal Work:

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

Demonstration on:

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

TOTAL: 60 PERIODS

Recommended by

Board of Studies of MECH dept.
Meeting No. 08 Dated: 01.06.2014

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Dipak Choudhury
CHAIRMAN
Board of Studies
Mechanical Engineering

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**Electrical**

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

Electronics

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

Civil

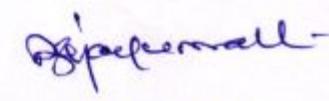
1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2. Carpentry vice (fitted to work bench).	15 Nos
3. Standard woodworking tools.	15 Sets
4. Models of industrial trusses, door joints, furniture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

Mechanical

1. Arc welding transformer with cables and holders	5 Nos
2. Arc welding transformer with cables and holders	5 Nos
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets

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CHAIRMAN
Mechanical Engineering
Mechanical Eng.

4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5. Centre lathe.	2 Nos
6. Hearth furnace, anvil and smithy tools.	2 Sets
7. Moulding table, foundry tools.	2 Sets
8. Power Tool: Angle Grinder.	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner.	1 each

OUTCOMES:

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

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

CO-PO 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

Recommended by

Board of Studies of MECH dept.
Meeting No. 08 Dated: 01.06.2024

SEMESTER - II

24AMPT201 106106182 SDG NO. 4 & 9	PYTHON PROGRAMMING LABORATORY WITH THEORY	L T P CP C
		1 0 4 5 3

OBJECTIVES:

- To teach essential problem-solving skills and the use of flowcharts and pseudocode.
- To develop simple Python programs with conditionals and loops.
- To define Python functions and to implement lists, tuples, dictionaries and sets.
- To comprehend the file and exception handling concepts .
- To understand NumPy and Pandas.

MODULE - I COMPUTATIONAL THINKING AND PROBLEM SOLVING

10

Fundamentals of Computing - Identification of Computational Problems - Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

LIST OF EXPERIMENTS:

- a. Write a program to find minimum in a list.
- b. Write a program to insert a card in a list of sorted cards.
- c. Get the height and weight value of five persons. Write a function `BMI_Calc()` to calculate the BMI. ($BMI = \text{weight} / \text{height}^2$) using all four prototypes.

MODULE - II PYTHON PROGRAMMING FUNDAMENTALS

10

Introduction to Python: Interactive and Script Mode - Indentation and Comments - Variables and Reserved Words - Data Types - Operators and their Precedence - Expressions - Built-in Functions- Importing from Packages.

LIST OF EXPERIMENTS:

Write a python program using simple data types. Get the input from the keyboard. (Do not use built-in functions).

- a. To find the square and cube of a number
- b. To find the roots of a quadratic equation
- c. To find the square root and cube root of a number
- d. To calculate Simple Interest

Recommended by

Board of Studies of CSE (AI&ML) dept.
Meeting No. 04 Dated: 31.05.2021

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EM
CHAIRMAN
Board of Studies
Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

MODULE - III CONTROL STRUCTURES AND FUNCTIONS 10

Decision Making and Branching: if, if-else, nested if, multi-way if-elif statements - Looping: while loop, for loop, else clauses in loops, nested loops - Break, continue and pass statements - Functions: Parameters and Arguments (Positional, Keyword, Default values) - Local and Global Scope of Variables - Functions with Arbitrary Arguments - Recursive Functions - Lambda Functions.

LIST OF EXPERIMENTS:

- Write a code to get the age of a person and print an age group. (Infant, Children, Adolescents, Adults, Older adults)
- Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
- Write a python program to print Pascal triangle using for loop.
- Write a program to print the multiplication table of the number entered by the user.

MODULE - IV COLLECTIONS AND STRINGS 10

Lists: Create, Access, Slicing, Negative Indices, List Methods, List Comprehensions - Tuples: Create, Indexing and Slicing, Operations on Tuples - Dictionary: Create, Add, Replace Values, Operations on Dictionaries - Sets: Creation and Operations - Strings: Comparison, Formatting, Slicing, Splitting, Stripping.

LIST OF EXPERIMENTS:

- Make a program that displays your favourite actor/actress and print the word 'lucky' inside the string.
- Print the day, month, year in the form "Today is 2/2/2016".
- Given an article, split it based on phrases.

MODULE - V FILES AND EXCEPTION 10

Files: Create, Open, Read, Write, Append, Close - Tell and Seek Methods. Errors and Exceptions: Syntax Errors, Exception types, Handling Exceptions, Raising Exceptions.

LIST OF EXPERIMENTS:

- Write a program to read a file and display its contents along with line numbers before each line. Also, handle EOF error.
- Suppose a file contains student's records with each record containing name and age of a student. Write a program to read these records and display them in sorted order by name. How will you handle if file is not found.

Recommended by

Board of Studies of CSE(AI&ML) dept.

Meeting No. 04 Dated: 31.05.2024

MODULE - VI MODULES AND PACKAGES**10**

Built-in Modules - User-Defined Modules - Packages: NumPy, Pandas, Scikit learn-Visualization Matplotlib package – Plotting Graphs.

LIST OF EXPERIMENTS:

- Perform Matrix operations using NumPy.
- Perform Dataframe operations using Pandas.
- Use Matplotlib on the dataset and visualize.

TOTAL: 60 PERIODS**TEXT BOOKS:**

- Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
- Anurag Gupta, G.P. Biswas, "Python Programming: Problem Solving, Packages and Libraries", McGrawHill, 2020.

REFERENCES:

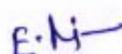
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
- Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
- John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

WEB REFERENCES:

- <http://greenteapress.com/wp/think-python/>
- www.docs.python.org
- <https://nptel.ac.in/courses/106/106/106106182/>

Recommended byBoard of Studies of CSE(A.I.&ML) dept.Meeting No. 04 Dated: 31.05.2024

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 Computer Science and Engineering
 (Artificial Intelligence and Machine Learning)

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

1. Apply computational thinking strategies to formulate algorithms using iteration, recursion for solving real-world problems. (K3)
2. Develop programs that apply decision-making constructs to control logical flow effectively. (K3)
3. Build solutions using arbitrary argument functions, recursive functions, and lambda functions for practical applications. (K3)
4. Make use of problem-solving techniques to manage and manipulate data collections and perform string operations. (K3)
5. Implement file operations with error and exception handling to ensure robust and error-free program execution. (K3)
6. Utilize Python modules like NumPy, Pandas, and Matplotlib for efficient data processing and visualization. (K3)

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

Recommended by

Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/5/2024

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	

Recommended by

Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/8/2024

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

Standards Formulation Process and Challenges:

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

WTO Good Practices for Standardization

World of Standards:

Important Indian and International Standards

TOTAL: 30 PERIODS

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES:

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

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

Recommended by

Board of Studies of H&S dept.
Meeting No. 6 Dated: 31/8/2024

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S. Namendarlal

Chairman

Board of Studies

Department of Humanities & Sciences

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

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

Recommended by

Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/5/2024

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

4

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

MODULE-2 EMBEDDED SYSTEMS, IOT AND ROBOTICS

4

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

MODULE-3 BASICS OF MECHANICAL ENGINEERING

4

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

MODULE 4 ALIGNMENT AND MAPPING OF IDEAS

4

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

MODULE-5 ENTREPRENEURSHIP SKILLS

4

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

MODULE-6 SCOUT for SDG IDEATHON

12

Evaluation Stages:

- First Round
- Second Round
- Idea Pitching

Recommended byBoard of Studies of H&S dept.Meeting No. 6 Dated: 31/5/2024**TOTAL: 30 PERIODS**


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

REFERENCES:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
4. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
5. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
6. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2017.
7. John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.

WEB REFERENCES

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

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Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/5/2024

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Board of Studies
Department of Humanities & Sciences

SEMESTER - III

24BSMA303	PROBABILITY AND STATISTICAL MODELLING	L	T	P	CP	C
SDG NO. 4		3	1	0	4	4

OBJECTIVES:

- The aim of this course is to provide a solid foundation in Probability and Statistics thereby students' master statistical tools and models that are of relevance to various fields of Engineering.

MODULE - I PROBABILITY AND RANDOM VARIABLES 12

Introduction to Probability and Conditional probability - Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

MODULE - II TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions - Covariance - Central limit theorem (for independent and identically distributed random variables).

MODULE - III LINEAR REGRESSION MODELS AND ANALYSIS OF VARIANCE 9

Simple linear regression and correlation, multiple regression and multiple correlation. Test of hypothesis - concept and formulation, Type I and Type II errors, Neyman Pearson lemma (Statement only), Procedures of testing. Analysis of Variance (one-way, two-way with as well as without interaction).

MODULE - IV NON-PARAMETRIC INFERENCE 12

Comparison with parametric inference, use of order statistics, Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test, Spearman's and Kendall's test. Tolerance region.

MODULE - V ESTIMATION 9

Point estimation, criteria for good estimates (unbiasedness, consistency), Methods of estimation including maximum likelihood estimation.

MODULE - VI TIME SERIES ANALYSIS AND FORECASTING 9

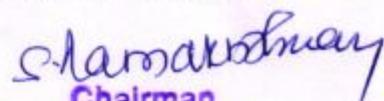
Basics of Time Series: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

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Meeting No. 6 Dated: 31/8/2024

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TOTAL: 60 PERIODS


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 Department of Humanities & Sciences

TEXT BOOKS:

1. Probability and Statistics for Engineers, I. R. Miller, J. E. Freund and R. Johnson, 8th Edition, Prentice Hall India Learning Pvt. Ltd., 2011.
2. Introduction to Probability Models, S. M. Ross, 11th Edition, Academic Press Inc., 2014.
3. 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.
4. The Analysis of Time Series: An Introduction, Chris Chatfield, 6th Edition, Chapman & Hall, 2003

REFERENCES:

1. A first course in Probability, S. M. Ross, 9th Edition, Pearson Education, India, 2013.
2. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D.C. Boes, 3rd Edition, McGraw-Hill Education, 2017.
3. Introduction to Linear Regression Analysis, D. C. Montgomery and E. Peck., 5th Edition, Wiley, 2012.
4. Applied Regression Analysis, N. Draper and H. Smith., 3rd Edition, Wiley-Interscience, 1998.
5. Time Series Analysis, James D. Hamilton, 1st Edition, Princeton University Press, 1994.

WEB REFERENCES:

1. <https://www.stat.berkeley.edu/~aldous/134/gravner.pdf>
2. <https://home.iitk.ac.in/~shalab/regression/Chapter2-Regression-SimpleLinearRegressionAnalysis.pdf>
3. <https://dl.icdst.org/pdfs/files3/22a131fac452ed75639ed5b0680761ac.pdf>
4. <https://otexts.com/fpp2/arima.html>

ONLINE RESOURCES:

1. <https://www.nptel.ac.in/courses/110107113/>
2. <https://nptel.ac.in/courses/103106123/>
3. <https://archive.nptel.ac.in/courses/111/102/111102111/>

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Meeting No. 6 Dated: 31/5/2024

COURSE OUTCOMES

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

1. Apply fundamental concepts of probability, random variables, and probability distributions to solve practical problems. (K3)
2. Apply concepts of joint, marginal, and conditional distributions, covariance, and the Central Limit Theorem to solve problems involving two-dimensional random variables. (K3)
3. Analyze linear regression models and hypothesis testing procedures, including ANOVA, to evaluate data relationships. (K4)
4. Analyze non-parametric inference methods for hypothesis testing when parametric assumptions are violated. (K4)
5. Apply suitable point estimation methods, including maximum likelihood estimation, and evaluate estimators based on properties such as unbiasedness and consistency. (K3)
6. Apply time series data through ARIMA modelling for accurate forecasting and trend analysis. (K3)

CO - PO, PSO MAPPING:

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

SEMESTER - III

24AMPC301 106102220 SDG NO. 4	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	L 3	T 0	P 0	CP 3	C 3
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OBJECTIVES:

- To understand various characteristics of Intelligent agents.
- To learn the different search strategies in AI.
- To learn to represent knowledge in solving AI problems.
- To understand the different ways of designing software agents.
- To know about the various applications of AI.

Recommended by

- To familiarize with advanced topics in AI.

MODULE - I INTRODUCTION

8

Introduction-Definition - History and milestones in AI development - Future of Artificial Intelligence - Trends in AI development - Characteristics of Intelligent Agents - Structure of agents - Typical Intelligent Agents - Problem Solving Approach to Typical AI Problems - Search Strategies- Uninformed-Heuristics-Informed.

MODULE - II PROBLEM SOLVING METHODS

8

Local Search Algorithms and Optimization Problems - Hill Climbing - Simulated Annealing - Genetic Algorithms - Searching with Partial Observations - Constraint Satisfaction Problems - Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games - Alpha - Beta Pruning.

MODULE - III REPRESENTATION OF KNOWLEDGE

7

First Order Predicate Logic - Quantifiers and connectives - Prolog Programming - Unification - Forward Chaining - Backward Chaining - Resolution in FOPL - Resolution - Knowledge Representation - Semantic networks - Ontological Engineering - Ontologies in AI.

MODULE - IV PLANNING

8

Planning - Components of a planning system - Planning problems - STRIPS notation - Simple planning agent - Planning languages - PDDL (Planning Domain Definition Language) - Blocks world - Goal stack planning - Mean Ends Analysis - Non-linear Planning - Conditional planning Reactive planning - Implementation of block world problem.

MODULE - V APPLICATIONS

7

AI applications - Language Models - Information Retrieval - Information Extraction - Natural Language Processing - Robot - Hardware - Perception - Planning - Moving - AI in Autonomous Systems - Self Driving Cars - Sensors and perception - Decision-making systems - Drones - Navigation and control.

MODULE - VI AI CHALLENGES AND OPPORTUNITIES

7

Challenges in AI - Limitations and Open Problems in AI Research - Ethics and Future of AI - Responsible AI - Explainable AI - Challenges Posed by Transparency - Data Integrity Principles.

TOTAL : 45 PERIODS**Recommended by**Board of Studies of CSE(AI&ML) dept.Meeting No. 05 Dated: 17.04.2020

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TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Fourth Edition, 2022.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2009.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

WEB REFERENCES:

1. <https://www.youtube.com/watch?v=5SVXUAFvui4&t=5s>
2. <https://www.geeksforgeeks.org/artificial-intelligence/>
3. <https://www.coursera.org/learn/ai-for-everyone>

ONLINE RESOURCES:

1. <https://www.khanacademy.org/computing/computer-science/algorithms>
2. <https://hai.stanford.edu/>

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

1. Apply AI concepts on evolution, intelligent agents, and search strategies to solve typical problem-solving tasks. (K3)
2. Apply appropriate searching techniques to solve problems with constraint and gaming. (K3)
3. Solve the problem and infer suitable knowledge representation schemes. (K3)
4. Develop planning and apply learning algorithms on block world problems. (K3)
5. Utilize the effectiveness of AI applications including robotics, natural language processing. (K3)
6. Identify the ethical, societal, and technical challenges of AI technologies. (K3)

Recommended by

Board of Studies of CSE (AI&ML) dept.
Meeting No. 05 Dated: 17.04.2025

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CO - PO, PSO MAPPING:

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

SEMESTER - III

24AMPC302 106106145 SDG NO. 4 & 9	FOUNDATIONS OF DATA STRUCTURES AND ALGORITHM DESIGN	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To analyze algorithm efficiency using time, space and recurrence-solving methods.
- To understand and apply linear data structures like List, stacks, queues and their applications.
- To perform operations on tree-based data structures including binary trees, AVL trees, splay trees and red-black trees.
- To represent graphs and apply traversal, shortest path, and minimum spanning tree algorithms effectively.
- To be able to incorporate various searching and sorting techniques in real time scenarios.
- To learn hashing, collision resolution, and rehashing techniques.

MODULE - I ALGORITHM ANALYSIS

7

Importance of algorithms and data structures-Fundamentals of Algorithm Analysis: Space and Time complexity of an algorithm- Types of Asymptotic Notations and its properties – Analysis of non-recursive and recursive algorithms- Solving Recurrence Relations: Substitution method, Master method and recursive Tree method.

MODULE - II LINEAR DATA STRUCTURES

8

Abstract Data Types (ADTs) – List ADT- Linked List Implementation: singly linked lists- circularly linked lists- doubly-linked lists –Applications of lists: Polynomial Manipulation - All operations (Insertion, Deletion, Merge,

Traversal)-Stack ADT - Operations-Evaluating arithmetic expressions-Conversion of Infix to postfix expression - Queue ADT - Operations - Circular Queue - Applications of Queues.

MODULE - III NON-LINEAR DATA STRUCTURES - TREES

7

Tree ADT: Terminologies in Tree Data Structure - Operations in Tree ADT- Tree Traversals: Inorder, Preorder, Postorder -Binary Tree ADT- Operations in Binary Tree ADT - Binary Search Trees- Operations in Binary Search Tree - AVL Trees: Key Properties of AVL Trees- Operations in AVL Trees (Insertion, Deletion) -Splay Trees (Insertion, Deletion, Searching)-Red-Black Trees and its operations.

MODULE - IV NON-LINEAR DATA STRUCTURES - GRAPHS

8

Graph Terminologies – Representation of Graph: Set, Linked and Matrix Representation – Graph Traversals: Breadth-first traversal (BFS), Depth first traversal (DFS) – Shortest Path Problem: Floyd-Warshall Algorithm, Dijkstra's Algorithm - Minimum Spanning Tree: Prim's Algorithm, Kruskal's Algorithm.

MODULE - V SEARCHING AND SORTING

7

Searching: Linear Search, Binary Search. Sorting: Insertion sort, Selection sort, Bubble sort, Quick sort - Merge Sort - Analysis of Sorting Algorithms.

MODULE - VI HASHING

8

Hashing: Hash Functions -Collision resolution strategies- Separate Chaining – Open Addressing: Linear Probing, Quadratic Probing, Double Hashing-Closed Hashing – Rehashing- Extendible Hashing.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, Data Structures & Algorithms in Python, John Wiley & Sons Inc., 2021.
2. Anany Levitin, "Introduction to design and analysis of algorithms",3rd Edition, Pearson Education,2017.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.
2. Mark Allen Weiss, –Data Structures and Algorithm Analysis in C++[], Fourth Edition,Pearson Education, 2014.
3. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.

Recommended by

WEB REFERENCES:

1. <https://www.geeksforgeeks.org/c-language-set-1-introduction/>
2. <https://www.codechef.com/certification/data-structures-and-algorithms/prepare>
3. <https://www.w3schools.in/data-structures-tutorial/intro/>

ONLINE RESOURCES:

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

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

1. Apply algorithmic analysis using time, space, and recurrence-solving methods to improve computational efficiency.(K3)
2. Use lists, stacks, and queues to develop efficient problem-solving programs.(K3)
3. Utilize tree structures to organize and retrieve hierarchical data effectively in programming tasks.(K3)
4. Apply graph algorithms to determine connectivity and optimal paths in network problems.(K3)
5. Analyze searching and sorting algorithms to evaluate their efficiency for various data-handling scenarios in real-time applications. (K4)
6. Apply hashing, collision resolution, and rehashing techniques to ensure efficient data access and storage. (K3)

CO - PO, PSO MAPPING:

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

Recommended by

Board of Studies of CSE(AI&ML) dept.
Meeting No. 05 Dated: 19.04.2025

SEMESTER - III

24AMPC303 106106144 SDG NO. 4, 9	OPERATING SYSTEM	L T P CP C 3 0 0 3 3
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OBJECTIVES:

- To apply core concepts and functions of operating systems in practical contexts.
- To analyze process management and evaluate CPU scheduling algorithms.
- To demonstrate deadlock scenarios and analyze prevention and avoidance strategies.
- To analyze various memory management techniques and their performance.
- To apply knowledge of file systems and their organizational methods.
- To analyze the architecture and features of Mobile OS and Linux systems.

MODULE - I OVERVIEW

7

Introduction to Operating Systems – Operating System Operations – Resource Management – Virtualization - Operating System Structures: Operating System Services – User and Operating System Interface – System Calls – System Services - Operating System Structure – Building and Booting an Operating System.

MODULE - II PROCESS MANAGEMENT

8

Processes: Process Concept – Process Scheduling – Operations on Processes – Inter process Communication - IPC in Shared-memory Systems - IPC in Message-Passing Systems – Threads: Overview – Multithreading models – CPU Scheduling: Basic Concepts - Scheduling Criteria – Scheduling Algorithms.

MODULE - III PROCESS SYNCHRONIZATION

8

Synchronization Tools: The Critical Section Problem – Peterson's Solution – Hardware support for Synchronization – Mutex Locks – Semaphores – Monitors - Synchronization Examples: Classic Problems of Synchronization – Deadlocks: Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

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MODULE - IV MEMORY MANAGEMENT

7

Main Memory: Background - Contiguous Memory Allocation - Paging - Structure of the Page Table - Swapping - Example: Intel 32-bit and 64-bit Architectures - Virtual Memory: Background - Demand Paging - Copy-on-Write - Page Replacement - Allocation of Frames - Thrashing.

MODULE - V STORAGE MANAGEMENT AND FILE SYSTEM

8

Mass Storage Structure: Overview of Mass-Storage Structure - HDD Scheduling - NVM scheduling - Swap-Space Management - File-System Interface: File Concept - Access Methods - Directory Structure - Protection - File-System Implementation: File-System Structures - File-System Operations - Directory Implementation - Allocation Methods - Free-Space Management.

MODULE - VI MOBILE OS AND CASE STUDIES

7

Mobile OS - iOS and Android. The Linux System: Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management - File Systems - Input and Output - Inter process Communication - Network structure - Security.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 10th Edition, Wiley, United States, 2021.

REFERENCES:

1. Andrew S. Tanenbaum, Herbert Bos. "Modern Operating Systems", Pearson, Fifth edition, 2023.
2. William Stallings, Operating Systems: Internals and Design Principles, 9th Edition, Prentice Hall, 2018
3. D. M. Dhamdhere. "Operating Systems: A Concept-Based Approach", 3rd. Edition, Tata McGrawHill, 2017.
4. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems - A Spiral Approach", Tata McGraw Hill Edition, 2010.
5. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

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>

Recommended byBoard of Studies of CSE(AI&ML) dept.Meeting No. 05 Dated: 14.4.2025

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4. <https://www.os-book.com/OS9/slide-dir/>
5. <http://web.iitd.ac.in/~minati/MTL458.html>

ONLINE RESOURCES:

1. <https://www.udacity.com/course/introduction-to-operating-systems--ud923>
2. <https://freevideolectures.com/course/3670/introduction-to-operatingsystems>

OUTCOMES

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

1. Apply the basic concepts and functions of the operating system to real-world scenarios. (K3)
2. Make use of process and CPU scheduling concepts to solve problems in process execution and synchronization. (K3)
3. Identify the deadlock conditions along with prevention and avoidance techniques. (K3)
4. Solve memory management problems using paging, segmentation, and virtual memory techniques. (K3)
5. Implement file-system structures and storage management techniques for efficient data access. (K3)
6. Analyze the design and key components of mobile and Linux OS, including process, memory, and file management. (K4)

CO – PO, PSO MAPPING:

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

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Meeting No. 05 Dated: 17.04.2025

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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.
7. Understanding human being as a co-existence of the sentient 'I' and the material Body

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

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

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

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

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

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

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

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

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

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

MODULE - VI UNIVERSAL HUMAN ORDER (4+3)

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

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Int'l. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. **Recommen**ded by - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj- Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda- Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOMES

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

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

CO - PO, PSO MAPPING:

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

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Board of Studies of CSE(AI&ML) dept.
Meeting No. 05 Dated: 17.04.2025

SEMESTER - III

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

ARMY WING

PERSONALITY DEVELOPMENT

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

LEADERSHIP

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

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

EA1 Environmental Awareness and Conservation 3

GENERAL AWARENESS

GA1 General Knowledge 4

ARMED FORCES 6

AE1 Armed Forces Army CAPE Police 6

ADVENTURE 1

AD1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS

BCA 1 History Geography & Topography of Border/Coastal areas

TOTAL: 45 PERIODS

Recommended by
Board of Studies of HVS dept.
Meeting No. 6 Dated: 31/8/2004

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

NAVAL WING**PERSONALITY DEVELOPMENT****9**

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

LEADERSHIP 7

L2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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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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NAVAL ORIENTATION 6

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

ADVENTURE 1

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

BCA 1	History, Geography & Topography of Border/Coastal areas	2
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TOTAL: 45 PERIODS**Recommended by**

Board of Studies of HAS dept.
 Meeting No. 6 Dated: 31/5/2024

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

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

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
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DISASTER MANAGEMENT**13**

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

ENVIRONMENTAL AWARENESS & CONSERVATION**3**

EA 1	Environmental Awareness and Conservation
------	--

3

GENERAL AWARENESS**4**

GA 1	General Knowledge
------	-------------------

4

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

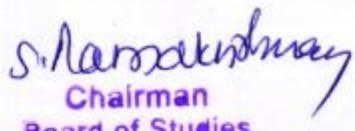
AD 1	Introduction to Adventure Activities
------	--------------------------------------

1

BORDER & COASTAL AREAS**2**

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

TOTAL :45 PERIODS**Recommended by**Board of Studies of PHS dept.Meeting No. 6 Dated: 31/5/2024

 S. Namakkal Murugai

 Chairman
 Board of Studies
 Department of Humanities & Sciences

SEMESTER - III

24AMPL302 - SDG NO. 4 & 9	DATA STRUCTURES AND ALGORITHM DESIGN LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To implement fundamental data structures like linked lists, stacks, queues, trees, and graphs in Python.
- To construct and manage binary search trees and AVL trees with self-balancing capabilities.
- To develop graph traversal methods using BFS and DFS with adjacency structures.
- To apply Prim's and Dijkstra's algorithms for minimum spanning tree and shortest path problems.
- To perform sorting, and searching using efficient algorithms.
- To demonstrate hashing with collision handling using linear and quadratic probing methods.

LIST OF PROGRAMS

Implement the following programs

1. Implement a Python program to perform addition, subtraction, and multiplication of two polynomials represented as linked lists.
2. Write a Python program to implement a stack using lists with push(), pop(), peek(), isEmpty() and handle underflow errors.
3. Write a Python program to evaluate a postfix expression using a stack, supporting integers and the operators +, -, *, and /.
4. Implement a queue data structure in Python using a custom singly linked list. Include operations such as enqueue(), dequeue(), isEmpty(), and display().
5. Write a Python program to implement a binary search tree with operations for inserting, deleting, and searching for elements.
6. Implement an AVL tree (a self-balancing binary search tree) in Python, with node insertion and automatic balancing using rotations to maintain the AVL property.
7. Write a Python program to represent a graph using an adjacency list or matrix, and implement both Breadth-First Search (BFS) and Depth-First Search (DFS) traversal methods.
8. Implement Prim's algorithm in Python to find the Minimum Spanning Tree of a weighted, undirected graph.

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- Implement Dijkstra's algorithm to find the shortest path from a starting node to all other nodes in a graph with non-negative edge weights.
- Write a Python program to implement Bubble sort, Selection sort, Insertion sort Algorithms.
- Write a Python program to implement Linear Search and Binary Search, with input validation (e.g., ensuring sorted input for binary search) and returning the index of the searched element if found.
- Write a program to implement Linear Probing and Quadratic Probing for inserting and searching elements.

TOTAL: 45 PERIODS

OUTCOMES

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

- Implement and apply linear and non-linear data structures such as stacks, queues, linked lists, trees, and graphs in solving computing problems. (K3)
- Apply searching and sorting techniques to solve problems efficiently, and evaluate their performance in different scenarios. (K4)
- Analyze real-world problems and design suitable data structure-based solutions with optimized algorithmic approaches. (K4)

LAB REQUIREMENTS:

Operating System: Windows 10 or above

IDE: VS Code, PyCharm, Jupyter Notebook (For Python)

Interpreter: Python 3.8

CO – PO, PSO MAPPING:

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

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Meeting No. 05 Dated: 17-04-2025

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Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

SEMESTER - III

24AMPT301 106104135 SDG NO. 4 & 9	DATABASE MANAGEMENT SYSTEMS LABORATORY WITH THEORY	L T P CP C 1 0 4 5 3
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OBJECTIVES:

- To design a database using ER diagrams, convert them to Relational Databases and to write SQL Queries.
- To learn SQL and normalization techniques for efficient database design.
- To understand the fundamental concepts of Transaction Processing, Concurrency Control techniques, and Recovery procedures.
- To understand file organization, indexing, and hashing techniques for efficient data storage and retrieval
- To explore distributed and object-oriented databases, focusing on architecture, data storage, and advanced query languages
- To study query processing, optimization techniques, and explore XML databases, including XML schema and Xquery.

MODULE - I DATABASE DESIGN

10

Purpose of Database System – Views of Data – Database System Architecture – Data Models – Entity Relationship Model – ER Diagrams – Enhanced ER Model – Introduction to Relational Databases – Relational Model – ER-to-Relational Mapping – Keys – Relational Algebra.

List of Experiments:

- a) Data Definition Language - Create, Describe, Alter, Truncate, Drop
 - i) Create the employee table with the following columns (EMP ID, EMP NAME, EMP AGE)
 - ii) Use a command to describe the structure of the employee's table.
 - iii) Write an SQL statement to alter the employees table to add a new column salary.
 - iv) Use a command to truncate the employees table, removing all rows but keeping the structure intact.
 - v) Write a command to drop the employees table completely from the database.
- b) Data Manipulation Language - Insert, Select, Update, Delete
 - i) Write an SQL command to insert a new student with (ID, NAME and GRADE)

Recommended by _____ to retrieve all records from the student's table.

- iii) Write an SQL command to update the grade of the student with ID.
- iv) Write an SQL command to delete the student record with their NAME.

- c) Transaction Control Language - Commit, Rollback, and Savepoint
 - i) Insert a new ID and name and Set a SAVEPOINT after the insertion.
 - ii) Insert another ID and name. Note that the second insertion was a mistake, so ROLLBACK to the savepoint.
 - iii) COMMIT the transaction to make the first insertion permanent in the database.

MODULE - II RELATIONAL DATABASES

10

SQL Fundamentals – Advanced SQL features – Embedded SQL – Dynamic SQL – Functional Dependencies – Non-loss Decomposition – First – Second – Third Normal Forms - Dependency Preservation – Boyce/Codd Normal Form – Multi Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

List of Experiments:

Database Querying:

- a) Write simple SQL queries to perform the following
 - i) Retrieve all the records from the student's table.
 - ii) Display only the name and grade of each student.
 - iii) Select all students who have scored more than 80.
 - iv) Display all student records sorted by grade in descending order.
 - v) Retrieve only the first two records from the table.

- b) Nested Queries
 - i) Retrieve the employee(s) who earn the highest salary in the company using a subquery.
 - ii) Display the names and salaries of employees whose salary is above the average salary of all employees.
 - iii) Find the department(s) where the lowest salary is paid, using a nested query
 - iv) List all employees whose department_id is found in a list of departments where at least one employee earns more than 100000, using a multi-row subquery

- c) Joins (Inner Join, Left Join, Right Join, Full Join, Cross Join)
 - i) Write a SQL query to list the names of all employees along with their department names, only for those employees who have a corresponding department in the departments table. Use an INNER JOIN.

ii) **Rewritten SQL query** to retrieve a list of all employees and their department

names. If an employee does not belong to any department, show the department name as NULL. Use a LEFT JOIN.

- iii) Write a SQL query to list all departments along with the names of employees working in those departments. If a department has no employees, display NULL for employee names. Use a RIGHT JOIN.
- iv) Write a SQL query to list all employees and all departments, even if some employees are not assigned to a department and some departments have no employees. Use a FULL OUTER JOIN.
- v) Write a SQL query to list all possible combinations of employee names and department names from the employees and departments tables. Use a CROSS JOIN

MODULE - III TRANSACTIONS

10

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.

List of Experiments:

- a) Write a SQL program for adding two numbers and displaying the sum.
- b) Write a SQL program to print a series of "n" numbers using for loop.
- c) Write a SQL program to print a series of "n" numbers using while loop.

MODULE - IV IMPLEMENTATION TECHNIQUES

10

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ Tree Index Files – B Tree Index Files – Static Hashing – Dynamic Hashing

List of Experiments:

- a) Write a SQL program for debiting an amount from an entry in a table
- b) Write a SQL program to determine the sum of a series of n numbers.
- c) Write a SQL program to determine the factorial of the given number.

MODULE - V DATABASE MODELS

10

Distributed Databases – Architecture – Data Storage – Transaction Processing – Object-Based Databases – Object Database Concepts – Object Relational Features – ODMG Object Model – ODL – OQL

List of Experiments:

- a) Write a SQL program for reversing a string using the for loop.
- b) Write a SQL program to implement Fibonacci series.

c) Write a SQL program for displaying a particular attribute from a table.

MODULE - VI ADVANCED TOPICS**10**

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation - XML Databases - XML Hierarchical Model-DTD-XML Schema-XQuery.

List of Experiments:

- Mini Project (Banking System) Connect Oracle Database from Visual Basic for Banking System.

TOTAL: 60 PERIODS**LAB REQUIREMENTS**

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

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

TEXT BOOKS:

- Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.
- Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2022.

REFERENCES:

- Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", Seventh Edition, McGraw-Hill Education, 2019.
- Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill Education, 2015.

WEB REFERENCES:

- https://swayam.gov.in/nd1_noc19_cs46/
- <http://www.nptelvideos.in/2012/11/database-management-system.html>
- <https://www.classcentral.com/course/swayam-database-management-system-9914>
- <https://www.w3schools.com/sql/default.asp>
- <https://www.khanacademy.org/computing/computer-programming/sql>

OUTCOMES

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

- Apply database concepts to design ER models, map entities to relational schemas, and implement the design using SQL. (K3)

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 (Artificial Intelligence and Machine Learning)

2. Select and apply normalization techniques and functional dependencies to enhance and optimize relational database design. (K3)
3. Utilize SQL queries for transaction processing and apply concurrency control mechanisms based on ACID properties. (K3)
4. Apply query processing and optimization strategies, including relational algebra and heuristic rules to improve SQL execution efficiency. (K3)
5. Identify appropriate indexing and hashing methods, such as B-Tree and B+ Tree, for efficient organization and retrieval of database records. (K3)
6. Analyze query optimization and XML database concepts to enhance the design and performance of applications like a banking system. (K4)

CO - PO, PSO MAPPING:

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

SEMESTER - III

24AMTP301 - 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

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MODULE - II QUANTITATIVE ABILITY AND REASONING ABILITY 16
 Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

MODULE - III VERBAL ABILITY 7
 Verbal Analogy – Vocabulary building – Sentence Structures - Comprehension – correct usage of words – Error deduction

TOTAL: 45 PERIODS

REFERENCES:

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

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

OBJECTIVES:

- Familiarize the team and leadership skills.
- Gain Scouting spirit.
- Understand the standards relevant to AI&ML.

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.

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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.

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]

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CO - PO, PSO MAPPING:

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

SEMESTER - III

24AMID301 - 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.

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COURSE METHODOLOGY:

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

EVALUATION:

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

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

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Apply entrepreneurial thinking to identify and articulate real-world problems and explore market needs using structured approaches. (K3)
2. Develop skill sets to design potential solutions and validate market opportunities within realistic constraints. (K4)

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3. Evaluate sustainable, ethical, and responsible innovation strategies, and communicate business models effectively. (K5)

CO – PO, PSO MAPPING:

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

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Meeting No. 05 Dated: 17.04.2025

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SEMESTER - IV

24BSMA407 - SDG NO. 4	LINEAR ALGEBRA AND ITS APPLICATIONS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To learn about solving system of linear equations using matrices
- To learn about vector spaces, subspaces, basis and dimension of Vector Spaces
- To learn about the Linear transformation and the matrix representation and diagonalizability
- To learn about the inner product Spaces, orthogonalization and Least Square Approximations
- To learn about the applications of singular value decomposition and principal component analysis in data science.

MODULE - I SOLUTION OF SYSTEM OF LINEAR EQUATIONS

9

Rank of a matrix.- Solution of systems of Linear Equations using Gaussian elimination and LU Decomposition

MODULE-II VECTOR SPACES

9

9
Field (definitions and examples) - Vector Spaces(definitions and examples) - Subspaces(definitions and examples) - Linear Combinations and system of linear equations - Linear Dependence and Linear Independence of Vectors - Bases and Dimensions

MODULE-III LINEAR TRANSFORMATIONS

12

LINEAR TRANSFORMATIONS 12

Linear Transformations - Null spaces and ranges - Dimension Theorem(Statement Only) - Matrix of a Linear Transformation - Eigen Values and Eigen Vectors - Diagonalizability-Test for Diagonalization

MODULEN-IV INNER PRODUCT SPACES 13

10.4 INNER PRODUCT SPACES 12

Introduction - Inner Product Spaces - orthogonality - Gram Schmidt Orthogonalization Process (without proof) - QR decomposition

MODULE-V ADJOINT OPERATORS

9

MODULE V ADJOINT OPERATORS 9

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MODULE - VI APPLICATIONS OF LINEAR ALGEBRA

9

Singular value decomposition - Principal component analysis - Introduction to their applications in Data Science.

TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.
2. Linear Algebra, Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, 5th edition, Pearson, 2018.

REFERENCES:

1. Advanced Engineering Mathematics, Peter V. O'Neil, 7th edition, Cengage Learning, 2011.
2. Advanced Engineering Mathematics, Michael D. Greenberg, 2nd edition, Pearson, 1998.
3. Introduction to linear algebra, Gilbert Strang, 5th edition, Wellesley-Cambridge Press, 2016.
4. Applied Mathematics (Vol. I & II), P. N. Wartikar & J. N. Wartikar, 1st edition, Pune Vidyarthi Griha Prakashan, 1985.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/111106135/>
2. https://swayam.gov.in/nd1_noc20_ma08/preview

ONLINE RESOURCES:

1. <https://freevideolectures.com/course/3382/linear-algebra-iLinear-Algebra> | Khan Academy
2. Singular Value Decomposition (SVD), Demystified | Towards Data Science
3. Principal Component Analysis Made Easy: A Step-by-Step Tutorial | Towards Data Science

COURSE OUTCOMES

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

1. Apply Gaussian elimination, LU decomposition, and rank computation to solve systems of linear equations. (K3)
2. Analyze vector spaces, subspaces, linear independence, basis, and dimension with examples. (K4)
3. Analyze linear transformations, compute null/range, and evaluate eigenvalues/eigenvectors for diagonalization. (K4)

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4. Apply inner product space concepts, orthogonality, and Gram-Schmidt process for orthonormal basis & QR decomposition. (K3)
5. Analyze least-squares approximations and properties of normal & self-adjoint operators using adjoint concepts. (K4)
6. Apply SVD and PCA for solving problems in data science contexts. (K3)

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	-	-	-	-	-	-	-	-	-	3	3
C06	3	-	-	-	3	-	-	-	-	-	-	3	3

SEMESTER - IV

24AMPC401 - SDG NO. 4	NATURE INSPIRED COMPUTING TECHNIQUES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To introduce students to the foundational concepts of nature-inspired computing.
- To enable them to explore and apply evolutionary algorithms.
- To learn swarm-based algorithms and their applications in problem-solving
- To familiarize with immune-inspired computing techniques.
- To examine the principles and computational potential of DNA computing.
- To know about challenges of nature-inspired algorithms.

MODULE - I INTRODUCTION

8

From Nature-to-Nature Computing, Philosophy, Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity, Interactivity, Adaptation Feedback - Self-Organization - Complexity, Emergence and, Bottom-up Vs Top - Down - Determination, Chaos and Fractals.

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MODULE - II COMPUTING INSPIRED BY NATURE 8

Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm - Genetic Algorithms, Reproduction - Crossover, Mutation Techniques, Evolutionary Programming, Genetic Programming.

MODULE - III SWARM INTELLIGENCE 8

Introduction - Ant Colonies, Ant Foraging Behavior - Positive feedback mechanisms Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics - Principles of distributed robotics, Foraging for food, Social Adaptation of Knowledge, Particle Swarm Optimization (PSO) - Velocity and position updates.

MODULE - IV IMMUNO COMPUTING 7

Introduction- Immune System - Anatomy and physiology of immunity, Physiology and main components, Pattern Recognition and Binding, Immune Network Theory- Danger Theory, Evaluation Interaction Immune Algorithms, Introduction - Genetic algorithms, Bone Marrow Models, Forest's Algorithm, Artificial Immune Networks.

MODULE - V COMPUTING WITH NEW NATURAL MATERIALS 7

DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers - Models and theoretical foundations, PAM Model, Splicing Systems, Lipton's Solution to SAT Problem, Scope of DNA Computing, From Classical to DNA Computing.

MODULE - VI APPLICATIONS IN NATURE INSPIRED COMPUTING 7

Applications in Optimization – Robotics and AI - Adaptive behavior and decision-making, Ensemble and Hybrid approaches – Real World Applications: Case Studies - Challenges and Future Directions - Scalability, Ethical and Environmental considerations - Impact on society and ecosystems.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall / CRC, Taylor and Francis Group, First Edition, 2006.

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REFERENCES:

1. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, Second Edition, 2023.
2. Albert Y. Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
3. Marco Dorigo, Thomas Stutzle, "Ant Colony Optimization", PHI, 2004.

WEB REFERENCES:

1. <https://link.springer.com/book/10.1007/978-3-319-50920-4>
2. <https://www.computersciencedegreeshub.com/faq/what-is-nature-inspired-computing/>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4675795/>

ONLINE RESOURCES:

1. <https://www.nature.com/natmachintell/>
2. <https://ai.stanford.edu/>

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

1. Identify the core concepts of nature-inspired computing techniques and explain their significance in solving complex problems. (K3)
2. Utilize knowledge of genetic algorithm operators and interpret genetic programming processes. (K3)
3. Apply the concepts of Ant Colony Optimization (ACO) and Particle Swarm Optimization (PSO) to solve practical optimization problems. (K3)
4. Model the functioning of the immune system and its relevance to immune computing, including pattern recognition and immune algorithms. (K3)
5. Build solutions using DNA computing principles to address computational problems. (K3)
6. Examine real-world applications using nature-inspired techniques in fields such as optimization, robotics, and AI. (K4)

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CO – PO, PSO MAPPING:

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

SEMESTER - IV

24AMPC402 106105183 SDG NO. 4 & 9	COMPUTER NETWORKS AND SECURITY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the basics of building communication networks and protocol layering.
- To familiarize in physical communication and data link protocols.
- To learn the functions of the network layer and its various routing protocols.
- To discuss transport and application layer services.
- To illustrate concepts of Security and its Protocols.
- To explore the roles of OSI layers and gain the knowledge of network security.

MODULE - I INTRODUCTION TO PHYSICAL LAYER

8

Evolution of Data Communication and Networks – Transmission Modes: Topology – The OSI model – TCP/IP Protocol suite – Transmission Fundamentals: Data and Signals – Analog and Digital transmission – Physical Layer: Transmission Medium: Guided and Unguided – Switching: Circuit and Packet Switching.

MODULE - II DATA LINK LAYER

8

Introduction: Data link Layer Services – Data Link Control: Flow control and Error Control – Framing – Error Detection and Correction – Media Access control – Local Area Network: Ethernet – Wi-Fi – IEEE 802.11 – Bluetooth –

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Zig-bee - Wide Area Networks: Cable Networks – Cellular Communication – Satellite Communication.

MODULE - III NETWORK LAYER

8

Introduction: Network Layer Services – Internetwork Protocol (IP) – Packet Switching – Performance – IPV4 & IPV6: Addressing and Protocols – Internet Control Message Protocol – Routing Algorithms: Distance Vector Routing: Routing Table – Link state Routing: Dijkstra Algorithm- Internet Group Message Protocol.

MODULE - IV TRANSPORT LAYER

7

Introduction: Transport Layer Services: End-to-End Delivery- Addressing – Flow Control – Connection: Connection-Oriented and Connectionless – Transport Protocol Data Unit (TPDU) – Transport Layer Protocols: User Datagram protocol (UDP) – Transmission Control Protocol (TCP) – Stream Control Transmission Protocol.

MODULE - V UPPER OSI LAYER

7

Introduction: Services – Session Layer: Synchronization – Session Protocol Data Unit – Presentation Layer: Translation – Encryption/ Decryption – Data Compression – Application Layer: Client/Server Paradigm, World Wide Web and HTTP – File Transfer Protocol – TELNET – DNS – Socket Interfacing.

MODULE - VI CRYPTOGRAPHY AND NETWORK SECURITY

7

Introduction – Confidentiality: Symmetric and Asymmetric Key Ciphers – Key Aspects of Security – Network Layer Security: Protocols – Modes – Security Association – IKE – VPN – Transport Layer Security – protocols – SSL Architecture – Application Layer Security – Firewall – Email – PGP.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data communications and networking with TCP/IP protocol suite", Sixth Edition, McGraw Hill, cop. 2022.
2. Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall, "Computer Networks", 6th edition, Pearson Education, 2022.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. Nader F. Mir, "Computer and Communication Networks", Second Edition Prentice Hall, 2014.

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3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
5. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2014.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc20_cs23/preview
2. https://onlinecourses.swayam2.ac.in/cec21_cs19/preview

OUTCOMES

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

1. Use the basic concepts of computer networks and layered communication architecture to support effective data communication.(K3)
2. Utilize data link and media access control functionalities to ensure reliable node-to-node transmission. (K3).
3. Apply routers, IP addressing, and routing algorithms to enable efficient packet forwarding.(K3)
4. Identify transport layer services and infer UDP and TCP protocols to facilitate end-to-end delivery.(K3).
5. Analyze the functionalities of the application layer to evaluate network-based services. (K4).
6. Select application layer security components such as firewalls, secure email, and PGP to support secure application communication. (K3)

CO – PO, PSO MAPPING:

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

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Meeting No. 05 Dated: 17.09.2025

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SEMESTER - IV

24AMPW401 106106139 SDG NO. 4 & 9	MACHINE LEARNING TECHNIQUES WITH LABORATORY	L T P CP C 3 0 2 5 4
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OBJECTIVES:

- To teach the theoretical foundations of various machine learning techniques.
- To learn the dimensionality reduction techniques for feature engineering.
- To know about the data pre-processing and feature engineering approaches.
- To understand the supervised classification and regression algorithms for solving real-world problems.
- To apply the clustering algorithm techniques for solving real-world problems.
- To explore Unsupervised learning and clustering methods.

MODULE - I INTRODUCTION TO PATTERN RECOGNITION AND MACHINE LEARNING

7

Machine Perceptron – Pattern Recognition Systems – Design Cycle – Introduction to Machine Learning – Essential concepts of ML – Types of learning: Supervised – Unsupervised – Reinforcement Learning – Applications of Machine Learning Techniques in Healthcare – Finance – Education – Computer Vision – Challenges in Machine Learning – State of Art Languages /Tools in Machine Learning.

MODULE - II DECISION THEORY & DIMENSIONALITY REDUCTION TECHNIQUES

8

Bayesian Decision Theory – Bayesian Networks – Association rule – Problems of Dimensionality – Dimensionality Reduction Techniques- Component Analysis and Discriminants: Principal Component Analysis (PCA) – Linear Discriminant Analysis (LDA) – Independent Component Analysis (ICA) – t-distributed Stochastic Neighbor Embedding (t-SNE).

MODULE - III DATA AND FEATURE ENGINEERING

8

Basic types of data – Numerical data – Categorical data – Data Quality and Remediation – Data Pre-processing – Training the models – Performance Evaluation – Fine-tuning model performance. Introduction to Feature Engineering – Feature construction – Feature extraction – Feature subset selection.

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MODULE - IV SUPERVISED MACHINE LEARNING CLASSIFICATION 8

Introduction to classification – Naïve Bayes – K-Nearest Neighbors – Decision Tree: CART & ID3 – Support Vector Machine: Kernel functions – Ensemble Learning: Random Forest – AdaBoost – eXtreme Gradient Boosting – Light Gradient Boosting Machine – Categorical Boosting – Introduction to scikit-Learn- Hyperparameter Tuning.

MODULE - V SUPERVISED MACHINE LEARNING REGRESSION 7

Introduction to Regression – Assumptions in Regression Analysis – Simple Linear Regression – Multiple Linear Regression – Improving Accuracy of Linear Regression Models – Polynomial Regression – Ridge regression – Lasso regression – Elastic Net Regression – Hyperparameter Tuning.

MODULE - VI UNSUPERVISED LEARNING 7

Introduction to Clustering – Unsupervised Vs Supervised – Applications of Unsupervised – Different types of Clustering – Partitioning based methods: K means – Fuzzy C-means clustering – K-Medoids – Hierarchical Clustering: Divisive and Agglomerative – Density-Based Clustering (DBSCAN).

TOTAL : 45 PERIODS

List of Experiments: 10

- 1) Explore Numpy and Pandas libraries for data pre-processing techniques such as handling missing data and outliers, encoding to prepare data for machine learning models.
- 2) Implement Linear Regression to predict a continuous target variable and explore how Multiple Linear Regression can capture the relationship between multiple predictors and the target. Use GHI dataset to perform model training, validation, and performance evaluation.
- 3) Apply Polynomial Regression to model non-linear relationships between the input variables and the target variable. Investigate how the degree of the polynomial impacts the model's ability to fit GHI data, avoiding overfitting or underfitting.
- 4) Learn how to apply Naïve Bayes and K-Nearest Neighbors (KNN) supervised learning techniques to identify Level of experience.
- 5) Implement a Decision Tree classifier technique to identify whether the cars require service or not and Plot the confusion Matrix using seaborn library.
- 6) Implementation of Support Vector Machine technique to identify user behavior classes and Plot the confusion Matrix using seaborn library.
- 7) Apply the Random Forest algorithm to identify Classification of users based on driving habits (e.g., Commuter, Long-Distance Traveler) and Plot the confusion Matrix using seaborn library.

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- 8) Implementation of AdaBoost technique to Classify loan approval and loan not approval and Plot the confusion Matrix using seaborn library.
- 9) Implementation of XGBoost and LightGBM technique to Classify Waitlist and admit in Wharton Class of 2025's statistics and Plot the confusion Matrix using seaborn library.
- 10) Implementation of K-means and Hierarchical Clustering on customer segmentation dataset and plot the elbow and dendrogram for k-means and Hierarchical clustering respectively.

TOTAL: 15 PERIODS

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", Fourth Edition, MIT Press, 2020.
2. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das "Machine Learning", First Edition, Wiley, 2018.

REFERENCES:

1. Christopher Bishop, "Pattern recognition and machine learning", Springer, 2007.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
3. Kevin Murphy, "Machine learning: a probabilistic perspective", MIT Press, 2012.
4. Charu C. Aggarwal, Data Classification Algorithms and Applications, CRC Press, 2014
5. Tom Mitchell, Machine Learning, McGraw Hill, 3rd Edition, 1997.
6. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

WEB REFERENCES:

1. <https://www.geeksforgeeks.org/machine-learning/>
2. https://onlinecourses.nptel.ac.in/noc22_cs97/preview
3. <https://archive.nptel.ac.in/courses/106/106/106106139/>

OUTCOMES

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

1. Utilize appropriate machine learning techniques to solve real-world problems across various domains. (K3)
2. Apply the dimensionality reduction techniques to reduce data complexity

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3. Make use of data preprocessing and feature engineering techniques to refine datasets for better model performance. (K3)
4. Select suitable supervised classification algorithms to effectively address real-world problem scenarios. (K3)
5. Examine supervised regression methods and assess their performance for predictive modelling tasks. (K4)
6. Analyze clustering algorithms to uncover patterns and groupings in unlabeled data. (K4)

CO - PO, PSO MAPPING:

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

SEMESTER - IV

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

ARMY WING

PERSONALITY DEVELOPMENT	9
PD 3 Group Discussion: Team Work	2
PD 4 Career Counselling, SSB Procedure & Interview Skills	3
PD 5 Public Speaking	4

BORDER & COASTAL AREAS	4
BCA 2 Security Setup and Border/Coastal management in the area	2
BCA 3 Security Challenges & Role of cadets in Border management	2

ARMED FORCES3

AF 2 Modes of Entry to Army, CAPF, Police	3
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Meeting No. 6 Dated: 31/8/2024

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COMMUNICATION	3
C1 Introduction to Communication & Latest Trends	3
INFANTRY	3
INF 1 Organisation of Infantry Battalion & its weapons	3
MILITARY HISTORY	23
MH 1 Biographies of Renowned Generals	4
MH 2 War Heroes - PVC Awardees	4
MH 3 Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4 War Movies	6
TOTAL: 45 PERIODS	
NAVAL WING	
PERSONALITY DEVELOPMENT	9
PD 3 Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5 Public Speaking	3
LEADERSHIP 7	
L2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
DISASTER MANAGEMENT	13
DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3 Fire Service & Fire Fighting	1
ENVIRONMENTAL AWARENESS & CONSERVATION	3
EA 1 Environmental Awareness and Conservation	3
GENERAL AWARENESS	4
GA 1 General Knowledge	4
NAVAL ORIENTATION 6	
AF 1 Armed Forces and Navy Capsule	3
EEZ 1 EEZ Maritime Security and ICG	3

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Meeting No. 6 Dated: 31/5/2024

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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**

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

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

A 1	Airmanship	1
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BASIC FLIGHT INSTRUMENTS

FI 1	Basic Flight Instruments	3
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AERO MODELLING

AM 1	Aero Modelling Capsule	3
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GENERAL SERVICE KNOWLEDGE

GSK 4	Latest Trends & Acquisitions	2
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AIR CAMPAIGNS

AC 1	Air Campaigns	6
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PRINCIPLES OF FLIGHT

PF 1	Principles of Flight	3
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PF 2	Forces acting on Aircraft	3
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NAVIGATION

NM 1	Navigation	2
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NM 2	Introduction to Met and Atmosphere	3
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Meeting No. 6 Dated: 31/8/2019

TOTAL :45 PERIODS

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SEMESTER - IV

24AMPT401 106106156 SDG NO. 4 & 9	WEB DEVELOPMENT FRAMEWORK LABORATORY WITH THEORY	L T P CP C 1 0 4 5 3
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OBJECTIVES:

- To apply HTML and CSS to design and develop interactive web pages.
- To use scripting languages like JavaScript to design interactive and dynamic web pages.
- To analyze the features and applications of Node.js for efficient web application development.
- To develop applications using MongoDB for efficient data storage and retrieval.
- To understand the role of Express and React in the development of modern web applications.
- To design and implement full-stack web applications using the MERN stack.

MODULE - I WEB PAGE DESIGNING

10

HTML – Form Elements - Input types and Media elements - CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.

List of Experiments:

- a) How to create a simple user registration form using HTML form elements. What are the common form elements used, and provide an example with code?
- b) Explain how to style a web page using the CSS Box Model and background properties. Describe the components of the box model and list various CSS background properties with examples. Provide sample CSS code to demonstrate their usage.
- c) How to implement CSS animations and create a multiple column layout using CSS. Describe the key properties used for animations and the methods to divide content into columns. Provide suitable examples with HTML and CSS code.

MODULE - II CLIENT-SIDE PROCESSING AND SCRIPTING

10

JavaScript Introduction – Variables and Data Types-Statements – Operators - Literals-Functions Objects- Arrays-Built-in-Objects- Regular Expression, Exceptions, Event handling, Validation.

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List of Experiments:

- Write a JavaScript program that declares and initializes variables using different data types, including string, number, Boolean, array, and object. Explain each data type briefly and provide example values.
- Write a JavaScript function that accepts an array of numbers as its parameter. The function should iterate through the array, identify all even numbers, and return the sum of those even numbers. Provide the complete code and explain how the function works.
- Design and create an HTML form that includes input fields for Name, Email, and Age. Ensure each field uses the appropriate input type and includes basic validation. Provide the complete HTML code.

MODULE - III PHP PROGRAMMING**10**

PHP - Working principle of PHP - PHP Variables - Constants - Operators - Flow Control and Looping - Arrays - Strings - Functions - File Handling - File Uploading.

List of Experiments:

- Write a PHP script that declares and initializes variables using different data types, including integer, string, float, and Boolean. Also, define a constant using the appropriate PHP function. Explain each data type with example values used in your script.
- Write a PHP function that accepts an array of numbers as input and returns the maximum value from the array. Explain how the function works and test it with a sample array.
- Write a PHP script to handle the file upload process, ensuring that only image files (JPEG, PNG) are allowed. Display a message confirming successful upload and save the file in a specific directory.

MODULE - IV NODEJS**10**

Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node JS application – Using Events – Listeners – Timers – Callbacks – Handling Data I/O.

List of Experiments:

- Write a simple "Hello, World!" program using Node.js. Save the program in a .js file and run it using the command line. Describe the steps involved in writing, saving, and executing the Node.js script.
- Write a Node.js program that creates an EventEmitter, defines a custom event called "welcome", and triggers it to display "Welcome to Node.js!" after 3 seconds using setTimeout().
- Write a Node.js function that accepts two numbers and a callback function as arguments. The callback function should return the sum of the two

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numbers. Explain how the function works, how the callback is used, and provide a sample program to demonstrate its functionality.

d) Write a Node.js script that reads the contents of a text file (e.g., sample.txt) and displays the content in the console. Use the fs module to handle file operations. Explain how the fs module works in Node.js and describe the steps involved in reading a file asynchronously.

MODULE - V MONGO DB 10

Understanding NoSQL and Mongo DB – Building Mongo DB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to Mongo DB from Node JS.

List of Experiments:

- Install MongoDB on your system and start the MongoDB server. Then, use the MongoDB shell to create a new database named studentDB. Describe the steps for installation, starting the server, and creating the database.
- In the database studentDB, create a collection called students and insert a document with the following details: {"name": "John Doe", "age": 20, "course": "Computer Science"}. Describe the steps for creating a collection and inserting the document using MongoDB shell.
- Write a simple Node.js script to connect to a MongoDB database and retrieve all documents from the student's collection using the MongoDB Node.js driver. Explain the steps involved in establishing the connection and retrieving data from the collection.

MODULE - VI EXPRESS AND REACT 10

Implementing Express in Node.js - Configuring routes - Using Request and Response objects - MERN STACK - Basic React applications - React Components - React State-Routing with React Router.

List of Experiments:

- Install Express.js and write a Node.js script to create a basic Express server that listens on port 3000. The server should respond with "Hello, Express!" when accessed at the root URL (/). Explain the steps for setting up Express and creating the server.
- Create a simple React application with a component named Counter. The component should have a button that, when clicked, increases a count state and displays the updated count. Explain the steps to set up the React application and implement the Counter component.
- Set up React Router in a React application and create two pages: "Home" and "About". Use navigation links to switch between these pages without refreshing the page. Explain the process of installing React Router, setting up routes, and handling navigation between pages.

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d) Create a React component named `ToggleText` that initially displays the text "Hello!". When a button is clicked, the component should toggle between displaying "Hello!" and "Goodbye!". Explain how to implement the functionality using React's state and event handling.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web - How to Program", 5th edition, Pearson Education, 2020.
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" 5e, O'Reilly publishers, 2018.
3. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018.

REFERENCES:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2007.
2. Steven Holzner, "PHP – The Complete Reference", 1st Edition, Mc-Graw Hill, 2020
3. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, McGraw Hill Publishers, 2017.
4. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
5. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018.
6. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.

WEB REFERENCES:

1. <https://developer.mozilla.org/en-US/docs/Glossary/PHP>
2. <https://www.mongodb.com/docs/>
3. <https://angular.dev/tutorials>
4. <https://developer.mozilla.org/en-US/docs/>
5. <https://react.dev/>

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OUTCOMES

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

1. Apply HTML and CSS to create interactive and dynamic websites. (K3)
2. Use JavaScript to develop interactive and dynamic website features. (K3)
3. Design and implement dynamic server-side applications using PHP. (K3)
4. Analyze Node.js and its features for efficient application development. (K4)
5. Develop applications using MongoDB for database management and storage. (K3)
6. Analyze and evaluate the features of Express and React for building web applications. (K4)

CO - PO, PSO MAPPING:

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

SEMESTER - IV

24AMTP401 - 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

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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 entrepreneurship - 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.

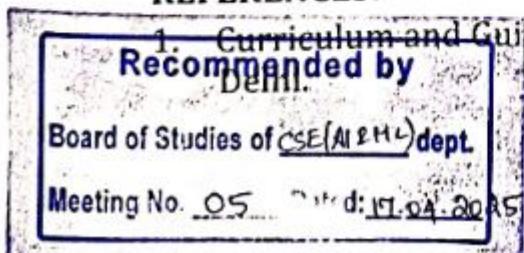
Software - Quality Assurance, Life Cycle & Testing: Introduction to Software life cycle processes and Software Testing (IS 16124 and IS 11291).

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:



2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. ISO / 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
CO1	3	3	2	2	2	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	2	-	-
CO3	3	3	3	3	2	-	-	-	-	-	2	2	2
CO4	3	3	3	2	3	-	-	-	2	1	3	-	-
CO5	-	-	-	-	-	3	-	-	1	-	2	2	2
CO6	-	-	-	-	-	3	-	-	1	-	2	2	2

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SEMESTER - IV

24AMID401 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To empower students to transform innovative ideas into viable venture blueprints through structured entrepreneurial exploration and opportunity framing.
- To provide experiential learning in adaptive product evolution by focusing on user-centric redesign, iterative testing, and technical refinement.
- To develop proficiency in assessing market traction, decoding customer behavior, and aligning product strategy with investment-readiness metrics.
- To instill a foundation of ethical entrepreneurship by integrating inclusive design principles, sustainability values, and responsible leadership.
- To enable data-driven innovation by leveraging field research, applying performance analytics, and integrating emerging technologies for solution optimization.
- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, focusing on the practical execution and refinement of entrepreneurial ventures.
2. The project work must involve the continuous development, iterative enhancement, and potential launch of an entrepreneurial solution. It must also include appropriate elements of the following: compliance with advanced engineering standards, iterative design analysis, enhanced prototyping, robust experimentation, real-world user feedback collection, data correlation, and advanced software/hardware development for the solution.
3. Projects can be individual work or group projects, with a maximum of Three students. In case of a group project, each student must submit an individual project report clearly specifying their unique contributions to the collective work.

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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)

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

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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...

Sairam Leo Muthuramalingam
CEO - Sairam Institutions

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through Quality education.*



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