



Sri

SAI RAM

INSTITUTE OF TECHNOLOGY

An Autonomous Institution

West Tambaram, Chennai - 44

www.sairamit.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

REGULATIONS

2024 - Version 2

With Effect From 24.05.2024

Academic Year 2024-25 onwards

AUTONOMOUS

CURRICULUM AND

SYLLABUS

I - IV

SEMESTERS

SRI SAI RAM INSTITUTE OF TECHNOLOGY



VISION

To be identified as a “Centre of Excellence” with high standards of Knowledge Dissemination and Research opportunities and to transform the students to imbibe qualities of technical expertise of international standards and high levels of ethical values, who in turn shall contribute to the advancement of society and human kind.



MISSION

We shall dedicate and commit ourselves to attain and maintain excellence in Technical Education through commitment and continuous improvement of infrastructure and equipment and provide an inspiring environment for Learning, Research and Innovation for our students to transform them into complete human beings with ethical and social values.



Educational Organization Management System (EOMS) Policy

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)



VISION

To emerge as a “Centre of Excellence” in the field of Cybersecurity, providing cutting-edge skill sets, deep domain expertise, and industry collaborations to nurture students into highly skilled, ethical professionals who contribute to safeguarding digital ecosystems and inspire them to become responsible members of society.



MISSION

- M1.** To facilitate a high-quality learning environment with excellent teaching and adequate infrastructure.
- M2.** To attain excellence and nurture growth in the field of computer science, emphasizing cybersecurity.
- M3.** Collaborate with industries to create opportunities for advanced real-time projects and internships, connecting academic learning with practical application.
- M4.** Promote moral and ethical values within the curriculum to enhance interpersonal skills and social awareness.

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	0	0	2	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	24ITPT201	OOPS Using Java Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - II							
1	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
2	24ENTP201	Digital Dynamics	0	0	2	2	0
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
Total						28	19

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA306	Linear Algebra and Number Theory	3	1	0	5	4
2	24SCPC301	Cyber Security Essentials	3	0	0	3	3
3	24SCPC302	Computer Networks	3	0	0	3	3
4	24ITPC301	Data structures and Algorithms	3	0	0	3	3
5	24ITPW301	Database Management Systems with lab	3	0	2	5	4
6	24HSMC301	Universal Human Values- II	3	0	0	3	3
7	24HSNC301	NCC course Level 2*	3	0	0	2*	0
PRACTICALS							
1	24CIPT301	Digital Design and Computer Organization Laboratory with Theory	1	0	4	5	3
2	24ITPL301	Data structures and Algorithms Laboratory	0	0	3	4	2
VALUE ADDITIONS - III							
1	24SCTP301	Aptitude skills	0	0	1	2	1
2	24SCID301	Innovative Design Lab - I	0	0	1	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC202	Joy of Computing using Python (Mandatory - NC)	2	0	0	1	0
Total						35	27

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA406	Probability and Statistics with R Programming	3	1	0	4	4
2	24SCPC401	Cryptography and Information Security	3	0	0	3	3
3	24SCPC402	Machine Learning Essentials for Cyber Security	3	0	0	3	3
4	24SCPC403	Software Development and Design Thinking	3	0	0	3	3
5	24xxOE9xx	Open Elective - I	3	0	0	3	3
6	24HSNC401	NCC course Level 3*	3	0	0	3#	0
PRACTICALS							
1	24CSPL401	Cryptography and Cyber Security Lab	0	0	4	4	1
2	24CSPT401	Operating System in Kali Linux lab with Theory	1	0	4	5	3
VALUE ADDITIONS - IV							
1	24CSTP401	Aptitude skills	0	0	1	1	0
2	24CSID401	Innovative Design Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
		Total				31	21

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24SCPC501	Theoretical Computer Science	3	0	0	3	3
2	24SCPC502	Secure Coding	3	0	0	3	3
3	24xxEL5XX	Professional Elective- I	3	0	0	3	3
4	24xxEL5YY	Professional Elective- II	3	0	0	3	3
5	24xxOE9XX	Open Elective - II	3	0	0	3	3
6	24MGMC501	Constitution of India	2	0	0	2	0
PRACTICALS							
1	24SCPL501	Secure Coding Lab	0	0	4	4	2
2	24SCPT502	Cyber Attacks Lab with Theory	1	0	2	3	3
VALUE ADDITIONS - V							
1	24SCTP501	Skill Enhancement	0	0	2	2	1
2	24SCID501	Prototype development Laboratory - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
Total						28	22

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24SCPC601	Penetration Testing and Ethical Hacking	3	0	0	3	3
2	24xxEL6vv	Professional Elective - III	3	0	0	3	3
3	24xxEL6ww	Professional Elective - IV	3	0	0	3	3
4	24xxEL6xx	Professional Elective - V	3	0	0	3	3
5	24xxOE9xx	Open Elective - III	3	0	0	3	3
6	24HSMG601	Principles of Engineering Management	3	0	0	3	3
PRACTICALS							
1	24SCPL601	Penetration Testing and Ethical Hacking Lab	0	0	4	4	2
2	24SCPL602	Cloud Security Laboratory with Theory	1	0	2	3	3
VALUE ADDITIONS - IV							
1	24SCTP601	Technical Skill	0	0	1	1	0
2	24SCID601	Prototype Development Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
As recommended by BOS							
Total						28	21

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24SCPC701	Cyber Forensics	3	0	0	3	3
2	24xxEL7xx	Professional Electives- VI	3	0	0	3	3
3	24xxOL7xx	Open Electives- IV	3	0	0	3	3
4	24MGEL703	Creative Innovation Entrepreneurship	3	0	0	3	3
PRACTICALS							
1	24SCPL701	Cyber Forensics Laboratory	1	0	4	4	2
2	24SCTP701	Block Chain lab with Theory	1	0	2	5	3
3	24SCPJ701	Project Work- Phase I	0	0	8	8	4
VALUE ADDITIONS - VII							
1	24SCTP701	Company Specific Skills	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS	0	0	2	2	1
Total						33	22

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
PRACTICALS							
1	24xxEL8xx	Professional Electives- VII	3	0	0	3	3
PRACTICALS							
1	24SCPJ801	Project Work- Phase I	0	0	12	12	6
VALUE ADDITIONS - VIII							
1	24SCIN801	Internship	0	0	9	9	3
Total						24	12

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PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL504	Affective Computing	3	Artificial Intelligence
2	24CSEL505	Decision Support Systems	3	Artificial Intelligence
3	24ITEL502	Evolution Of AI Languages	3	Artificial Intelligence
4	24SCEL501	Tokenization of Assets	3	Fintech and Block chain
5	24SCEL502	Fintech Risk Management	3	Fintech and Block chain
6	24SCEL503	Digital Identity Solutions in Fintech	3	Fintech and Block chain
7	20ITEL503	Learning Analytics Tools	3	Data Science
8	20ITEL504	Data Warehousing And Data Mining	3	Data Science
9	20ITEL505	Big Data Tools And Techniques	3	Data Science
10	20ITEL506	Switching Circuits And Logic Design	3	Internet of Things
11	20ITEL507	IoT Architecture And Programming	3	Internet of Things
12	20ITEL508	IoT Concepts And Applications	3	Internet of Things
13	24SCEL504	Fundamentals of Quantization	3	Quantum Computing
14	24SCEL505	Quantum Communication Systems	3	Quantum Computing
15	24SCEL506	Quantum Cryptography	3	Quantum Computing
16	24MGEL5xx	Intellectual Property Rights	3	Management

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL510	Introduction To Machine Learning	3	Artificial Intelligence
2	24CSEL511	Fundamentals Of Edge And Soft Computing	3	Artificial Intelligence
3	24CSEL512	Cognitive Computing	3	Artificial Intelligence
4	24SCEL507	Crypto currency Economics	3	Fintech and Block chain
5	24SCEL508	Digital Payments Systems	3	Fintech and Block chain
6	24SCEL510	Regulatory Frameworks in Fintech	3	Fintech and Block chain
7	20ITEL509	Business Intelligence & Analytics	3	Data Science
8	20ITEL510	Nosql Database Techniques	3	Data Science
9	20ITEL511	Data Acquisition System	3	Data Science
10	20ITEL512	Microprocessors And Interfacing	3	Internet of Things
11	20ITEL513	Blockchain And IoT	3	Internet of Things
12	20ITEL514	IoT Communication Protocols	3	Internet of Things
13	24SCEL511	Quantum Algorithms	3	Quantum Computing
14	24SCEL512	Quantum Machine Learning	3	Quantum Computing
15	24SCEL513	Quantum Software Development	3	Quantum Computing
16	24MGEL6vv	Total Quality Management	3	Management

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PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24ITEL602	Responsible & Safe AI Systems	3	Artificial Intelligence
2	24CSEL605	Software Defined Networks	3	Artificial Intelligence
3	24CSEL606	Business Intelligence	3	Artificial Intelligence
4	24SCEL601	Fintech Innovation and Disruption	3	Fintech and Block chain
5	24SCEL602	Fintech Risk Management	3	Fintech and Block chain
6	24SCEL603	Fintech for Financial Inclusion	3	Fintech and Block chain
7	20ITEL603	Data Analytics With Python	3	Data Science
8	20ITEL604	Text Mining And Analytics	3	Data Science
9	20ITEL605	Data Science For Engineers	3	Data Science
10	20ITEL606	Introduction To Internet Of Things	3	Internet of Things
11	20ITEL607	IoT And Multimedia Technology	3	Internet of Things
12	20ITEL608	Applications Of IoT In Robotics	3	Internet of Things
13	24SCEL604	Quantum Network Protocols	3	Quantum Computing
14	24SCEL605	Quantum Information Theory	3	Quantum Computing
15	24SCEL606	Quantum Communication Systems	3	Quantum Computing
16	24MGEL6xx	Disaster management	3	Management

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL610	Computer Vision (AI AND DS)	3	Artificial Intelligence
2	24CSEL611	Agent Based Intelligent Systems	3	Artificial Intelligence
3	24CSEL612	Robotic Process Automation	3	Artificial Intelligence
4	24SCEL607	Decentralized Autonomous Organizations (DAOs)	3	Fintech and Block chain
5	24SCEL608	Asset Tokenization Platforms	3	Fintech and Block chain
6	24SCEL609	Fintech Regulations and Compliance Challenges	3	Fintech and Block chain
7	20ITEL609	Advanced R Programming For Data Analytics In Business (data Science)	3	Data Science
8	20ITEL610	Ethics In Data Science	3	Data Science
9	20ITEL611	Accelerated Data Science	3	Data Science
10	20ITEL612	Digital Design With Verilog	3	Internet of Things
11	20ITEL613	Programming For Iot Boards	3	Internet of Things
12	20ITEL614	Software And Programming In IoT	3	Internet of Things
13	24SCEL610	Quantum Key Distribution	3	Quantum Computing
14	24SCEL611	Quantum Control Theory	3	Quantum Computing
15	24SCEL612	Quantum Simulation	3	Quantum Computing
16	24MGEL6yy	Human Rights	3	Management

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PROFESSIONAL ELECTIVES - V

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL616	Natural Language Processing	3	Artificial Intelligence
2	24CSEL617	Predictive Modeling	3	Artificial Intelligence
3	24CSEL618	Augmented , Virtual And Mixed Reality	3	Artificial Intelligence
4	24SCEL613	Block Chain Scalability Solutions	3	Fintech and Block chain
5	24SCEL614	Digital Identity Solutions in Fintech	3	Fintech and Block chain
6	24SCEL615	Blockchain Governance Models	3	Fintech and Block chain
7	20ITEL616	Games And Information (AI,DS)	3	Data Science
8	20ITEL617	Multivariate Techniques For Data Analytics	3	Data Science
9	20ITEL618	Web Intelligence	3	Data Science
10	24XXEL6zz	Software and Programming in IoT	3	Internet of Things
11	24XXEL6zz	Mobile Application Development for IoT	3	Internet of Things
12	24XXEL6zz	Digital Twin Technology	3	Internet of Things
13	24SCEL616	Quantum Optics	3	Quantum Computing
14	24SCEL617	Quantum Photonics	3	Quantum Computing
15	24SCEL618	Quantum Artificial Intelligence	3	Quantum Computing
16	24MGEL6zz	Industrial Psychology	3	Management

PROFESSIONAL ELECTIVES - VI

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL704	Deep Learning	3	Artificial Intelligence
2	24CSEL705	Bio-inspired Optimization Techniques	3	Artificial Intelligence
3	24CSEL706	Neural Networks	3	Artificial Intelligence
4	24SCEL701	Insure-tech Innovations	3	Fintech and Block chain
5	24SCEL702	Asset Tokenization's Platforms	3	Fintech and Block chain
6	24SCEL703	Regulatory Technology Solutions	3	Fintech and Block chain
7	20ITEL702	Deep Learning For Computer Vision	3	Data Science
8	20ITEL703	Cloud Computing For Data Analytics	3	Data Science
9	20ITEL704	Bio Informatics	3	Data Science
10	24XXEL7xx	Introduction to Industry IoT 4.0 and Industrial Internet of Things	3	Internet of Things
11	24XXEL7xx	Programming for IoT Boards	3	Internet of Things
12	24XXEL7xx	Virtual and Augmented Reality	3	Internet of Things
13	24SCEL704	Quantum Materials	3	Quantum Computing
14	24SCEL705	Quantum Sensors for Medical Applications	3	Quantum Computing
15	24SCEL706	Quantum Imaging	3	Quantum Computing
16	24MGEL7xx	Introduction to Innovation, IP, Management and Entrepreneurship	3	Management

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PROFESSIONAL ELECTIVES - VII

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL710	Pattern Recognition And Application	3	Artificial Intelligence
2	24CSEL711	Generative AI	3	Artificial Intelligence
3	24CSEL712	Generative Deep Learning	3	Artificial Intelligence
4	24SCEL707	Cyber Threat Landscape Monitoring	3	Fintech and Block chain
5	24SCEL708	Cyber Security Data Visualization	3	Fintech and Block chain
6	24SCEL709	Decentralized Finance Platforms	3	Fintech and Block chain
7	20ITEL709	Social Network Analysis	3	Data Science
8	20ITEL710	Mining Massive Datasets	3	Data Science
9	20ITEL711	Healthcare Analytics	3	Data Science
10	24XXEL7yy	IoT & Edge Computing	3	Internet of Things
11	24XXEL7yy	IoT for Smart Cities	3	Internet of Things
12	24XXEL7yy	Applications of IoT in Robotics	3	Internet of Things
13	24SCEL710	Quantum Cryptanalysis	3	Quantum Computing
14	24SCEL711	Quantum Secure Multi-Party Computation	3	Quantum Computing
15	24SCEL712	Quantum-resistant Blockchain	3	Quantum Computing
16	24MGEL7yy	Foundation Skills in Integrated Product Development	3	Management

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1:** Formulate, analyze and solve Engineering problems with strong foundation in Mathematical, Scientific and Engineering fundamentals
- PEO2:** Analyze the requirements, realize the technical specification and design the Engineering solutions by applying computer science theory and principles.
- PEO3:** Promote collaborative learning and team work spirit through multi -disciplinary projects and diverse professional activities.
- PEO 4:** Equip the graduates with strong knowledge, competence and soft skills that allow them to contribute ethically to the needs of society.
- PEO 5:** Accomplish sustainable progress in the emerging areas of Engineering through life-long learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

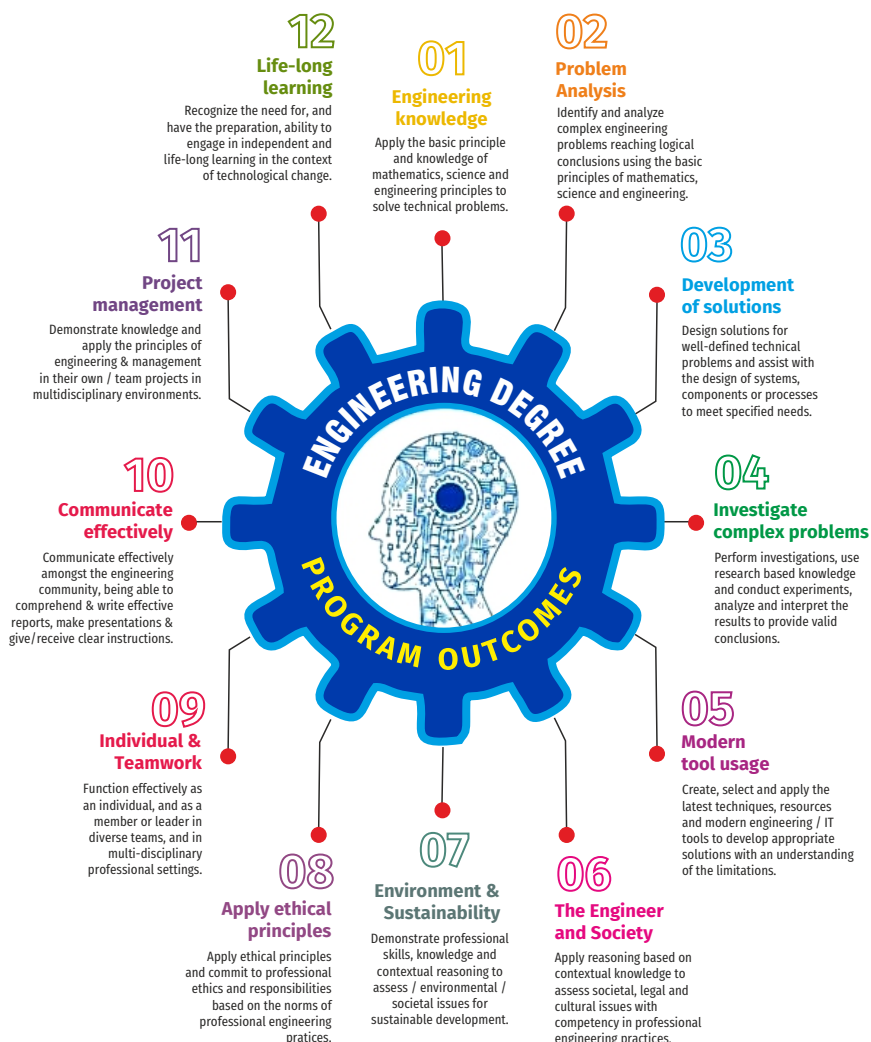
- PSO1** Demonstrate basic knowledge of computer applications and apply standard practices in software project development.
- PSO2** Understand, Analyze and Develop computer programs for efficient design of computer-based systems of varying complexity.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences (BS)	18	32	30
Engineering Sciences (ES)	5	12	09
Humanities and Social Sciences (HS)	8	13	13
Professional Electives (EL)	15	26	26
Program Core + Program Lab (PC+PL)	22	47	37
Program theory with Lab (PW) / Program Lab With Theory (PT)	11	25	18
Open Elective (OE)	7	12	12
Training & Placement (TP)	2	14	4
Innovation & Development (ID) / Project (PJ)	10	32	16
Internships (IN)	2	9	3
Mandatory Courses (MC)	NA	4	NA
Total		226	168

PROGRAMME OUTCOMES(POs)

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



SEMESTER - I

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

OBJECTIVES:

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

MODULE - I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (without proof) – Symmetric and orthogonal matrices - Reduce the Quadratic to Canonical form using orthogonal transformation - Nature of Quadratic forms.

MODULE - II FUNCTIONS OF SEVERAL VARIABLES**12**

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

MODULE - III VECTOR DIFFERENTIATION**4**

Scalar and Vector valued functions- Gradient and Directional derivatives – Tangent plane - Divergence and Curl- Irrotational and Solenoidal vector fields - Scalar and Vector Potentials - Vector identities (without proof).

MODULE - IV VECTOR INTEGRATION**8**

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

MODULE - V MULTIPLE INTEGRALS**12**

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

MODULE - VI FOURIER SERIES

Fourier series – Convergence of Fourier series -Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

COURSE OUTCOMES:

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

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values for functions of several variables. (K3)

3. Compute the derivatives of scalar and vector point functions. (K3)
4. Use the vector point function to establish the relation between line, surface and volume integrals. (K3)
5. Apply double and triple integrals to find the area and the volume of a region. (K3)
6. Compute Fourier series expansion of a function. (K3)

CO-PO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I COMMUNICATION PROCESS**8**

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

MODULE - II LANGUAGE BARRIERS, LEVELS AND CHANNELS 8

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

MODULE - III NARRATION AND SUMMATION 8

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

MODULE - IV WRITING MECHANICS 7

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

MODULE - V INTERPRETATION SKILLS 7

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

MODULE - VI COGENT EXPOSITIONS 7

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

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

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

CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE -I PROPERTIES OF MATTER**8**

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

MODULE -II MECHANICAL WAVES AND LASERS**7**

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

MODULE - III ELECTROMAGNETIC WAVES**8**

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

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

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

MODULE - V CRYSTAL PHYSICS**8**

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

MODULE - VI THERMAL PHYSICS**7**

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

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

REFERENCES:

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

OUTCOMES:

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

1. Understand the mechanical properties of materials. (K2)
2. Express the knowledge of waves and to discuss about lasers and its applications (K2)
3. Understand the properties of electromagnetic waves and its propagation in different medium (K2)
4. Discuss the dual nature of matter and radiation and application of one dimensional Schrodinger's wave equations to a matter wave system (K3)
5. Understand the basics of crystal, its structure determination and different growth techniques. (K2)
6. Discuss the heat transfer in different media and its applications. (K2)

CO-PO, PSO Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE -I POLYMER CHEMISTRY

8

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

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

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

MODULE -II ELECTROCHEMISTRY AND BATTERY TECHNOLOGY

7

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

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

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY

7

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

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

MODULE - IV CHEMICAL THERMODYNAMICS

8

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

MODULE - V FUELS

8

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

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

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

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

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

6. Demonstrate the knowledge of nanomaterials, including their properties, behavior, interactions and applications across various disciplines of science and technology. (K3)

CO-PO, Mapping:

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

SEMESTER - I

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

OBJECTIVES:

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

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

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

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

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

MODULE - III ARRAYS AND STRINGS**8**

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

MODULE - IV FUNCTIONS AND POINTERS**9**

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

MODULE - V STRUCTURES**7**

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

MODULE - VI FILE PROCESSING**7**

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

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. R.G. Dromey, "How to solve it by Computers", Reprint, PHI Publishers, 2011.

2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2018.
3. Kernighan, B.W and Ritchie D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	2	-	-	-	-	-	2	2	2	2
C02	3	3	3	3	2	-	-	-	-	-	2	2	2	2
C03	3	3	3	3	2	-	-	-	-	-	2	-	2	2
C04	2	2	-	2	2	-	-	-	-	-	1	-	3	2
C05	2	2	-	-	1	-	-	-	-	-	1	-	3	3
C06	2	2	-	-	2	-	-	-	-	-	1	-	3	3

SEMESTER - I

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

OBJECTIVES:

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

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

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

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

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

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

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

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

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

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

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

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

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

TOTAL: 60 PERIODS**TEXT BOOKS:**

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

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

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

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C02	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C03	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C04	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C05	3	-	-	-	-	-	-	2	-	2	-	-	3	2
C06	3	-	-	-	-	-	-	2	-	2	-	-	3	2

SEMESTER - I

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

OBJECTIVES:

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

UNIT - I LANGUAGE AND LITERATURE**3**

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of

minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

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

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

UNIT - III FOLK AND MARTIAL ARTS 3

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

UNIT - IV THINAI CONCEPT OF TAMILS 3

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

தமிழர் மரபு

அலகு - I மொழி மற்றும் இலக்கியம்: 3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியோர் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு - II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை 3
- சிற்பக் கலை:
நடுகல் முதல் நவீன சிற்பங்கள் வளர் - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - கதர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு - III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலொட்டம், தொல்பாறைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV தமிழர்களின் திறைக் கோட்பாடுகள்: 3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்கொப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு - V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

OUTCOMES:

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

1. Understand Tamil as a classical language & Literature (K2)
2. Explore about Tamil Heritage & Sculptures, Role of temples (K2)
3. Appreciate Sports and games of Tamils (K2)
4. Perceive Thinaï concept of Tamils (K2)
5. Comprehend Education and literacy during Sangam Age (K2)
6. Understand the Contribution of Tamils to National Movement & Indian Culture (K2)

CO- PO, PSO MAPPING

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

SEMESTER - I

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

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

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

Sl.No. Name of the Experiment

- 1 (a) Determination of wavelength of Laser
(b) Determination of numerical aperture and acceptance angle in an optical fiber.
(c) Determination of particle size using laser source.
- 2 Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- 3 Determination of Young's modulus by non-uniform bending method.
- 4 Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.
- 5 Find out the thickness of the given wire by air wedge method.
- 6 Calculation of lattice cell parameter – X-ray diffraction method.
- 7 Determination of Planck's constant.
- 8 Determination of wavelength of mercury spectrum – spectrometer grating.

- 9 Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
- 10 Determination of band gap of a semiconductor.
- 11 Determination of Hall coefficient by Hall Effect experiment.
- 12 Determination of solar cell characteristics.

CHEMISTRY LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

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

Sl.No. Name of the Experiment

- 1 Conductometric titration of strong acid vs strong base.
- 2 Determination of chloride content of water sample by Argentometric method.
- 3 Determination of strength of acids in a mixture of acids using conductivity meter.
- 4 Determination of total, temporary & permanent hardness of water by EDTA method.
- 5 Estimation of iron content of the given solution using potentiometer.
- 6 Determination of DO content of water sample by Winkler's method.
- 7 Determination of strength of given hydrochloric acid using pH meter.
- 8 Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method).
- 9 Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.
- 10 Determination of molecular weights of polymer samples using Ostwald's Viscometer.
- 11 Synthesis of nano-CdS by precipitation. (Demonstration only)
- 12 Corrosion experiment-weight loss method.

TOTAL: 60 PERIODS

TEXT BOOKS:

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

TEXTBOOK:

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

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

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

CO-PO MAPPING:

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

SEMESTER - I

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

OBJECTIVES:

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

LIST OF EXPERIMENTS

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

- (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: 30 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

OUTCOMES:

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - I

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

OBJECTIVES:

- To understand the significance of Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) of the United Nations
- To familiarize with SDG targets and indicators
- To identify the Constitutional implementation pertaining to SDGs in Panchayat Raj

- To acquire knowledge of the State and the Central government welfare schemes
- To recognise the role of educational institutions' in community development
- To develop critical thinking skills to address complex societal challenges through an immersion program

MODULE - I United Nations Sustainability and the Sustainable Development Agenda **3**

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

MODULE - II Universal SDG Targets **4**

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

MODULE - III SDG and Indian Gram Panchayat **3**

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

MODULE - IV 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 - V Community Engagement **4**

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

MODULE - VI Idea Generation

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

TOTAL: 30 PERIODS**REFERENCES:**

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

WEB REFERENCES

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

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I LISTENING **5**

Techniques of effective listening

Listening and comprehending

Probing questions

Barriers to listening

Reflection from listening

MODULE - II SPEECH MECHANICS **5**

Pronunciation

Enunciation

Vocabulary

Fluency

Common errors

MODULE - III READING SKILLS **5**

Techniques of effective reading

Kinds of reading

Gathering ideas and information from the text

Evaluating the ideas and information

Interpreting the text from multiple angles

MODULE - IV WRITING ASPECTS **5**

Writing process

Effective writing strategies

Different modes of writing

Optimizing the use of resources

Editing

MODULE - V PRESENTATION SKILLS**5**

Types of presentations

Nonverbal communication

Understanding the purpose and the audience

Beginning and closure of presentations

Presentation tools and strategies

MODULE - VI ARTICULATION ASPECTS**5**

Perform exercises

Slow speeches

Long speeches

Monologues, Dialogues and Conversation

Feedback necessity

TOTAL : 30 PERIODS**REFERENCES:**

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

WEB REFERENCES:

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

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

- To understand the concepts of Logic, Rules of inference and Quantifiers.
- To learn the concepts of Mathematical induction, Permutation and Combination.
- To impart the knowledge on Groups and Normal subgroups.
- To develop Graph Algorithms by using the concepts of Graphs.
- To learn the concepts of Lattices and Boolean algebra.

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.

MODULE-VI BOOLEAN ALGEBRA 9

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

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Discrete Mathematics and its Applications: with Combinatorics and Graph Theory, Kenneth H. Rosen, 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. Discrete Mathematical Structure with Applications to Computer Science”, J.P. Tremblay and R. Manohar, Reprint, McGraw-Hill Education (India), 1997.

REFERENCES:

1. Discrete Mathematics with Applications, Susanna S. Epp, 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Discrete Mathematics, Norman L. Biggs, 2nd Edition, Oxford University Press, 2002.
3. Discrete Mathematics, Seymour Lipschutz, Marc Lipson, Schaum’s Outlines Series, 3rd edition, McGraw-Hill Education, 2009.
4. Elements of Discrete Mathematics: A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 4th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2012.

WEB REFERENCES:

1. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>
2. <https://www.cs.cornell.edu/~rafael/discmath.pdf>
3. <http://home.iitk.ac.in/~aralal/book/mth202.pdf>
4. https://drive.google.com/file/d/1-PqMUIqDim1-AHQK5_zL34I97zHV3W15/view

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/106106183>
2. <https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20>
3. https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4. <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3ogovVxVxCTII45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9OQG Mqxersk8fUxiUMSIx0DBqsKZS>

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

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

CO-PO, MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

MODULE - I EFFECTIVE COMMUNICATION**6**

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

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

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

MODULE - III REPORT WRITING**4**

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

MODULE - IV DIVERSE WRITING SKILLS**5**

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

MODULE - V CAREER COMPETENCIES**6**

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

MODULE - VI LEXICAL ENHANCEMENT**4**

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

TOTAL: 30 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

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

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

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

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

MODULE - I CONDUCTING MATERIALS**8**

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

MODULE - II SEMICONDUCTOR MATERIALS**7**

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

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. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations with temperature (K3)
3. Have an insight into the different types of magnetic materials and magnetic data storage device (K2)
4. Interpret the properties and types of superconducting materials and apply the knowledge on optical interactions with materials to optoelectronic devices (K3)
5. Acquire knowledge on quantum structures and apply it for illustrating nanodevices such as single electron transistors and quantum dot Laser (K3)
6. Explore the basics of quantum computing and their applications (K3)

CO-PO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

MODULE -I INTRODUCTION TO ENVIRONMENTAL SCIENCE**8**

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

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

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

MODULE - II ATMOSPHERIC CHEMISTRY

7

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

MODULE - III WATER CHEMISTRY

8

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

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT

7

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

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

MODULE - V ENERGY AND ENVIRONMENT

8

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

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

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY

7

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

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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

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

CO-PO MAPPING:

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

SEMESTER - II

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

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

UNIT - I WEAVING AND CERAMIC TECHNOLOGY

3

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

UNIT - II DESIGN AND CONSTRUCTION TECHNOLOGY

3

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

UNIT - III MANUFACTURING TECHNOLOGY

3

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

UNIT - IV AGRICULTURE AND IRRIGATION TECHNOLOGY

3

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

UNIT - V SCIENTIFIC TAMIL & TAMIL COMPUTING

3

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

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

தமிழர் மரபு

அலகு - I நெசவு மற்றும் பாணைத் தொழில்நுட்பம்:

3

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

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:

3

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

அலகு - III உற்பத்தித் தொழில் நுட்பம்:

3

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

அலகு - IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:

3

அணை, ஏரி, குளங்கள், மதகு -சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் — பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு - V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:

3

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

OUTCOMES:

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

1. Understand Weaving and Ceramic Technology during Sangam Age (K2)
2. Explore about Design & Construction of House and Temples during Sangam Age (K2)
3. Appreciate Manufacturing Technology of Tamils (K2)
4. Perceive Agriculture and Agro-processing during Sangam Age (K2)

5. Comprehend Ancient Knowledge of Ocean & Fisheries(K2)
 6. Understand the Scientific Tamil & Tamil Computing (K2)

CO-PO, PSO MAPPING

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

SEMESTER - II

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

ARMY WING**NCC GENERAL**

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

NATIONAL INTEGRATION AND AWARENESS

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

PERSONALITY DEVELOPMENT

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

LEADERSHIP		5
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		8
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
TOTAL: 30 PERIODS		

NAVAL WING

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

NATIONAL INTEGRATION AND AWARENESS **4**

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

PERSONALITY DEVELOPMENT **7**

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

LEADERSHIP **5**

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

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		8
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
TOTAL: 30 PERIODS		

ARMY WING**NCC GENERAL** **6**

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

NATIONAL INTEGRATION AND AWARENESS **4**

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

PERSONALITY DEVELOPMENT **7**

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

LEADERSHIP **5**

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

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT **8**

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

TOTAL: 30 PERIODS

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.

CIVIL ENGINEERING PRACTICE

Buildings:

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

Plumbing Works:

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

Carpentry using Power Tools only:

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

MECHANICAL ENGINEERING PRACTICE**Welding:**

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

Basic Machining:

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

Sheet Metal Work:

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

Demonstration on:

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

TOTAL: 60 PERIODS

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

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

ELECTRONICS

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

CIVIL

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

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos
2. Arc welding transformer with cables and holders	5 Nos
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5. Centre lathe.	2 Nos

- | | |
|--|--------|
| 6. Hearth furnace, anvil and smithy tools. | 2 Sets |
| 7. Moulding table, foundry tools. | 2 Sets |
| 8. Power Tool: Angle Grinder. | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner. | 1 each |

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

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

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C02	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C03	3	2	1	-	-	-	-	-	-	-	1	-	3	2
C04	3	1	1	-	-	-	-	-	-	-	1	-	3	2
C05	2	-	-	-	-	-	-	2	-	-	-	-	2	2
C06	2	-	-	-	-	-	-	2	-	-	-	-	2	2

SEMESTER - II

24ITPT201 106107574 & 10610519 SDG NO. 4,9	OOP USING JAVA LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

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

MODULE -I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 8

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

List of Experiments

- a) Write a program to find the sum of individual digits of a positive integer.
- b) Write a program to generate the first n terms of the sequence.
- c) Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- d) Write a program to find both the largest and smallest number in a list of integers.
- e) Write a program to find factorial of list of number reading input as command

MODULE -II INHERITANCE AND INTERFACES 8

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

List of Experiments

- a) Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited

classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary

- b) Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape. Use interface
- c) Write a program to perform string operations using ArrayList. Write functions for the following a. Append - add at end b. Insert – add at particular index c. Search d. List all string starts with given letter

MODULE - III EXCEPTION HANDLING AND I/O

8

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

List of Experiments

- a) Implement exception handling and creation of user defined exceptions
- b) Design a Java interface for ADT Stack. Implement this interface using an array. Provide necessary exception handling in both the implementations.
- c) Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes

Module - IV MULTITHREADING AND GENERIC PROGRAMMING

7

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

List of Experiments

- a) Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
- b) Write a program to implement the concept of importing classes from user defined package and creating packages
- c) Write a java program to find the maximum value from the given type of elements using a generic function

MODULE - V COLLECTION FRAMEWORK**7**

Collections overview, Collection interfaces - List, Set, Map, List - ArrayList, LinkedList, Vector, Set - HashSet, TreeSet, Map - HashMap, Accessing a collection via an Iterator, Comparator, comparable.

List of Experiments

- Write a Java program to create a new array list, add some colors and print the collection.
- Write a Java program to shuffle elements in array list
- Write a Java program to iterate through all elements in a linked list
- Write a Java program to create an ArrayList of Student (id,name,dept,age) objects and search for particular Student objects based on id number.
- Write a Java program to create an ArrayList which will be able to store only char and String but not any other data type.
- Write a Java program using Queue Collection for Cinema Ticket Sale.

MODULE - VI GUI PROGRAMMING WITH APPLLET AND SWING**7**

Applets - Applet Class, Applet Skeleton, Simple Applet, Delegation Event Model - Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events. Swing - JLabel and Image icon, JTextField, JButton, JCheckBox, JRadioButton, JComboBox

List of Experiments

- Develop an Applet program to accept two numbers from the user and output the sum and difference in the respective text boxes.
- Write a program that identifies key-up key-down event user entering text in a Applet
- Write a Java program to design student registration form using Swing controls. The form which having the following fields and button SAVE
- Write a program to display the digital watch in swing

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

REFERENCES:

- Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015.
- Steven Holzner, "Java 2 Blackbook", Dream Tech Press, 2011.

3. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000

WEB REFERENCES:

1. https://www.w3schools.com/java/java_oop.asp
2. <https://www.edureka.co/blog/object-oriented-programming/>
3. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOPBasics.html
4. <https://introcs.cs.princeton.edu/java/lectures/>

OUTCOMES:

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

1. Apply object-oriented programming principles and Java fundamentals to develop basic programs involving control structures, arrays, and simple algorithmic logic. (K3)
2. Demonstrate the use of inheritance, abstract classes, interfaces, and Java collection classes to construct structured and reusable object-oriented programs. (K3)
3. Implement robust Java applications by integrating exception handling mechanisms and performing file I/O operations using streams. (K3)
4. Analyze the behavior of multithreaded applications and generic programming constructs to improve concurrency and code reusability in Java. (K4)
5. Evaluate the functionality and efficiency of Java Collection Framework components to optimize data storage and retrieval in real-world applications. (K4)
6. Design and analyze interactive graphical user interfaces (GUIs) using Applet and Swing components to enhance user experience in Java applications. (K4)

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

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

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

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

MODULE-2 EMBEDDED SYSTEMS, IOT AND ROBOTICS
4

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

MODULE-3	BASICS OF MECHANICAL ENGINEERING	4
	● Study of mechanical modeling using fusion 360 ● Demonstration of 3D scanner ● Demonstration of 3D printer ● Demonstration of laser cutter and RD works software ● Study of slicer software ● Study of master cam software	
MODULE 4	ALIGNMENT AND MAPPING OF IDEAS	4
	● Project Title: Problem Statement, solution and justification for SDG and SAP	
MODULE-5	ENTREPRENEURSHIP SKILLS	4
	● Startup Awareness ● Entrepreneurship Opportunities ● Mock Presentations ● Innovation ● Novelty Feasibility ● Presentation Skills	
MODULE-6	SCOUT for SDGs	4
	History of Scouting and Guiding - Introduction to Rovering and Ranging - Education objectives - Different Sections of Scouting- Bunnies, Cubs-Bulbuls, Scouts-Guides, Rovers-Ranger	
	Promise and Law: Scouting and Guiding with meaning to each point-how a boy and girl implement it on the daily life, saving life, Duties as citizens.	
	Leadership Skills: Mindsets of Leadership, Carrier Council. Community Service: Meaning, Types, duration, difference between community Service and Community Development.	
	Sairam SDG Ideathon	6
	● Preparedness of Ideathon ● Idea Pitching	
		TOTAL: 30 PERIODS
REFERENCES:		
1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020 2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019 3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House		

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

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc24_ee112/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs115/preview
3. https://onlinecourses.nptel.ac.in/noc24_me104/preview
4. https://onlinecourses.nptel.ac.in/noc24_me88/preview
5. <http://sdgs.scout.org>

OUTCOMES:

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

1. Gain the knowledge on Basic Electronics & Electrical Circuits (K2)
2. Understand the Basics of Embedded systems, IOT & Robotics (K1)
3. Explore the Basics of Mechanical Modeling (K2)
4. Interpret the mapping of SDGs to ideas. (K2)
5. Comprehend the guidance for the Idea presentation and to Innovate the ideas for market opportunities (K2)
6. Understand the scouting as a way of life for community development and illustrate the ideas for Ideathon event emphatically (K4)

CO-PO, PSO MAPPING:

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

SEMESTER - II

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

OBJECTIVES:

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

MODULE - I DIGITAL CULTURE AND SOCIETY

6

Adapting to changes

Importance in today's digital landscape

Digital identity and self- presentation

Online communities and forums

Digital divide and consequences

Online collaboration and collective action

MODULE - II DIGITAL LITERACY AND ACCESS TO TECHNOLOGY

5

Computer skills

Social and cultural understanding

Social media campaign and Activism

Netiquettes

Trending Technologies

Digital tools and softwares

MODULE - III DIGITAL ETHICS

3

Digital ethics and moral panics

The art of protecting secrets

Overview of digital tools

MODULE - IV CYBER SECURITY

3

Threats, vulnerability and consequences

Data making and usage practice

Importance of security

MODULE - V DIGITAL NETWORKING

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

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

6

Standardization –Basic Concepts:

Basic concepts of standardization
Purpose of standardization, marking and certification of articles and processes
Importance of standards to industry, policy makers, trade, sustainability and innovation

Standards Formulation Process and Challenges:

Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/ IEC Directives
WTO Good Practices for Standardization

World of Standards:

Important Indian and International Standards

TOTAL: 30 PERIODS**REFERENCES:**

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

WEB REFERENCES:

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

OUTCOMES:

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

1. Demonstrate basic understanding of effective online communication techniques (K1)
2. Show and utilize fundamental computer skills (K1)

3. Comprehend and apply the use of virtual platforms to enhance communication reachability (K2)
4. Understand and implement principles of digital ethics (K2)
5. Use basic technologies for securing data and maintaining information integrity (K1)
6. Understand the importance of standardization and adhere to BIS (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	-	-	-	-	-	-	-	-	-	2	-	2	-	-
C02	-	-	-	-	-	-	-	-	-	2	-	2	-	-
C03	-	-	-	-	-	-	-	-	-	2	-	2	-	-
C04	-	-	-	-	-	-	-	-	-	2	-	2	-	-
C05	-	-	-	-	-	-	-	-	-	2	-	2	-	-
C06	-	-	-	-	-	-	-	-	-	2	-	2	-	-

SEMESTER - III

24BSMA306	LINEAR ALGEBRA AND NUMBER THEORY	L	T	P	CP	C
-		3	1	0	4	4
SDG NO. 4						

OBJECTIVES:

- The main objective of this course is to provide students with the foundations of Number Theory and linear algebra mostly used in diverse applications in Cyber Security.

MODULE -I VECTOR SPACES

9

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

MODULE II LINEAR TRANSFORMATION AND DIAGONALIZATION 12

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

MODULE -III INNER PRODUCT SPACES

9

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

MODULE -IV DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS

9

Division algorithm — Base — b representations — Prime and composite numbers — GCD — Euclidean algorithm — Fundamental theorem of arithmetic — LCM.

MODULE -V DIOPHANTINE EQUATIONS AND CONGRUENCES 12

Linear Diophantine equations — Congruences — Linear Congruences — Applications: Divisibility tests — Modular exponentiation-Chinese remainder theorem.

MODULE -VI CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS

9

Wilson's theorem — Fermat's little theorem — Euler's theorem — Euler's Phi functions.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Linear Algebra, Stephen Friedberg, Arnold Insel and Lawrence Spence, 5th Edition, Pearson, 2018.
2. Elementary Linear Algebra, Howard Anton and Chris Rorres, 11th Edition, Wiley Publications, 2014 (Units - I, II & III).
3. Elementary Number theory with Applications, Koshy T, 1st Edition, Elsevier Publications, New Delhi, 2002.
4. A course in Number theory and Cryptography, Koblitz N, 2nd Edition, Springer Verlag, New York, 1994.

REFERENCES:

1. Linear Algebra - A Geometric Approach, Kumaresan S., 1st edition (reprint), Prentice – Hall of India, New Delhi, 2010.
2. Linear Algebra and Learning from Data, Gilbert Strang, 1st edition, Wellesley-Cambridge Press, 2019
3. A course in Number Theory, Rose H.E, Clarendon Press, 2nd edition, Oxford, 1995.
4. A classical introduction to Modern Number Theory, Kenneth Ireland & Michael Rosen, Springer International Edition, 2nd edition, New York 2010.

WEB REFERENCES:

1. <https://archive.nptel.ac.in/courses/111/106/111106135/>
2. <https://archive.nptel.ac.in/courses/111/101/111101137/>
3. <https://www.imsc.res.in/~svis/Algebra/Sunder-LinearAlg-notes.pdf>

ONLINE RESOURCES:

1. <https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/resources/an-overview-of-linear-algebra-1/>
2. <https://freevideolectures.com/course/3382/linear-algebra-i>
3. <https://ocw.mit.edu/courses/18-781-theory-of-numbers-spring-2012/pages/lecture-notes/>

COURSE OUTCOMES

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

1. Apply the concepts of vector spaces, subspaces, linear dependence / independence, and basis to solve problems related to vector representation and dimensionality. (K3).
2. Apply the concepts of linear transformations, eigenvalues, and eigenvectors to determine the diagonalizability of matrices. (K3)

3. Utilize inner product space concepts and the Gram-Schmidt process to obtain an orthonormal basis and perform least square approximations. (K3)
4. Demonstrate understanding of number theoretic concepts such as divisibility, prime factorization, GCD, and the Euclidean algorithm to solve basic arithmetic problems. (K3)
5. Solve linear Diophantine and congruence equations and apply modular arithmetic in real-life and theoretical contexts using the Chinese Remainder Theorem. (K3)
6. Apply classical number theory theorems such as Fermat's, Wilson's, and Euler's to solve problems involving integers and evaluate properties of multiplicative functions. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24SCPC301 106105217 SDG NO. 4,9,11&17	CYBER SECURITY ESSENTIALS					L	T	P	CP	C
						3	0	0	3	3

OBJECTIVES:

- Explain the core principles of cybersecurity, including the CIA triad (Confidentiality, Integrity, Availability) and how they apply to real-world scenarios
- Provide a comprehensive understanding of cryptographic techniques,
- Demonstrate tools for secure software development,
- Explore emerging trends and their implications in the cyber security domain.
- Demonstrate frameworks for cybersecurity governance and the importance of policies and procedures in managing security.

- To understand Cyber security standards, Policies, Governance and Ethical issues.

MODULE - I INTRODUCTION TO CYBER SECURITY 7

Fundamentals of Cyber Security- Cyber Threats and Vulnerabilities- Cyber-Attacks: Malware, Phishing, Denial-of-Service, Ransomware- Cyber Security Architecture: CIA Triad (Confidentiality, Integrity, Availability)- Overview of Cyber Laws and Policies

MODULE - II CRYPTOGRAPHY AND NETWORK SECURITY 8

Principles of Cryptography-Symmetric and Asymmetric Key Algorithms (e.g., AES, RSA)-Digital Signatures and Certificates-Public Key Infrastructure (PKI)- Network Security Basics: Firewalls, VPNs, IDS and IPS

MODULE - III SECURE SOFTWARE DEVELOPMENT 7

Secure Software Development Lifecycle (SDLC)-Threat Modeling and Risk Management-Common Software Vulnerabilities (e.g., OWASP Top 10)-Code Analysis and Secure Coding Practices-DevSecOps: Integrating Security into Development

MODULE - IV CYBER SECURITY TOOLS AND TECHNIQUES 8

Cyber Security Tools: Packet Analysis with Wireshark-Exploitation Frameworks with Metasploit-Web Application Security with Burp Suite-Network Scanning with Nmap- Ethical Hacking and Penetration Testing-Incident Response and Forensic Techniques-Security Information and Event Management (SIEM) Tools-Real-time Monitoring: Log Analysis and Threat Detection.

MODULE - V EMERGING TRENDS IN CYBER SECURITY 7

Artificial Intelligence and Cyber Security -IoT Security Challenges and Best Practices- Blockchain for Cyber Security-Cloud Security: Concepts and Threats- Zero Trust Architecture and Adaptive Security

MODULE - VI CYBER SECURITY GOVERNANCE, STANDARDS AND ETHICS 8

Cyber Security Frameworks (e.g., NIST, ISO 27001) - Standards: PCI DSS, NIST SP 800-53- Security Policies -Ethical and Legal Issues in Cyber Security-Data Protection and Privacy Laws (e.g., GDPR)-Governance, Risk Management, and Compliance (GRC)

TOTAL : 45 PERIODS

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson, 2020.
2. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics, and Legal Perspectives, Wiley, 2011.

REFERENCES:

1. C.K. Shyamala et al., Cryptography and Security, Wiley India, 2011.
2. Michael T. Simpson et al., Hands-On Ethical Hacking and Network Defense, Cengage Learning, 2020.

NPTEL/WEB LINKS:

1. NPTEL: Cyber Security
2. Coursera: Introduction to Cyber Security by NYU
3. Udemy: Ethical Hacking Bootcamp

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

1. Apply the fundamentals of cyber security and legal aspects (K3).
2. Implement cryptographic algorithms and network security protocols to ensure data confidentiality, integrity, and authentication. (K3).
3. Analyze software vulnerabilities and implement secure coding practices (K4).
4. Use cyber security tools for penetration testing and forensic investigations (K3).
5. Analyze and integrate the cyber security tools and techniques on cyber security frameworks (K4).
6. Apply cybersecurity governance frameworks, standards, and ethical/legal considerations to assess and enhance organizational strategies. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24SCPC302 noc23-cs85 SDG NO. 4, 9, 11	COMPUTER NETWORKS				L	T	P	CP	C
					3	0	0	3	3

OBJECTIVES:

- Provide foundational knowledge of computer networking concepts, architectures, and protocols.
- Enable students to design and analyze network systems for different use cases.
- To learn the functions of network layer and the various routing protocols
- To understand various application layer protocols.
- Foster understanding of the latest advancements in networking technologies and promote awareness of sustainability and ethical considerations in network design and operations.
- To understand the Emerging Technologies like SDN, IoT and Next Generation Networks

MODULE -I INTRODUCTION TO COMPUTER NETWORKS**7**

Basics of Computer Networks - Types of Networks: LAN, WAN, MAN, PAN-OSI and TCP/IP Models- Network Topologies and Switching Techniques- Physical Layer: Transmission Media, Signals, and Bit Transmission

MODULE -II DATA LINK LAYER**8**

Error Detection and Correction Techniques- Data Link Protocols: Stop-and-Wait, Sliding Window- Medium Access Control (MAC) Protocols: ALOHA, CSMA/CD, CSMA/CA- Ethernet (IEEE 802.3), Wireless LANs (IEEE 802.11)

MODULE - III NETWORK LAYER**8**

Logical Addressing: IPv4 and IPv6- Subnetting and Supernetting- Routing Algorithms: Shortest Path, Distance Vector, Link State- Network Devices: Routers, Switches, Gateways- Internet Protocols: ICMP, ARP, RARP

MODULE - IV TRANSPORT LAYER**7**

Transport Layer Protocols: TCP, UDP- Congestion Control Mechanisms- Flow Control Techniques - Quality of Service (QoS) in Transport Layer

MODULE - V APPLICATION LAYER**8**

Introduction- Electronic mail (SMTP, POP3, IMAP, MIME)-DNS-FTP-HTTP and SNMP -Introduction to Cloud Networking - Peer-to-Peer Networks- Network Security Basics: Firewalls, IDS & IPS

MODULE - VI EMERGING TOPICS IN NETWORKING**7**

Software-Defined Networking (SDN)- Internet of Things (IoT) and Smart Networks- Energy Efficiency in Networking- Next-Generation Networks (5G and Beyond)- Ethical and Sustainability Issues in Networking

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Computer Networking: A Top-Down Approach by James F. Kurose and Keith W. Ross, 8th Edition, 2021
2. Data Communications and Networking by Behrouz A. Forouzan, 5th Edition, 2017.

REFERENCE BOOKS

1. Computer Networks by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, 2013
2. Network Security Essentials: Applications and Standards by William Stallings, 6th Edition, 2020

WEB REFERENCES

1. Computer Networks (Prof. Bhaskar Ramamurthi, IIT Madras)
2. Data Communication Networks (Prof. Sudarshan Iyengar, IIT Ropar)

OUTCOMES

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

1. Apply the principles, design, terminology, and concepts of network models to configure and manage basic network communications. (K3)
2. Select the protocols of data link layer and apply error control mechanisms (K3)
3. Apply subnetting, routing algorithms, and congestion control techniques to practical scenarios. (K3)
4. Choose the Transport Layer Protocols suitable for transmission of data (K3)
5. Examine the application layer protocols and their basic functionalities. (K4)
6. Address sustainability and ethical challenges in networking design. (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24ITPC301 106105225 SDG NO. 4	DATA STRUCTURES AND ALGORITHMS					L	T	P	CP	C
						3	0	0	3	3

OBJECTIVES:

- To introduce the concepts of Abstract Data Types (ADTs) and provide a thorough understanding of Stacks and Queues
- To develop proficiency in implementing linked list structures
- To impart knowledge on tree data structures
- To familiarize with the fundamentals of graph theory
- To provide foundational skills in algorithm design and analysis

MODULE - I STACKS AND QUEUES 8

Stacks-and-Queues: Abstract-Data-Types-(ADTs): Stack ADT: Operations - Applications - Evaluating arithmetic expressions - Infix, Prefix and Postfix expression - Operations - Queue ADT: Operations - Circular Queue - Priority Queue - Dequeue

MODULE - II LINKED LIST 7

Linked List: List ADT – Array-Based Implementation – Linked List Implementation -- Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists – All Operations (Insertion, Deletion, Merge, Traversal).

MODULE - III TREES 7

Trees – Tree Traversals - Binary Tree ADT – Expression Trees – Binary Search Tree ADT – Threaded Binary Trees- AVL Trees – B-Tree - Heap

MODULE - IV GRAPHS 8

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

MODULE - V SORTING AND SEARCHING ALGORITHMS 8

Bubble sort – Selection sort – Insertion sort - Divide and Conquer – Merge sort – Quick sort – Analysis of sorting algorithm – Linear search - Binary search.

MODULE - VI ALGORITHM ANALYSIS TECHNIQUES 7

Fundamentals of Algorithmic Problem Solving – Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties - – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Greedy Technique - 0/1 Knapsack problem

TOTAL : 45 PERIODS

TEXT BOOKS:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES

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

1. Illustrate the ADT for stack and Queue Data Structures (K3)
2. Demonstrate the ADT for Linked List Data Structures (K3).
3. Interpret the ADT for Tree Data Structures in Real World Problem (K3).
4. Construct Non-Linear for Graph Data Structures (K3).
5. Compare sorting and searching algorithms in terms of time and space complexity. (K4)
6. Analyze greedy algorithms to develop efficient solutions for optimization problems. (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24ITPW301 106106220 SDG NO. 4, 9	DATABASE MANAGEMENT SYSTEMS WITH LABORATORY	L	T	P	CP	C
		3	0	2	5	4

OBJECTIVES:

- To design database and database queries using ER diagrams and SQL respectively
- To understand Dependencies and various types of normalization in database application
- To understand the concepts of concurrent Transaction Processing and recovery procedures
- To understand the cursor, procedure and control structure in PL/SQL
- To obtain knowledge about the Distributed, Object Databases ,XML and NOSQL databases

MODULE - I DATABASE DESIGN AND RELATIONAL DATABASES 8

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 – SQL Fundamentals

MODULE - II FUNCTIONAL DEPENDENCIES AND NORMALIZATION 7

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

MODULE - III PL/SQL PROGRAMMING 9

Introduction of PL/SQL -Advantages of PL/SQL- PL/SQL Block Structure, PL/SQL Data Types, Variable, Constant- Control Structure- Conditional Control, Iterative Control, Sequential Control- Exception handling Predefined Exception, User defined Exception-Cursors- Implicit and Explicit Cursors, Declaring, opening and closing cursor, fetching a record from cursor, cursor for loops, parameterized cursors- Procedures- Advantages, Create, Execute and Delete a Stored Procedure.

MODULE - IV CONCURRENT TRANSACTION PROCESSING 7

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

MODULE - V FILE ORGANIZATION AND QUERY PROCESSING 7

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 – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation.

MODULE - VI OBJECT ORIENTED DATABASE,XML DATABASE AND NOSQL 7

Distributed Databases–Architecture-Data Storage-Transaction Processing–Object Based Databases - Object Database Concepts – Object Relational Features - ODMG Object Model – ODL - OQL – XML Databases - XML Hierarchical Model–DTD-XML Schema–Xquery. Introduction to NoSQL-Four types of NoSQL database

LIST OF EXPERIMENTS 15

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying–Simple queries, Nested queries, Sub queries and Joins.
3. Implementation of Views, Sequences and Synonyms.
4. Implicit and Explicit Cursors
5. Procedures and Functions.
6. Triggers.
7. Exception Handling
8. Develop any one application using the following steps
 - i) Database Design using ER Model
 - ii) Normalization
 - iii) Front End and Back End Design and connectivity

TOTAL: 60 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

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

1. Sketch the principles of Relational databases to design the Entity relationship diagrams for any given scenario. (K3)
2. Demonstrate the use of normalization and functional dependencies to refine the database system. (K4)
3. Implement basic control structures, Exceptions, Cursors, Procedures in PL/SQL. (K3)
4. Examine various SQL queries for Transaction Processing and Locking using the concept of Concurrency control. (K3)
5. Demonstrate indexing and hashing techniques for the organization of databases and to perform advanced query processing. (K5)
6. Examine the various types of modern and traditional databases (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - III

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

OBJECTIVES:

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

SYLLABUS:

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

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

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 Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - JC Kumarappa
8. Bharat Mein Angreji Raj - Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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

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

CO – PO, PSO MAPPING:

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

SEMESTER - III

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

ARMY WING**PERSONALITY DEVELOPMENT****9**

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

LEADERSHIP**7**

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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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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ARMED FORCES	6
AF 1 Armed Forces, Army, CAPF, Police	6
ADVENTURE	1
AD 1 Introduction to Adventure Activities	1
BORDER & COASTAL AREAS	2
BCA 1 History, Geography & Topography of Border/Coastal areas	2
TOTAL: 45 PERIODS	
NAVAL WING	
PERSONALITY DEVELOPMENT	9
PD 3 Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5 Public Speaking	3
LEADERSHIP 7	
L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
DISASTER MANAGEMENT	13
DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3 Fire Service & Fire Fighting	1
ENVIRONMENTAL AWARENESS & CONSERVATION	3
EA 1 Environmental Awareness and Conservation	3
GENERAL AWARENESS	4
GA 1 General Knowledge	4
NAVAL ORIENTATION 6	
AF 1 Armed Forces and Navy Capsule	3
EEZ 1 EEZ Maritime Security and ICG	3
ADVENTURE	1
AD 1 Introduction to Adventure Activities	1

BORDER & COASTAL AREAS	2
BCA 1 History, Geography & Topography of Border/Coastal areas	2
TOTAL: 45 PERIODS	

AIR FORCE WING**PERSONALITY DEVELOPMENT 9**

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

LEADERSHIP 7

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

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

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1	Environmental Awareness and Conservation	3
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GENERAL AWARENESS 4

GA 1	General Knowledge	4
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GENERAL SERVICE KNOWLEDGE 6

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

ADVENTURE 1

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

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

SEMESTER - III

24CIPT301 - SDG NO. 4, 9	DIGITAL DESIGN AND COMPUTER ORGANIZATION SYSTEM LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	4	3

OBJECTIVES:

- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions.
- To introduce the methods for simplifying Boolean expressions.
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- To illustrate the concept of synchronous and asynchronous sequential circuits.
- To introduce the concept of memories and programmable logic devices

MODULE - I LOGIC SIMPLIFICATION**7**

Review of number systems and number representation – Binary codes – Code Conversion; Logic Simplification: Review of Boolean Algebra and De Morgan's Theorem – SOP and POS forms – Canonical forms – Karnaugh maps up to 4 variables- Implementation using logic gates.

List of Experiments

1. Verification of Boolean Theorems using basic gates
2. Converting Boolean functions to Standard SOP/POS Form using K map realization and Implementation.
3. Implementation of boolean functions using NAND and NOR gate.

MODULE - II COMBINATIONAL LOGIC DESIGN**7**

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder.

List of Experiments

1. Design and implement Half/Full Adder and Subtractor
2. Design and implement combinational circuits using MSI devices:
 - a. 4 bit binary adder/subtractor
 - b. Magnitude comparator

MODULE - III SYNCHRONOUS SEQUENTIAL CIRCUITS**7**

Flip - Flops: Bistable elements, Latches, Flip flops – SR, JK, T, D- operation and excitation tables, Triggering of Flip Flop- Master/Slave Flip flop. Registers and Counters: Shift registers - SISO, SIPO, PISO and PIPO; up/down Counters; Design of Synchronous counters - Shift Register Counters.

List of Experiments

1. To design 4 bit synchronous Counter using JK Flip flops - Ic7476
2. To design and Implement- T and D flip flops

MODULE - IV ASYNCHRONOUS SEQUENTIAL CIRCUITS**7**

Introduction to asynchronous sequential circuits - fundamental mode and pulse mode circuits - State Diagram and Excitation Table - Ripple Counters cycles and races, state reduction, race free assignments

List of Experiments

1. To design 4-bit Ripple counter using JK Flip flops - IC7476
2. To design an asynchronous 4-bit up and down counter.

MODULE - V ARITHMETIC OPERATIONS IN PROCESSORS**5**

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism – one's and two's complement – Booth algorithm

List of Experiments

1. Binary number multiplication using Booth's algorithm
2. Addition and Subtraction Operations in Processors

MODULE - VI MEMORY DEVICES AND PROGRAMMABLE**LOGIC DEVICES****5**

Memory Devices: Basic memory structure – ROM - PROM – EPROM – EEPROM – EAPROM, RAM – Static and dynamic RAM PLDs: PLA, PAL, PROM, Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL. – CPLD.

List of Experiments

1. Implementation of adder using PAL and PLA
2. Implementation of Multiplier using PLA and PAL

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", Fifth Edition, Pearson, 2014.
2. S. Salivahanan, S. Arivazhagan, "Digital Circuits and Design", Oxford Press India, Fifth Edition, 2018.
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.

REFERENCE BOOKS:

1. Charles H. Roth. "Fundamentals of Logic Design", 6 Edition, Thomson Learning, 2013.
2. Thomas L. Floyd, "Digital Fundamentals", 10 Edition, Pearson Education Inc, 2011.
3. S. Salivahanan and S. Arivazhagan, "Digital Electronics", 1 Edition, Vikas Publishing House Pvt Ltd, 2012
4. A. Anand Kumar, "Fundamentals of Digital Circuits", 4 Edition, PHI Learning Private Limited, 2016.

WEB RESOURCES:

1. <http://nptel.ac.in/courses/117106086/1>
2. <http://nptel.ac.in/courses/117103064/>

ONLINE RESOURCES:

1. <https://www.allaboutcircuits.com/textbook/digital/>
2. <http://web.iitd.ac.in/~shouri/eel201/lectures.php>

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

1. Discuss different types of logic gates and their roles in implementing Boolean functions. (K2)
2. Implement synchronous counters, shift registers, and sequence detectors using D, JK, and T flip-flops (K2)
3. Demonstrate synchronous sequential circuits based on specified input/output behavior using state diagrams and flip-flops. (K2)
4. Apply the principles of asynchronous circuit design to develop basic asynchronous sequential systems (K2)
5. Examine the fixed and floating point arithmetic operations. (K2)
6. Describe the function, characteristics and structure of different memory systems (K2)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24ITPL301 - SDG NO. 4	DATA STRUCTURES AND ALGORITHMS LABORATORY				L	T	P	CP	C
					0	0	4	4	2

OBJECTIVES:

- To implement and demonstrate basic data structures
- To understand and apply algorithmic paradigms
- To apply graph algorithms and optimization techniques
- To develop and analyze efficient searching and sorting techniques
- To implement advanced data structures and algorithms

List of Experiments:

1. Implement the basic operations of a stack using arrays (push, pop, peek, and isEmpty).
2. Implement the basic operations of a queue using arrays (enqueue, dequeue, front, rear, and isEmpty).
3. Implement the conversion of an infix expression to a postfix expression using a stack.
4. Implement a singly linked list with basic operations such as insertion, deletion, and traversal.
5. Implement a doubly linked list with basic operations such as insertion, deletion, and traversal.
6. Implement a binary tree and perform basic operations like insertion, deletion, and traversal (inorder, preorder, postorder).
7. Implementation of AVL tree (all operation).
8. Implementation of Priority queue using Heap.
9. Graph representation and Traversal algorithms a) Depth first Search b) Breadth First Search.

10. Implement Dijkstra's algorithm to find the shortest path from a source vertex to all other vertices in a graph.
11. Implement linear search and Binary search.
12. Implement merge sort and quick sort for Divide and Conquer.
13. Implement the 0/1 Knapsack Problem using the Greedy technique
14. Analyze and implement a recursive algorithm (like factorial or Fibonacci)

TOTAL : 45 PERIODS**LAB REQUIREMENTS :** Turbo C/Dev C++, Borland C or GCC equivalent**OUTCOMES****Upon completion of the course, the student will be able to:**

1. Apply basic linear and non linear data structures (K3)
2. Analyze and compare various trees, searching and sorting algorithms (K4)
3. Apply algorithmic strategies such as greedy and graph-based techniques (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24SCTP301 - SDG NO. 4	APTITUDE SKILLS					L	T	P	CP	C
						0	0	2	2	1

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

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

MODULE - I QUANTITATIVE ABILITY**22**

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

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

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

MODULE - III VERBAL ABILITY**7**

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

TOTAL: 45 PERIODS**REFERENCES:**

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

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

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

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

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

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

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

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

MODULE - II RANGER AND ROVER**10**

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

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

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

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

Activating the Earth Tribe Initiative in your Community.

MODULE - III BIS STANDARDS IN CYBER SECURITY**8**

Introduction to Cyber Security Standardization n-CIA Triad (Confidentiality, Integrity, Availability) as the foundation for all standards- Role of BIS in Cyber Security- LITD 17 (Electronics and IT Division Council)-ISO/IEC JTC 1/SC 27- Key BIS Standards for Cyber Security (Based on ISO/IEC)-Practical Applications and Case Studies- National Cyber Security Framework and BIS Alignment-Cyber Security Policy 2013-CERT-IN, NIC, MeitY

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://lms.scout.org/course_items/show/1172182?course_id=214307#course-item-id=1172182
2. 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 Cyber Tools. [K2]

CO – PO, PSO MAPPING:

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

SEMESTER - III

24SCID301 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - I					L	T	P	CP	C
						0	0	2	2	1

OBJECTIVES:

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

- To prepare students to design sustainable business models and present entrepreneurial ideas through structured, outcome-driven business pitches using core startup frameworks.

COURSE METHODOLOGY:

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

EVALUATION:

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

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

TOTAL: 45 PERIODS

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

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

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	3	3	2	-	-	-	-	2	-	-	-	2	2
C02	3	3	2	-	-	-	-	2	-	-	-	2	2
Co3	3	3	2	-	-	-	-	2	-	-	-	2	2

SEMESTER - IV

24BSMA406 - SDG NO. 4	PROBABILITY & STATISTICS WITH R PROGRAMMING	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To introduce basic statistical concepts and data visualization techniques using R.
- To understand probability theory and random variables for modelling uncertainty.
- To explore key probability distributions and their applications in cyber contexts.
- To perform statistical inference and hypothesis testing using R.
- To analyze relationships through correlation, regression, and time series methods.
- To apply statistical methods for cyber security data analysis and anomaly detection.

MODULE - I DESCRIPTIVE STATISTICS AND DATA

VISUALIZATION IN R

10

Types of data: quantitative, qualitative – Measures of Central tendency: Mean, Median, Mode – Measures of Dispersion: Range, Variance, Standard Deviation, Inter-quartile range – Position metrics: percentiles, quartiles – Frequency distribution and Tabulation. Reading data from CSV/text – Using summary(), sd(), quartile() – Visualizations using hist(), boxplot(), pie(), ggplot2.

MODULE - II PROBABILITY CONCEPTS AND RANDOM VARIABLES 10

Classical, empirical and axiomatic definitions of probability – Conditional probability and independence – Baye's Theorem and applications – Random Variables: Discrete and Continuous – Expectation, Variance and Standard Deviation – Probability distribution and probability density functions. Simulating random experiments (e.g., dice, coin) – Visualizing probability spaces – Using functions sample(), replicate(), mean(), var().

MODULE - III DISCRETE AND CONTINUOUS PROBABILITY

DISTRIBUTIONS

10

Discrete Probability Distributions: Bernoulli, Binomial, Poisson and Geometric – Continuous Probability Distributions: Uniform, Exponential and normal – Properties of Probability mass function, Probability density function, Cumulative distribution function, Mean and variance. Using dbinom(), dpois(), dnorm(), pexp() – Plotting PDFs and CDFs – Parameter estimation via fitting functions.

MODULE - IV STATISTICAL INFERENCE AND HYPOTHESIS TESTING 10

Sampling and Sampling Distributions – Central Limit Theorem (CLT) – Confidence Intervals for Mean and Proportion – Hypothesis Testing: z-test, t-test, chi-square test, ANOVA. Simulations to demonstrate CLT – Performing and interpreting test results in R using `t.test()`, `chisq.test()`, `aov()`.

MODULE - V CORRELATION, REGRESSION AND TIME SERIES ANALYSIS 10

Pearson and Spearman Correlation – Simple and Multiple Linear Regression – Model Fit and Diagnostics – Basics of Time Series: Trends, Seasonal Components, Smoothing. Using functions `cor()`, `lm()`, `summary()`, time series plotting using `ts()`, 'forecast' package.

MODULE - VI APPLICATIONS IN CYBER SECURITY WITH R 10

Anomaly detection: Detect unusual patterns in network traffic, login attempts or system behavior – use of statistical threshold for detecting outliers in logs or traffic (use `ts`, `forecast`, `anomalize` packages) – Classification overview: logistic regression and Naïve Bayes – Introduction only – Classify network activity as normal or malicious (use `caret`, `glm` for classification modelling) – Risk assessment and modelling: Quantify and predict cyber risks using binomial, Poisson distributions and Monte Carlo simulation (use `mc2d`, `fitdistrplus` for fitting distributions and simulation).

TOTAL : 60 PERIODS**TEXT BOOKS:**

1. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon Ross, 5th Edition. Academic Press, 5th Edition, 2014.
2. Using R for Introductory Statistics, John Verzani, 2nd Edition, CRC Press, 2nd Edition, 2014.

REFERENCES:

1. R in Action: Data Analysis and Graphics with R, Robert I. Kabacoff, 2nd Edition, Manning, 2nd Edition, 2015.
2. An Introduction to Statistical Learning with Applications in R (ISLR), Gareth James et al., 2nd Edition, Springer, 2021.
3. Modern Applied Statistics with S, W. N. Venables and B. D. Ripley, Springer, 4th Edition, 2002.
4. The Art of R Programming, Norman Matloff, 1st Edition, No Starch Press, 2011.

ONLINE RESOURCES:

1. Coursera – Statistical Inference (by Johns Hopkins University)
<https://www.coursera.org/learn/statistical-inference>

2. DataCamp – Introduction to R & Statistics with R Track
<https://www.datacamp.com/tracks/statistics-with-r>
3. edX – Probability and Statistics in Data Science using R (UC San Diego)
<https://www.edx.org/course/probability-and-statistics-in-data-science-using-r>
4. <https://www.youtube.com/c/joshstarmer>
5. <https://www.youtube.com/channel/UCaNIxVagLhqupvUiDK01Mgg>

WEB RESOURCES:

1. R Project Official Site: <https://www.r-project.org/>
2. R Documentation: <https://stat.ethz.ch/R-manual/>
3. R-bloggers: <https://www.r-bloggers.com/>
4. Categorized R packages: <https://cran.r-project.org/web/views/>

COURSE OUTCOMES

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

1. Summarize and visualize data using descriptive statistics and R programming. (K2)
2. Apply fundamental probability concepts and simulate random experiments in R. (K3)
3. Use appropriate probability distributions to solve real-world problems. (K3)
4. Conduct statistical inference and hypothesis testing using R. (K3)
5. Build and interpret correlation, regression, and basic time series models for data analysis. (K3)
6. Implement statistical methods in R for analyzing cyber security datasets. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCPC401 noc21_cs88 SDG NO. 4, 9, 16	CRYPTOGRAPHY AND INFORMATION SECURITY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To introduce the foundations and evolution of cryptography in securing data.
- To explore classical, symmetric, and asymmetric cryptographic algorithms.
- To develop the ability to implement cryptographic systems in practical scenarios.
- To understand modern security protocols and mechanisms like SSL/TLS and PKI.
- To analyze various authentication and access control models for secure systems.
- To examine advanced security techniques including blockchain and quantum cryptography.

MODULE - I INTRODUCTION TO CRYPTOGRAPHY**7**

Overview of Cryptography: Definition, History, and Applications- Classical Encryption Techniques: Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Transposition Cipher -Modern Cryptography: Symmetric and Asymmetric Encryption- Cryptographic Algorithms: DES, AES, RSA, ECC (Elliptic Curve Cryptography) -Security Models: Confidentiality, Integrity, Authentication, and Non-repudiation

MODULE - II SYMMETRIC KEY CRYPTOGRAPHY**8**

Stream Ciphers and Block Ciphers: Working and examples (e.g., RC4, AES)- Data Encryption Standard (DES): Overview, Block Cipher Structure, Key Schedule, and Modes of Operation-Advanced Encryption Standard (AES): Working, Key Expansion, Rounds, and Modes of Operation-Cipher Block Chaining (CBC), Electronic Codebook (ECB), and Other Modes of Operation

MODULE - III PUBLIC KEY CRYPTOGRAPHY**7**

Public Key Encryption: RSA, Diffie-Hellman Key Exchange- Elliptic Curve Cryptography (ECC): Introduction, Uses, and Efficiency -Digital Signatures: Definition, RSA Digital Signature, DSA (Digital Signature Algorithm) -Key Management and Distribution

MODULE - IV CRYPTOGRAPHIC PROTOCOLS AND ALGORITHMS 8

Key Management Protocols: Key Agreement, Key Distribution, Public Key Infrastructure (PKI) -Secure Hash Functions: SHA (Secure Hash Algorithm), MD5, HMAC (Hashed Message Authentication Code)- Message Authentication Codes (MACs): Function and Applications -Digital Certificates and SSL/TLS: Certificate Authorities (CAs), SSL Handshakes, HTTPS

MODULE - V INFORMATION SECURITY MECHANISMS 7

Access Control Models: Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role-Based Access Control (RBAC)- Authentication Mechanisms: Passwords, Biometrics, Two-Factor Authentication-Firewalls and Intrusion Detection Systems (IDS): Network Security and Monitoring Tools- Public Key Infrastructure (PKI) and its use in securing communication

MODULE - VI ADVANCED TOPICS IN CRYPTOGRAPHY AND SECURITY 8

Quantum Cryptography: Introduction and Basics, Quantum Key Distribution (QKD)- Zero-Knowledge Proofs: Concept and Applications in Authentication - Blockchain Technology: Overview, Cryptography in Blockchain, Consensus Algorithms -Secure Multi-party Computation (SMC): Principles and Applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security – Principles and Practice, 8th Ed., Pearson, 2023.
2. Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, Springer, 2020.

REFERENCE BOOKS:

1. Jonathan Katz, Yehuda Lindell, Introduction to Modern Cryptography, 3rd Ed., CRC Press, 2021.
2. Douglas Stinson, Cryptography: Theory and Practice, 4th Ed., CRC Press, 2019.
3. Bruce Schneier, Applied Cryptography, 20th Anniversary Edition, Wiley, 2017.

NPTEL COURSES AND LINKS:

1. Cryptography and Network Security
2. Introduction to Cryptography
3. Information Security

OUTCOMES

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

1. Implement Classical and modern Cryptography techniques to solve real world security challenges, and protocols.(K3)
2. Apply cryptographic algorithms in practical scenarios (K3)
3. Examine the working principles behind symmetric and asymmetric cryptographic systems.(K4)
4. Apply cryptographic techniques in real-world scenarios, such as secure communication and data protection. (K3)
5. Analyze the security requirements of different systems and determine appropriate cryptographic techniques. (K3)
6. Apply advanced cryptographic techniques like QKD,ZKPs and blockchain to develop secure communication (K4).

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCPC402 CS32, AI01, Cs39 SDG NO. 9 & 16	MACHINE LEARNING ESSENTIALS FOR CYBER SECURITY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Provide an in-depth understanding of machine learning and its role in enhancing cyber security.
- Equip students with the skills needed to preprocess and analyze security data for machine learning.
- Enable students to implement supervised and unsupervised learning models for detecting and preventing cyber threats.
- Expose students to advanced techniques such as deep learning and anomaly detection in security applications.

- Equip students with the skills to implement machine learning frameworks and develop cybersecurity-specific solutions through hands-on practice with real-world datasets.
- Prepare students for real-world challenges in deploying and securing machine learning models in the cyber security domain.

MODULE - I INTRODUCTION TO MACHINE LEARNING AND CYBER SECURITY

7

Introduction to Machine Learning (ML): Definitions, Types (Supervised, Unsupervised, Reinforcement Learning)- Overview of Cyber Security: Cyber threats, types of attacks, and their impact- ML in Cyber Security: Introduction to how ML is applied to enhance cyber defense-Overview of ML Algorithms: Basic introduction to key algorithms like Decision Trees, Naive Bayes and SVM.

MODULE - II DATA PREPROCESSING AND FEATURE ENGINEERING FOR SECURITY DATA

7

Data Collection in Cyber Security: Logs, network traffic, system events-Data Cleaning and Normalization: Handling missing values, scaling, and normalizing data- Feature Engineering: Selecting and transforming features to improve model performance- Imbalanced Data: Techniques for dealing with class imbalance in security datasets.

MODULE - III SUPERVISED LEARNING ALGORITHMS IN CYBER SECURITY

8

Supervised Learning Overview: Introduction to classification and regression- Algorithms in Cyber Security: Decision Trees, Random Forest, Naive Bayes, and SVM-Model Evaluation Metrics: Accuracy, Precision, Recall, F1-Score, Confusion Matrix- Applications in Cyber Security: Intrusion Detection Systems (IDS), email spam detection, and network security.

MODULE - IV UNSUPERVISED LEARNING AND ANOMALY DETECTION

8

Unsupervised Learning Overview: Clustering, dimensionality reduction- Anomaly Detection: Detecting fraud, intrusion, and malicious activities- Algorithms: K-Means, DBSCAN, PCA, Isolation Forest-Challenges in Anomaly Detection: Evaluation methods and real-world challenges.

MODULE - V TOOLS AND FRAMEWORKS FOR MACHINE LEARNING IN CYBER SECURITY

8

Frameworks and Tools: Keras, TensorFlow, PyTorch- Hands-on Practice: Building models for real-world cyber security datasets.Cyber Security-

Specific Tools :Snort,OpenVAS .Security-Specific ML Toolkits and Libraries:Deep Packet,Pandas and Matplotlib/Seaborn

MODULE - VI MODEL EVALUATION, DEPLOYMENT, AND SECURITY

CONSIDERATIONS

7

Evaluating ML Models for Cyber Security: Cross-validation, hyperparameter tuning- Model Deployment: Best practices for deploying ML models in live security environments- Security Challenges: Adversarial attacks, model poisoning, and securing ML models-Future Trends: Advanced security issues in ML applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Machine Learning for Cybersecurity by Faron Moller (2019)
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron (2022).Third Edition O'Reilly Publisher

REFERENCE BOOKS:

1. "Introduction to Machine Learning with Python" by Andreas C. Müller and Sarah Guido (2016)
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop (2006)
3. "Data Mining and Machine Learning: Concepts and Techniques" by Jiawei Han and Micheline Kamber (2011)

NPTEL COURSES:

1. Introduction to Machine Learning
2. Cyber Security

OUTCOMES

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

1. Apply machine learning concepts to identify and analyze various cyber threats and attacks (K3)
2. Assess the effectiveness of various data preprocessing and feature engineering techniques in enhancing the performance of machine learning models applied to cybersecurity datasets.(K4)
3. Evaluate the effectiveness of various supervised learning models in addressing cybersecurity challenges (K4).
4. Apply the effectiveness of various unsupervised learning models in anomaly detection (K3)

5. Utilize machine learning frameworks and cybersecurity-specific tools to develop and evaluate models for real-world cybersecurity datasets, .(K4)
6. Evaluate the Secure machine learning models in cybersecurity context (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCPC403 106105182, 110107130 SDG NO. 4, 9	SOFTWARE DEVELOPMENT AND DESIGN THINKING				L	T	P	CP	C
					3	0	0	3	3

OBJECTIVES:

- To explain different software process models, distinguish between Agile and traditional models, and describe the principles and practices of Extreme Programming
- To apply core-analytical knowledge and appropriate techniques and provide solutions to real time challenges of national and global society
- Apply ethical knowledge for professional excellence & leadership for the betterment of the society
- Use software design principles and tools to create modular, maintainable and scalable software architectures
- Develop life-long learning skills needed for better employment and entrepreneurship.
- To understand the Empathizing Techniques and Design Thinking Frameworks.

MODULE - I SOFTWARE PROCESS AND AGILE DEVELOPMENT 7

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

MODULE - II REQUIREMENTS ANALYSIS AND SPECIFICATION 8

Software Requirements: Functional and Non-Functional -User requirements - System requirements - Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary

MODULE - III UNIFIED PROCESS AND USE CASE DIAGRAMS 8

Introduction to OOAD with OO Basics - Unified Process - UML diagrams - Use Case –Case study - the Next Gen POS system, Inception - Use case Modelling-Relating Use cases - include, extend and generalization - When to use Use-cases

MODULE - IV UML DIAGRAMS 8

Class Diagram - Elaboration - Domain Model - Finding conceptual classes and description classes - Domain model refinement - Finding conceptual class Hierarchies - Aggregation and Composition -Relationship between sequence diagrams and use cases - When to use Class Diagrams- Dynamic Diagrams - UML interaction diagrams -System sequence diagram - Collaboration diagram - When to use Communication Diagrams - State machine diagram and Modelling –When to use State Diagrams - Activity diagram

MODULE - V PRINCIPLES OF DESIGN THINKING 7

What is Different About Design thinking? Design Thinking Skills Principles of Design Thinking, The Basis for Design Thinking, The Design Thinking Team, Design Thinking Workshops and Meetings – Exercises and case based discussions

MODULE - VI DESIGN THINKING FRAMEWORK 7

Listening and Empathizing Techniques – observation – structured open ended approach - , Design Thinking Frameworks, Ideation tools – brainstorming, innovation heuristics, behaviour models, overcoming cognitive fixedness – Case study for Mind analysis.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Software Engineering A Practitioner's Approach, Roger S Pressman, 6th edition. McGraw Hill International Edition.2015.
2. Craig Larman, –Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development||, Third Edition, Pearson Education, 2005.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage",Harvard Business Press , 2009.
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

REFERENCES:

1. Rajib Mall, –Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited,2009
2. Pankaj Jalote, –Software Engineering, A Precise Approach, Wiley India, 2010.
3. Kelkar S.A., –Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, –Software Engineering, Tata McGraw-Hill Publishing Company Limited,2007
5. Jeanne Liedtka , Andrew King, Kevin Bennett , “Book - Solving Problems with Design Thinking - Ten Stories of What Works” (Columbia Business School Publishing), 2013

ONLINE RESOURCES:

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

OUTCOMES

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

1. Apply Agile Practices and Software Process Models (K3)
2. Implement Requirement Analysis and Documentation Techniques (K3)
3. Apply Software Design Principles and Models (K3)
4. Analyze Software Testing Strategies and Debugging Techniques (K4)

5. Analyse Project Management Techniques for Effort Estimation and Scheduling (K4)
6. Categorise the Mitigate Risks in Software Development (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

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

ARMY WING**PERSONALITY DEVELOPMENT 9**PD 3 Group Discussion: Team Work 2PD 4 Career Counselling, SSB Procedure & Interview Skills 3PD 5 Public Speaking 4**BORDER & COASTAL AREAS 4**BCA 2 Security Setup and Border/Coastal management in the area 2BCA 3 Security Challenges & Role of cadets in Border management 2**ARMED FORCES 3**AF 2 Modes of Entry to Army, CAPF, Police 3**COMMUNICATION 3**C 1 Introduction to Communication & Latest Trends 3**INFANTRY 3**INF 1 Organisation of Infantry Battalion & its weapons 3

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

AIR FORCE WING**PERSONALITY DEVELOPMENT 9**

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

BORDER & COASTAL AREAS 4

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

AIRMANSHIP 1

A 1	Airmanship	1
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BASIC FLIGHT INSTRUMENTS 3

FI 1	Basic Flight Instruments	3
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AERO MODELLING 3

AM 1	Aero Modelling Capsule	3
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GENERAL SERVICE KNOWLEDGE 2

GSK 4	Latest Trends & Acquisitions	2
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AIR CAMPAIGNS 6

AC 1	Air Campaigns	6
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PRINCIPLES OF FLIGHT 6

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

NAVIGATION 5

NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3

TOTAL :45 PERIODS

SEMESTER - IV

24SCPL401 - SDG NO. 4, 9, 16, 17	CRYPTOGRAPHY AND CYBER SECURITY LAB	L	T	P	CP	C
		0	0	3	3	1

OBJECTIVES:

- Understand the fundamental concepts of cryptography and their implementation in C programming.
- Apply encryption and decryption techniques using symmetric and asymmetric cryptography in C.
- Implement and evaluate hashing algorithms and digital signatures to ensure data integrity and authentication.
- Analyze and perform vulnerability assessments and penetration testing on network systems.
- Design and implement secure applications that integrate encryption, authentication, and secure communication protocols.

NAME OF THE EXPERIMENTS:

- Lab 1 Introduction to Cryptography Concepts in C Programming (Key Concepts & Simple Examples).
- Lab 2 Implementing Symmetric Key Encryption using the DES Algorithm in C.
- Lab 3 Implementing Symmetric Key Encryption using AES Algorithm in C.
- Lab 4 Implementing RSA Public Key Cryptography in C (Key Generation and Encryption/Decryption).
- Lab 5 Implementing the SHA-256 Hash Function in C.
- Lab 6 Implementing MD5 Hash Function and its Applications in Data Integrity in C.
- Lab 7 Digital Signatures Implementation in C for Authentication and Verification.
- Lab 8 Setting up a Basic Public Key Infrastructure (PKI) in C for Encryption and Decryption.
- Lab 9 Implementing Secure Socket Layer (SSL) Communication Protocol in C.
- Lab 10 Implementing Simple File Encryption and Decryption using C (AES/DES).
- Lab 11 Analyzing Network Traffic with Wireshark and Identifying Security Vulnerabilities.
- Lab 12 Performing Penetration Testing on a Sample Network Application (Using Kali Linux).

Lab 13 Implementing SSL/TLS Encryption for Secure Communication in C.

Lab 14 Vulnerability Assessment using OpenSSL and C Programming to Analyze Weaknesses.

Lab 15 Developing a Secure Communication Application (Capstone Project) with Encryption and Integrity Checking.

TOTAL: 30 PERIODS

Software Tools Required:

C Programming (with libraries for cryptography)

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. Implement symmetric and asymmetric cryptographic algorithms in C.
2. Apply hashing algorithms and digital signatures in C programming for data integrity and authentication.
3. Analyze network security vulnerabilities and implement solutions using ethical hacking tools.
4. Design and implement secure communication protocols using C programming.
5. Understand and propose solutions to security issues by designing secure systems.

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCPT401 noc21_cs88 SDG NO. 4, 9, 16	OPERATING SYSTEM IN KALI LINUX LAB WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- Understand the foundational knowledge of operating system concepts with a focus on security.
- Develop hands-on expertise in using Kali Linux for OS-level operations and security testing.
- Equip students to apply process, memory, and file management techniques in practical scenarios.
- Enable students to conduct network monitoring and security assessments using Kali tools.
- Prepare students for advanced use cases like penetration testing and incident response.
- To Understand the Penetration Testing workflow tools like Metasploit, Wireshark, and Burp Suite

MODULE - I INTRODUCTION TO OPERATING SYSTEMS AND KALI LINUX

6

Operating System Overview: Functions and Types -Key OS Concepts: Processes, Threads, Scheduling, and Memory Management- Introduction to Kali Linux: History, Installation, and Key Features-Use Cases of Kali Linux for Penetration Testing

Lab Exercises:

1. Install and configure Kali Linux on VirtualBox or Bare Metal
2. Basic Command-Line Operations in Kali Linux

MODULE - II PROCESS MANAGEMENT AND SCHEDULING IN KALI LINUX

8

Process Lifecycle: Creation, Execution, Termination- Scheduling Algorithms: First Come First Serve (FCFS), Shortest Job Next (SJN), Round Robin (RR)- Managing Processes in Kali Linux using Commands - Multi-tasking and Multi-threading in Kali Linux

Lab Exercises:

1. Using ps, top, kill, nice, and renice commands
2. Create and Manage Background Processes in Kali Linux

MODULE - III MEMORY MANAGEMENT AND FILE SYSTEMS IN KALI LINUX**8**

Memory Allocation Techniques: Paging and Segmentation- Virtual Memory and Swapping in Kali Linux- File Systems: EXT, NTFS, FAT32 Overview - File Permissions and Management in Kali Linux

Lab Exercises:

1. Configure and Monitor Memory Usage
2. Use Commands like chmod, chown, and lsattr to Manage File Permissions
3. Mount and Unmount Drives and File Systems

MODULE IV NETWORKING AND SECURITY FEATURES IN KALI LINUX**8**

Basic Networking Concepts: TCP/IP Stack, Ports, and Protocols- Networking Tools in Kali Linux: nmap, netstat, ping- Security Essentials: Firewalls, SELinux, and IP Tables -Managing Network Interfaces in Kali Linux

Lab Exercises:

1. Perform Network Scanning with nmap
2. Monitor Network Traffic using tcpdump and wireshark
3. Configure and Test Firewall Rules with iptables

MODULE - V USER MANAGEMENT AND SCRIPTING IN KALI LINUX**7**

Managing Users and Groups in Kali Linux- User Authentication and Password Management- Shell Scripting for Automation in Kali Linux- Automating Security Tasks using Scripts

Lab Exercises:

1. Create and Manage Users and Groups using useradd, usermod, and passwd
2. Write Shell Scripts for Automated Backup or Network Monitoring

MODULE - VI ADVANCED TOPICS AND USE CASES**8**

Penetration Testing Workflow in Kali Linux- Advanced Tools in Kali Linux: Metasploit, Wireshark, and Burp Suite- Best Practices for Security and Incident Response-Future Trends in Operating Systems and Cyber Security

Lab Exercises:

1. Conduct a Penetration Testing Simulation with Metasploit
2. Capture and Analyze Packets with Wireshark
3. Perform Vulnerability Scanning using Kali Tools

TOTAL : 45 PERIODS

TEXT BOOKS:

1. "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, Greg Gagne (10th Edition, 2018).
2. "Kali Linux Revealed" by Raphael Hertzog, Jim O'Gorman, and Mati Aharoni (2017).

REFERENCE BOOKS:

1. "Modern Operating Systems" by Andrew S. Tanenbaum and Herbert Bos (4th Edition, 2015).
2. "The Linux Command Line: A Complete Introduction" by William E. Shotts (2nd Edition, 2019).

NPTEL COURSES:

1. Operating System
2. Cyber Security

OUTCOMES

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

1. Apply the core operating system concepts and their applications in Kali Linux. (K3)
2. Implement process management and scheduling algorithms. (K3)
3. Explain the process, memory, and file management mechanisms in Kali Linux. (K3)
4. Use networking and security tools in Kali Linux for real-world applications. (K3)
5. Analyze the effectiveness of various OS features and security configurations. (K4)
6. Analysis of Security Features and Exploits (K4)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCTP401 - SDG NO. 4	APTITUDE SKILLS	L	T	P	CP	C
		0	0	2	2	0

PROBLEM SOLVING TECHNIQUES USING C PROGRAMMING – PHASE 1**OBJECTIVES:**

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

MODULE - I FOUNDATIONS OF PROGRAMMING 12

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

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

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

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

- Pointers in C:
- Understanding memory management.

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

TOTAL: 45 PERIODS

REFERENCES:

1. Let Us C – Yashavant Kanetkar
2. Programming in ANSI C – E. Balagurusamy
3. The C Programming Language – Brian W. Kernighan and Dennis M. Ritchie
4. C: How to Program – Paul Deitel and Harvey Deitel
5. Problem Solving and Program Design in C – Jeri R. Hanly and Elliot B. Koffman

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

OBJECTIVES:

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

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

14

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

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

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

Managing Personal Finance - Budgeting - Setting personal goals - Estimate likely expenses Monitor spending to obtain the most value for the available

funds - Saving and Investing - Advantages of saving money - Concept of present and future value of money.

MODULE - II RANGER AND ROVER

10

Scouting for Boys: Scout Craft, Campaigning.

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

Growing Together: Understanding the growth context.

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

MODULE - III SOFTWARE - QUALITY ASSURANCE & ARTIFICIAL INTELLIGENCE

6

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

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

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

TOTAL: 30 PERIODS

REFERENCES:

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

ONLINE RESOURCES

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

OUTCOMES

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

1. Understand and apply the fundamentals of C programming for problem-solving. (K2)
2. Utilize control structures, operators, and functions to write modular programs. (K2)

3. Implement pointers and arrays for efficient memory and data management. (K2)
4. Solve real-world problems by designing and optimizing algorithms. (K2)
5. Demonstrate career and managerial skills. (K2)
6. Understand BIS standards for Information security and AI domain. (K2)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24SCID401 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - II					L	T	P	CP	C
						0	0	2	2	1

OBJECTIVES:

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

- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

COURSE METHODOLOGY:

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

EVALUATION:

1. First evaluation (Immediately after first internal examination): 20 marks (Focus on refined problem statement, advanced MVP design, and detailed development plan)
2. Second evaluation (Immediately after second internal examination): 30 marks (Focus on prototype/MVP implementation, initial testing, and preliminary market validation results)
3. Final evaluation (Last week of the semester): 50 marks (Focus on the complete refined solution, comprehensive market validation, growth strategy, final project report, and viva-voce)

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

TOTAL: 45 PERIODS

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

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

CO – PO, PSO MAPPING:

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

Imagine the Future and Make it happen!



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

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

There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY** which will help to create **DECENT WORK AND ECONOMIC GROWTH**. Our prosperity shall be fuelled

by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to **REDUCE INEQUALITIES** by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES**.

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

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

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

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

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



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

Together we can...

Sai Prakash Leo Muthu

Chairman & CEO – Sairam Institutions

We build a Better nation
through Quality education.



Sri

SAI RAM

INSTITUTE OF TECHNOLOGY

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

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and **NIRF** ranked institution

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