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 & ENGINEERING

REGULATIONS
2024

Academic Year 2024-25 onwards

AUTONOMOUS

CURRICULUM AND

SYLLABUS
I - II
SEMESTERS

SRI SAIRAM 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.

QUALITY POLICY

We at Sri Sai Ram Institute of Technology are committed to build a better nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Services to satisfy the Students, Parents, Industry and Society.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION

To be a centre of excellence in educating and graduating Computer Engineers by providing unique environment that foster research, technological, and social enrichment with intellectual knowledge to acquire international standards.

MISSION

M1: Develop high quality Computer Science and Engineering graduates with technical and Professional skills by providing modern infrastructure to acquire international standards.

M2: Foster research to solve real world problems with emerging Technologies

M3: Establish center of excellences in collaboration with industries, to meet the changing needs of society

M4: Inculcate spirit of moral values that contributes to societal ethics

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA101	Matrices and Calculus	3	1	0	4	4
2	24HSEN101	Communicative English	3	0	0	3	3
3	24BSPH101	Engineering Physics	3	0	0	3	3
4	24BSCY101	Engineering Chemistry	3	0	0	3	3
5	24ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	24HSTA101	Heritage of Tamils	1	0	0	1	1
PRACTICALS							
1	24ESGE102	Engineering Practices Laboratory	0	0	4	4	2
2	24BSPL101	Physics and Chemistry Laboratory	0	0	4	4	2
3	24ESPL101	Programming in C Laboratory	0	0	2	2	1
VALUE ADDITIONS - I							
1	24ESID101	Idea Engineering Lab - I	0	0	2	2	1
2	24ENTP101	Functional Life Skills	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
					Total	31	24

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA201	Discrete Structures	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH203	Physics for Information Science	3	0	0	3	3
4	24BSCY201	Chemistry for Environment and Sustainability	3	0	0	3	3
5	24HSTA201	Tamils and Technology	1	0	0	1	1
6	24ESGE101	Engineering Graphics	1	2	0	3	3
7	24HSNC201	NCC Course Level 1*	2	0	0	2*	0
PRACTICALS							
1	24AIPT201	Python for Data Science Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - II							
1	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
2	24ENTP201	Digital Dynamics	0	0	2	2	0
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
					Total	25	20

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SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA301	Statistics and Linear Algebra	3	1	0	4	4
2	24CSPC301	Database Management System	3	0	0	3	3
3	24CSPC302	Data Structures	3	0	0	3	3
4	24ITPC302	Software Engineering	3	0	0	3	3
5	24CSPW301	Digital Design and Computer Organization with Laboratory	3	0	2	5	4
6	24HSMC301	Universal Human Values - II	3	0	0	3	3
7	24HSNC301	NCC course Level 2*	3*	0	0	3*	0
PRACTICALS							
1	24CSPL301	Database Management Systems Laboratory	0	0	4	4	2
2	24CSPL302	Data Structures Laboratory	0	0	4	4	2
VALUE ADDITIONS - III							
1	24CSTP301	Aptitude skills	0	0	2	2	1
2	24CSID301	Innovative Design Laboratory - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC301	Joy of Computing using Python (Mandatory - NC)	2	0	0	2	0
				Total		35	26

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA402	Probability and Queueing Theory	3	1	0	4	4
2	24CSPC401	Theoretical Computer Science	3	0	0	3	3
3	24CSPC402	Design and Analysis of Algorithms	3	0	0	3	3
4	24CSPW401	Operating Systems with Laboratory	3	0	2	5	4
5	24CSPC403	Microprocessor and Microcontroller	3	0	0	3	3
6	24XXOEXXX	Open Elective – I#	3	0	0	3	3
7	24HSNC401	NCC course Level 3*	3	0	0	3*	0
PRACTICALS							
1	24CSPT401	Object Oriented Programming Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - IV							
1	24CSTP401	Aptitude skills	0	0	2	2	0
2	24CSID401	Innovative Design Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
				Total		30	24

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SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24ITPC501	Computer Networks	3	0	0	3	3
2	24CSPW501	Artificial Intelligence with Laboratory	3	0	2	5	4
3	24XXEL5YY	Professional Elective - I	3	0	0	3	3
4	24YYEL5ZZ	Professional Elective - II	3	0	0	3	3
5	24XXOEXXX	Open Elective - II#	3	0	0	3	3
6	24MGMC501	Constitution of India	2	0	0	2	0
PRACTICALS							
1	24ITPL501	Computer Networks Laboratory (Cisco Platform)	0	0	4	4	2
VALUE ADDITIONS - V							
1	24CSTP501	Skill Enhancement	0	0	2	2	1
2	24CSID501	Prototype Development Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
					Total	27	20

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24CSPC601	Internet Programming	3	0	0	3	3
2	24XXEL6uu	Professional Elective - III	3	0	0	3	3
3	24XXEL6vv	Professional Elective - IV	3	0	0	3	3
4	24XXEL6ww	Professional Elective - V	3	0	0	3	3
5	24XXOEXXX	Open Elective - III	3	0	0	3	3
6	24HSMG501	Principles of Engineering Management	3	0	0	3	3
PRACTICALS							
1	24CSPL601	Internet Programming Laboratory	0	0	4	4	2
VALUE ADDITIONS - VI							
1	24CSTP601	Technical Skill	0	0	2	2	0
2	24CSID601	Prototype Development Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
					Total	26	21

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SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24ITPC701	Cryptography and Network Security	3	0	0	3	3
2	24XXEL7xx	Professional Elective - VI	3	0	0	3	3
3	24XXEL7yy	Professional Elective - VII	3	0	0	3	3
4	24XXEL7zz	Professional Elective - VIII	3	0	0	3	3
5	24XXOEXXX	Open Elective - IV	3	0	0	3	3
6	24MGEL703	Creative Innovation and Entrepreneurship	2	0	0	2	2
PRACTICALS							
1	24ITPL701	Network Security Laboratory	0	0	4	4	2
2	24CSPJ701	Project Work - Phase I	0	0	8	8	4
VALUE ADDITIONS - VII							
1	24CSTP701	Company Specific Skills	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
					Total	31	24

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
PRACTICALS							
1	24CSPJ801	Project Work - Phase II	0	0	12	12	6
VALUE ADDITIONS - VIII							
1	24CSIN801	Internship	0	0	9	9	3
					Total	21	9

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PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL501	Advanced Computer Architecture	3	Computing Essentials
2	24CSEL502	Distributed Systems	3	Computing Essentials
3	24CSEL503	Mobile Computing	3	Computing Essentials
4	24CSEL504	Affective Computing	3	Artificial Intelligence
5	24CSEL505	Decision Support Systems	3	Artificial Intelligence
6	24CSEL506	Knowledge Representation and Reasoning	3	Artificial Intelligence
7	24ITEL503	Learning Analytics Tools	3	Data Science
8	24ITEL504	Data Warehousing and Data Mining	3	Data Science
9	24ITEL505	Big Data Tools and Techniques	3	Data Science
10	24ITEL606	Introduction to Internet of Things	3	Internet of Things
11	24ITEL507	IoT Architecture and Programming	3	Internet of Things
12	24ITEL508	IoT Concepts and Applications	3	Internet of Things
13	24SCEL504	Fundamentals of Quantization	3	Quantum Computing
14	24SCEL505	Quantum Algorithms	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	24CSEL507	Software Testing	3	Computing Essentials
2	24CSEL508	Software Quality Assurance	3	Computing Essentials
3	24CSEL509	Software Project Management	3	Computing Essentials
4	24CSEL510	Introduction to Machine Learning	3	Artificial Intelligence
5	24CSEL511	Fundamentals of Edge and Soft Computing	3	Artificial Intelligence
6	24CSEL512	Cognitive Computing	3	Artificial Intelligence
7	24ITEL509	Business Intelligence & Analytics	3	Data Science
8	24ITEL510	NoSQL Database Techniques	3	Data Science
9	24ITEL511	Data Acquisition System	3	Data Science
10	24ITEL512	Microprocessors and Interfacing	3	Internet of Things
11	24ITEL513	Blockchain and IoT	3	Internet of Things
12	24ITEL514	IoT Communication Protocols	3	Internet of Things
13	24SCEL522	Quantum Information Theory	3	Quantum Computing
14	24SCEL523	Quantum Machine Learning	3	Quantum Computing
15	24SCEL524	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	24CSEL601	Cloud Computing	3	Computing Essentials
2	24CSEL602	High Performance Computing	3	Computing Essentials
3	24CSEL603	Information Storage and Management	3	Computing Essentials
4	24CSEL604	Game Theory	3	Artificial Intelligence
5	24CSEL605	Software Defined Networks	3	Artificial Intelligence
6	24CSEL606	Business Intelligence	3	Artificial Intelligence
7	24ITEL603	Data Analytics with Python	3	Data Science
8	24ITEL604	Text Mining and Analytics	3	Data Science
9	24ITEL605	Data Science for Engineers	3	Data Science
10	24ITEL705	Introduction to Industry 4.0 and Industrial Internet of Things	3	Internet of Things
11	24CSEL620	Data Science for Internet of Things	3	Internet of Things
12	24ITEL608	Applications of IoT in Robotics	3	Internet of Things
13	24SCEL604	Quantum Network Protocols	3	Quantum Computing
14	24SCEL605	Quantum Metrology	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	24CSEL607	Computer Networks and Internet Protocol	3	Computing Essentials
2	24CSEL608	Full Stack Software Development	3	Computing Essentials
3	24CSEL609	Wireless Ad Hoc and Sensor Networks	3	Computing Essentials
4	24CSEL610	Computer Vision	3	Artificial Intelligence
5	24CSEL611	Agent Based Intelligent Systems	3	Artificial Intelligence
6	24CSEL612	Robotic Process Automation	3	Artificial Intelligence
7	24ITEL609	Advanced R Programming for Data Analytics in Business	3	Data Science
8	24ITEL610	Ethics in Data Science	3	Data Science
9	24ITEL611	Accelerated Data Science	3	Data Science
10	24CSEL621	Mobile Application Development for IoT	3	Internet of Things
11	24ITEL613	Programming for IoT Boards	3	Internet of Things
12	24ITEL614	Software and Programming in IoT	3	Internet of Things
13	24SCEL622	Quantum Key Distribution	3	Quantum Computing
14	24SCEL623	Quantum Control Theory	3	Quantum Computing
15	24SCEL624	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	24CSEL613	Foundations of Cryptography	3	Computing Essentials
2	24CSEL614	Intrusion Detection Systems	3	Computing Essentials
3	24CSEL615	Introduction to Cybersecurity	3	Computing Essentials
4	24CSEL616	Natural Language Processing	3	Artificial Intelligence
5	24CSEL617	Predictive Modeling	3	Artificial Intelligence
6	24CSEL618	Augumented, Virtual and Mixed Reality	3	Artificial Intelligence
7	24ITEL616	Games and Information	3	Data Science
8	24ITEL617	Multivariate Techniques for Data Analytics	3	Data Science
9	24CSEL619	Web Analytics	3	Data Science
10	24CSEL622	Dynamic Paradigm in IoT	3	Internet of Things
11	24ITEL620	IoT and Sensor Technologies	3	Internet of Things
12	24ITEL621	IoT & Edge Computing	3	Internet of Things
13	24SCEL640	Quantum Optics	3	Quantum Computing
14	24SCEL641	Quantum Photonics	3	Quantum Computing
15	24SCEL642	Quantum Artificial Intelligence	3	Quantum Computing
16	24MGEL6ZZ	Industrial Psychology	3	Management

PROFESSIONAL ELECTIVES - VI

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL701	Parallel Algorithms	3	Computing Essentials
2	24CSEL702	Agile Methodologies	3	Computing Essentials
3	24CSEL703	Green Computing	3	Computing Essentials
4	24CSEL704	Deep Learning	3	Artificial Intelligence
5	24CSEL705	Bio-Inspired Optimization Techniques	3	Artificial Intelligence
6	24CSEL706	Neural Networks	3	Artificial Intelligence
7	24ITEL702	Deep Learning for Computer Vision	3	Data Science
8	24CSEL709	Deep Learning for Data Analytics	3	Data Science
9	24ITEL704	Bio Informatics	3	Data Science
10	24CSEL623	Digital Twin Technology	3	Internet of Things
11	24ITEL706	IoT Based Smart Systems	3	Internet of Things
12	24ITEL707	IoT for Smart Cities	3	Internet of Things
13	24SCEL658	Quantum Materials	3	Quantum Computing
14	24SCEL659	Quantum Sensors For Medical Applications	3	Quantum Computing
15	24SCEL660	Quantum Imaging	3	Quantum Computing
16	24MGEL7XX	Introduction to Innovation, IP, Management & Entrepreneurship	3	Management

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PROFESSIONAL ELECTIVES - VII

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL707	Real-Time Systems	3	Computing Essentials
2	24CSEL708	Information Retrieval Techniques	3	Computing Essentials
3	24CSEL709	Information System Audit	3	Computing Essentials
4	24CSEL710	Pattern Recognition and Application	3	Artificial Intelligence
5	24CSEL711	Generative AI	3	Artificial Intelligence
6	24CSEL712	Generative Deep Learning	3	Artificial Intelligence
7	24ITEL709	Social Network Analysis	3	Data Science
8	24ITEL710	Mining Massive Datasets	3	Data Science
9	24ITEL711	Healthcare Analytics	3	Data Science
10	24ITEL712	Digital Image Processing	3	Internet of Things
11	24ITEL713	IoT Cloud Processing and Analytics	3	Internet of Things
12	24ITEL714	Cognitive IoT	3	Internet of Things
13	24SCEL704	Quantum Cryptanalysis	3	Quantum Computing
14	24SCEL705	Quantum Secure Multi-Party Computation	3	Quantum Computing
15	24SCEL706	Quantum-Resistant Blockchain	3	Quantum Computing
16	24MGEL7YY	Foundation Skills in Integrated Product Development	3	Management

PROFESSIONAL ELECTIVES - VIII

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSEL713	Blockchain Architecture Design and Use Cases	3	Computing Essentials
2	24CSEL714	Ethical Hacking	3	Computing Essentials
3	24CSEL715	Digital Security and Forensics	3	Computing Essentials
4	24CSEL716	Artificial Intelligence Search Methods for Problem Solving	3	Artificial Intelligence
5	24CSEL717	Time Series Analysis	3	Artificial Intelligence
6	24CSEL718	Visualization Techniques	3	Artificial Intelligence
7	24ITEL717	Reinforcement Learning	3	Data Science
8	24ITEL718	Database Security and Auditing	3	Data Science
9	24ITEL719	Data Mining and Analytics	3	Data Science
10	24ITEL720	Blockchain and its Applications	3	Internet of Things
11	24ITEL721	Open Source Programming for IoT	3	Internet of Things
12	24ITEL722	Artificial IoT	3	Internet of Things
13	24SCEL713	Quantum-resistant Cryptography	3	Quantum Computing
14	24SCEL714	Quantum-enhanced Metrology For Navigation	3	Quantum Computing
15	24SCEL715	Quantum-enhanced Radar Systems	3	Quantum Computing
16	24MGEL7yy	HR Analytics	3	Management

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
L&T BASKET

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CSIE501	UI/UX Developer	3	Information Technology
2	24ITIE502	Software Engineering Tools	3	Information Technology
3	24ITIE601	Data-driven Storytelling and Visualization	3	Information Technology
4	24ITIE602	Fundamentals of Business Analytics	3	Information Technology
5	24ITIE603	NODE JS - The Complete Guide	3	Cross-Platform
6	24ITIE604	Security Professional	3	Security and Risk Management
7	24CSIE601	Network Professional	3	Information Technology
8	24CSIE602	Cyber Defense	3	Information Security
9	24CSIE603	Fundamentals of Agile Methodology with DevOps Integration	3	Software Development
10	24CSIE701	Building Web Services with Java Network Programming	3	Information Technology

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
HCL BASKET

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24EIIE611	Embedded System for Connected Devices	3	Embedded
2	24CSIE612	C++ for Embedded Systems	3	Embedded
3	24ITIE711	Advanced C++ for Embedded Programming	3	Embedded
4	24EIIE712	Product Development Process	3	Embedded
5	24CSIE712	Project Phase-I	4	Embedded
6	24CSIE811	Internship	3	Embedded
7	24CSIE812	Project Phase-II	6	Embedded

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
SALESFORCE BASKET

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24ITIE503	Salesforce Administrator	3	Data Science
2	24CSIE504	Salesforce Developer	3	Data Science
3	24ITIE605	MuleSoft Anypoint Platform Fundamentals	3	Data Science
4	24CSIE606	Salesforce Business Analyst	3	Data Science

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 : Formulate, analyze and solve Engineering problems with strong foundation in Mathematical, Scientific and Engineering fundamentals.

PEO 2 : Analyze the requirements, realize the technical specification and design the Engineering solutions by applying computer science theory and principles.

PEO 3 : 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 allows 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.

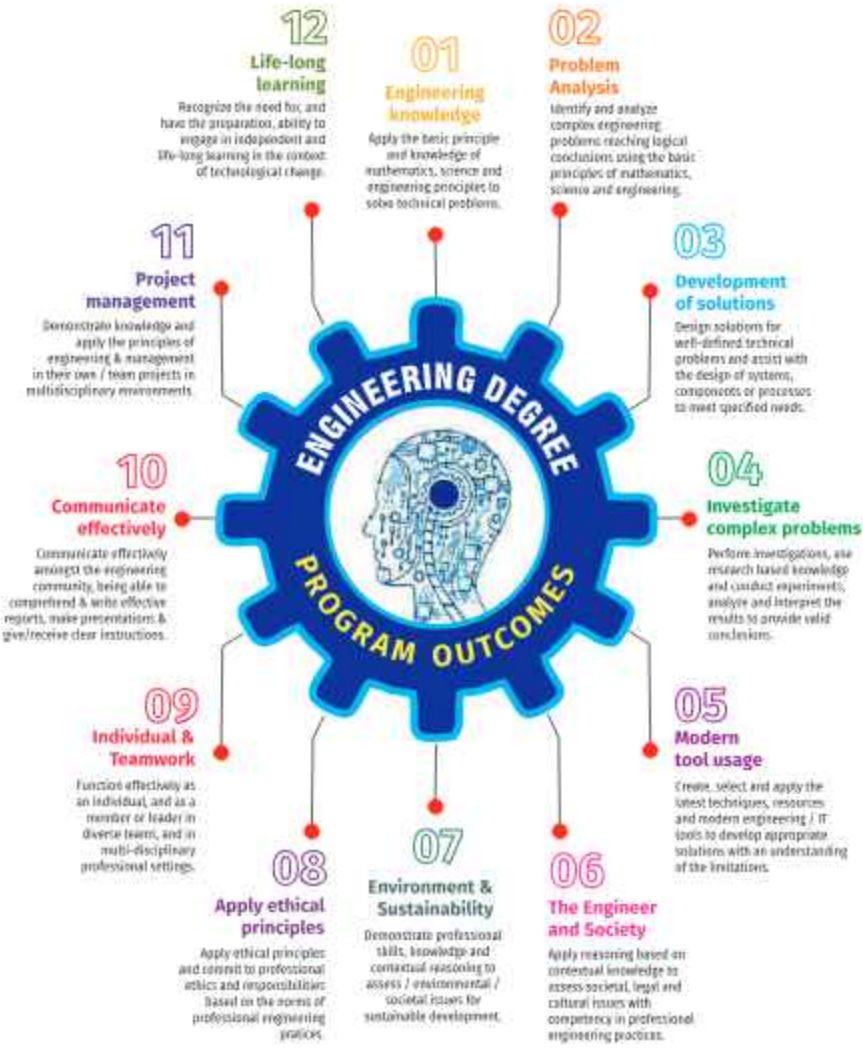
PSO2: Understand, Analyze and Develop computer programs for efficient design of computer-based systems of varying complexity.

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 SDG NO. 4 & 9	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	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 **12**

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

TOTAL: 60 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

OUTCOMES:

Upon completion of the course, the student will 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	PO12
CO1	3	1	1	1	-	-	-	-	-	-	-	1
CO2	3	1	1	1	-	-	-	-	-	-	-	1
CO3	3	1	1	1	-	-	-	-	-	-	-	1
CO4	3	1	1	1	-	-	-	-	-	-	-	1
CO5	3	1	1	1	-	-	-	-	-	-	-	1
CO6	3	1	1	1	-	-	-	-	-	-	-	1

SEMESTER - I

24HSEN101 SDG NO. 4	COMMUNICATIVE ENGLISH	L	T	P	C
		3	0	0	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://wwPearson.com/english/catalogue/business-english/technical-english.html
2. https://ww.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

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

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

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	3	-	-

SEMESTER - I

24BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	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 Wiely & 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	PO12
CO1	3	2	2	-	2	-	-	-	-	-	-	1
CO2	3	2	2	1	3	-	-	-	-	-	-	2
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	2	2	-	-	-	-	-	-	1
CO5	3	2	2	3	1	-	-	-	-	-	-	1
CO6	3	3	3	2	2	-	-	-	-	-	-	1

SEMESTER - I

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

OBJECTIVES:

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

MODULE - I POLYMER CHEMISTRY **8**

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

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

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

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

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

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

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY 7

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

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

MODULE - IV CHEMICAL THERMODYNAMICS 8

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

MODULE - V FUELS 8

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

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

MODULE - VI NANOCHEMISTRY 7

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

OUTCOMES:

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

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

CO-PO, Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	2	-	-	-	-	-	-	-	1

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
CO1	3	3	3	3	2	-	-	-	-	-	2	2	2	2
CO2	3	3	3	3	2	-	-	-	-	-	2	2	2	2
CO3	3	3	3	3	2	-	-	-	-	-	2	-	2	2
CO4	2	2	-	2	2	-	-	-	-	-	1	-	3	2
CO5	2	2	-	-	1	-	-	-	-	-	1	-	3	3
CO6	2	2	-	-	2	-	-	-	-	-	1	-	3	3

SEMESTER - I

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

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, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT - III FOLK AND MARTIAL ARTS 3

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

UNIT - IV THINAI CONCEPT OF TAMILS 3

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

தமிழர் மரபு

அலகு - I மொழி மற்றும் இலக்கியம்: 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் -

பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு - II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை: 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - 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, ஒயிலொட்டம், தொல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV தமிழர்களின் திறைக் கோட்பாடுகள்: 3

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

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

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு 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 Thinai 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	PSO1	PSO2
CO1	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	3	-	-

SEMESTER - I

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO2	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO3	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO4	3	1	1	-	-	-	-	-	-	-	1	-	3	2
CO5	2	-	-	-	-	-	-	2	-	-	-	-	2	2
CO6	2	-	-	-	-	-	-	2	-	-	-	-	2	2

SEMESTER - I

24BSPL101 SDG NO. 4,6,11, 12 & 17	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	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, ParikshitGogoi, 2010.

OUTCOMES:

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

1. Demonstrate the wave nature of light using diffraction and interference properties. (K3)
2. Study the thermal conductivity of a bad conductor. (K3)
3. Verify experimentally the elastic properties of materials. (K3)
4. 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)

5. Apply spectroscopic techniques to determine the concentration of metal ions in solutions and use viscometry to determine the molecular weight of a polymer. (K3)
6. Demonstrate the ability to synthesize nanoparticles using simple chemical or physical methods and apply the weight loss method to study and analyze the corrosion behavior of materials in different environments.(K3)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	3
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	2	2	2	1	-	-	-	-	-	-	-	1
CO6	2	2	2	1	-	-	-	-	-	-	-	1

SEMESTER - I

24ESPL101 SDG NO. 4 & 9	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	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:

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. Illustrate C programs for simple applications making use of basic constructs, arrays, strings, functions and recursion.(K2)
2. Demonstrate C programs involving pointers, and structures. (K3)
3. 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
CO1	3	3	3	3	2	-	-	-	-	-	-	3	1	2
CO2	3	3	3	3	2	-	-	-	-	-	-	3	2	1
Co3	3	3	3	3	2	-	-	-	-	-	-	3	3	2

SEMESTER - I

24ESID101 SDG NO. 1-17	IDEA ENGINEERING LAB - I	L	T	P	C
		0	0	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 12

Immersion Program

Focus Areas:

- Channelizing Ideas
- Forming Working Teams for SDGs (Sustainable Development Goals)

TOTAL: 30 PERIODS

REFERENCES:

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

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	C
		0	0	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	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	2	-	2	-	-

SEMESTER - II

24BSMA201 SDG NO. 4	DISCRETE STRUCTURES	L	T	P	C
		3	1	0	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, McGraw-Hill Education (India) Edition 1997.

REFERENCES:

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

WEB REFERENCES:

1. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
2. https://www.cs.cornell.edu/~rafael/discmath.pdf
3. http://home.iitk.ac.in/~arlal/book/mth202.pdf
4. https://drive.google.com/file/d/1-PqMUlqDim1-AHQK5_zL34l97zHV3W15/view

ONLINE RESOURSES:

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=PLwdnzlV3ogoVxVxCTll45pDVM1aoYoMHf
5. https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9OQGMqxersk8fUxiUMSIx0DBqsKZS

OUTCOMES:

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

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

CO-PO, MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	-	-	-	-	-	0
CO2	3	1	1	1	-	-	-	-	-	-	-	0
CO3	3	1	1	1	-	-	-	-	-	-	-	0
CO4	3	1	1	1	-	-	-	-	-	-	-	0
CO5	3	1	1	1	-	-	-	-	-	-	-	0
CO6	3	1	1	1	-	-	-	-	-	-	-	0

SEMESTER - II

24HSEN201 SDG NO. 4	PROFESSIONAL ENGLISH	L	T	P	C
		2	0	0	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	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	3	-	-

SEMESTER - II

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

OBJECTIVES:

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

MODULE - I CONDUCTING MATERIALS **8**

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

MODULE - II SEMICONDUCTOR MATERIALS 7

Direct and indirect band gap semiconductors - Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Variation of Fermi level with temperature and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices.

MODULE - III MAGNETIC PROPERTIES OF MATERIALS 8

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

MODULE - IV SUPERCONDUCTING & OPTICAL PROPERTIES OF MATERIALS 7

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

MODULE - V NANO DEVICES 8

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

MODULE - VI QUANTUM COMPUTING 7

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.
2. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw- Hill Education, 2017.
3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2018.
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. Discuss 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 (K2)
2. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations (K2)
3. Understand the different types of magnetic materials and magnetic data storage device applications (K2)
4. Identify the different types of superconducting, optical materials and their applications (K2)
5. Explain the basics of quantum structures, single electron transport, basics of quantum computing and its applications (K2)
6. Describe the basics of quantum structures and their applications to quantum computing (K2)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	1
CO2	3	3	1	-	-	-	-	-	-	-	-	1
CO3	3	3	2	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO6	3	3	2	2	-	-	-	-	-	-	-	2

SEMESTER - II

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

OBJECTIVES:

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

MODULE - 1 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. Mc Carty, Gene F. Parkin, 4th Edition, McGraw-Hill.

OUTCOMES:

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

1. Develop a foundational understanding of environmental science, the interactions within ecosystems, the significance of biodiversity, and the importance of conservation strategies for maintaining ecological balance. (K3)
2. Identify the primary components of the atmosphere, explain the causes of atmospheric pollution, and propose basic strategies to promote a sustainable and clean atmosphere. (K3)
3. Demonstrate complex water quality parameters, and develop innovative methods for producing cost-effective soft water suitable for both industrial use and potable consumption. (K3)
4. Describe the composition and functions of soil components, analyze the sources and characteristics of solid wastes, and evaluate the methods and strategies 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	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	2	2	2	-	-	-	-	-	-	-	1
CO5	2	2	2	1	-	-	-	-	-	-	-	1
CO6	2	2	2	1	-	-	-	-	-	-	-	1

SEMESTER - II

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

OBJECTIVES:

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

UNIT - I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT - II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT - III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone 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 - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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

தமிழர் மரபு

அலகு - I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3

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

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க கொலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் ___ சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் கொலத்தில் 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 குமுழித் 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 நூ லகம் - 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	PSO1	PSO2
CO1	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO2	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO3	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO5	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO6	3	-	-	-	-	3	-	-	-	-	-	3	-	-

SEMESTER - II

24ESGE101 SDG NO. 4,6,7,9, 12,14 & 15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	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
CO1	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO2	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO3	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO4	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO5	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO6	3	-	-	-	-	-	-	2	-	2	-	-	3	2

SEMESTER - II

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

ARMY WING

NCC GENERAL **6**

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

NATIONAL INTEGRATION AND AWARENESS **4**

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

PERSONALITY DEVELOPMENT **7**

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

LEADERSHIP **5**

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

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT **8**

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

TOTAL: 30 PERIODS

NAVAL WING

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
		TOTAL: 30 PERIODS

ARMY WING

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

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
		TOTAL: 30 PERIODS

SEMESTER - II

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

OBJECTIVES:

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

Module - I BASICS OF PYTHON PROGRAMMING 8

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

List of Experiments

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

Module - II FILES, EXCEPTIONS, OOPS CONCEPTS 8

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

List of Experiments

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

Module - III DATA SCIENCE AND DESCRIPTIVE STATISTICS 8

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

List of Experiments

1. Write a program to handle numerical operations using math and random number functions.
2. Create user-defined functions with different types of function arguments.

Module - IV INTRODUCTION TO NUMPY 7

NumPy Basics: Arrays and Vectorized Computation - The NumPy ndarray - Creating ndarrays - Data Types for ndarrays - Arithmetic with NumPy Arrays - Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions - Mathematical and Statistical Methods-Sorting - Unique and Other Set Logic.

List of Experiments

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
2. Manipulation of NumPy arrays - Indexing, Slicing, Reshaping, Joining and Splitting.

Module - V DATA MANIPULATION WITH PANDAS 7

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

List of Experiments

1. Create Pandas Series and DataFrame from various inputs.
2. Import any CSV file to Pandas DataFrame and perform the following:

A Visualize the first and last 10 records

B Get the shape, index and column details

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

D Perform ranking and sorting operations.

E Do required statistical operations on the given columns.

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

G Rename single/multiple columns

Module - VI DATA CLEANING, PREPARATION AND VISUALIZATION 7

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

List of Experiments

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

A Handle missing data by detecting and dropping/ filling missing values.

B Transform data using apply () and map() method.

C Detect and filter outliers.

D Perform Vectorized String operations on Pandas Series.

E Visualize data using Line Plots, Bar Plots, Histograms, Density Plotsand Scatter Plots.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES:

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

1. Identify the need for data science and solve basic problems using Python built-in data types and their methods. (K3)
2. Develop an application with user-defined modules and packages using the OOP concept. (K3)
3. Gain Knowledge on data science fundamentals and process.(K2)
4. Understand data operations using NumPy arrays.(K2)
5. Apply powerful data manipulations using Pandas. (K3)
6. Do data pre-processing and visualization using Pandas.(K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	1	-	-	-	1	1	2	3	2
CO2	3	3	3	2	3	2	1	-	-	1	-	-	1	1
CO3	2	2	2	2	2	1	-	-	-	2	-	-	2	2
CO4	3	2	2	2	3	1	-	-	-	1	-	1	1	2
CO5	3	2	3	3	3	2	2	1	-	-	-	1	1	1
CO6	3	3	3	2	3	2	1	-	-	1	-	2	1	1

SEMESTER - II

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

OBJECTIVES:

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

MODULE - 1 Basics of Design Thinking in Electrical and Electronic Components 4

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

MODULE - 2 Embedded systems, IOT and Robotics 4

- Study of Sensors and Transducers
- Study of Embedded Protocols ,IOT Protocols & Embedded C
- Demonstration of Robotics & Drones model

MODULE - 3 Basics of Mechanical Engineering 4

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

Module - 4 Alignment and Mapping of Ideas 4

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

MODULE - 5 Entrepreneurship skills 4

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

MODULE - 6 Sairam SDG Ideathon 12

Evaluation Stages:

- First Round
- Second Round
- Idea Pitching

TOTAL: 30 PERIODS

REFERENCES:

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

WEB REFERENCES

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

OUTCOMES:

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

1. Exhibit knowledge on Basic Electronics (K2)
2. Understand the Basics of Mechanical Designs (K1)
3. Apply the Basics of IoT (K2)
4. Interpret the mapping of SDGs to ideas. (K2)
5. Follow the guidance for the Idea presentation. (K2)
6. Illustrate the ideas in the Ideathon event emphatically. (K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	2	-	2	-	2	2
CO2	3	-	-	-	-	2	2	-	2		2	2
CO3	3	-	-	-	-	2	2	-	2		2	2
CO4	3	-	-	-	-	2	2	-	2		2	2
CO5	3	-	-	-	-	2	2	-	2		2	2
CO6	2	2	-	-	2	2	2	-	2	-	2	2

SEMESTER - II

24ENTP201 SDG NO. 4	DIGITAL DYNAMICS	L	T	P	C
		0	0	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 7

Remote work and virtual teams

Authenticity in digital interactions

Engaging content creation

Tools and and techniques for insightful usage

Balancing online and offline interactions

Collaboration for research and innovation

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

Standardization –Basic Concepts:

Basic concepts of standardization

Purpose of standardization, marking and certification of articles and processes

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

Standards Formulation Process and Challenges:

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

WTO Good Practices for Standardization

World of Standards:

Important Indian and International Standards

TOTAL: 30 PERIODS

REFERENCES:

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

WEB REFERENCES:

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

OUTCOMES:

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

1. 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	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	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.

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