

B.E.-CSE (Cyber Security)

CURRICULUM AND SYLLABUS HANDBOOK
Regulation 2023

Approved by Academic Council on 14.10.2024

2024-2025



Sri Eshwar
College of Engineering
Coimbatore | Tamilnadu
An Autonomous Institution
Affiliated to Anna University, Chennai




Chairman – Board of Studies

1.0 Vision, Mission and Core Values of the Institution

Vision

“To be recognized as a premier institution, grooming students into globally acknowledged engineering professionals.”

Mission

We will achieve the Vision by:

- ✓ Providing outcome and value-based engineering education
- ✓ Nurturing research and entrepreneurial culture
- ✓ Enabling students to be industry-ready and fulfil their career aspirations
- ✓ Grooming students through behavioural and leadership training programs
- ✓ Making students socially responsible

Core Values

The following core values of Sri Eshwar College of Engineering are closely aligned with its vision and mission, supporting the college's goal of developing well-rounded, globally capable, and socially responsible engineering professionals:

1. Pursuit of Excellence,
2. Problem Solving Mindset
3. Spirit of Collaboration
4. Culture of Innovation
5. Responsibility to Society

2.0 Vision and Mission of the Department of Computer Science and Engineering (Cyber Security)

Vision

“ To be a globally prominent academic department for high quality education in the domain of Cyber security with ethical values and social commitment.”

Mission Statements

- M1: Impart comprehensive technical skills in Cyber Security through innovative teaching-learning methods.
- M2: Establish modern computing facilities and Industry supported centres for Skill Enrichment.
- M3: Impart ethics, Social responsibility and necessary professional, leadership skills through student centric.

3.0 B.E. CSE (Cyber Security) Program Educational Objectives (PEOs)

- PEO1:** Graduates will get recognized as effective professionals in the field of cyber security.
- PEO2:** Graduates will enrich skills and adopt emerging cyber security needs to pursue life-long learning and serve society with social concern and code of ethics.
- PEO3:** Graduates will adapt to cater the industrial needs through innovation and promote entrepreneurship in technology development, deployment and diverse cyber ethics

4.0 Knowledge and Attitude Profile (WK)

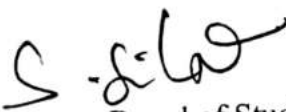
WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.


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- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

5.0 B.E. CSE (Cyber Security) Program Outcomes (POs)

- PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to the economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)


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- PO8: Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

6.0 B.E. CSE (Cyber Security) Program Specific Outcomes (PSOs)

- PSO1:** Apply cyber security skills to construct secure systems, from the hardware to the software to the human-computer interface.
- PSO2:** Use cyber security and cyber forensics software/tools to assess cyber-security risk management policies to protect information and assets.

7.0 B.E. CSE (Cyber Security) Program Curriculum

7.1. Curriculum Structure

The curriculum structure includes the following course categories:

Humanities and Social Sciences (HS): Technical English, Foreign Languages, Management & Engineering Ethics, and Engineering Economics.

Basic Sciences (BS): Mathematics, Physics, and Chemistry.

Engineering Sciences (ES): Materials Science, Workshop Practices, Drawing, and Fundamentals of Electrical, Electronics, Mechanical, and Computer Engineering.

Professional Core (PC): Courses specific to the chosen specialization or branch.

Professional Electives (PE): Elective courses within the chosen specialization (Vertical).

Open Electives (OE): Courses from other technical or emerging subject areas.

Project Work (PW): Projects involving Design Thinking (Product/Software Development Life Cycle), Innovative/Multidisciplinary Projects, Industry Projects, and other project work.

Employability Enhancement Courses (EM): Personality Development, Verbal and Soft Skills, Advanced Logical Thinking, and Industry or External Internships.

Mandatory Courses (MC): Heritage of Tamils (HSMC), Tamils and Technology (HSMC), Environmental Science, and Universal Human Values.

Optional Courses (OC): NCC Credit Course Level I, NCC Credit Course Level II, NCC Credit Course Level III and Honours Courses.

Student Induction Program (SIP)

The Student Induction Programme (SIP) is an essential three-week orientation tailored for first-year undergraduate students enrolled in BE/B.Tech programs. Held annually, this programme is designed to facilitate a smooth transition from secondary education to collegiate life, ensuring that students effectively integrate into both the academic and social environments of the institution.

Program Components

- ✓ Universal Human Values
- ✓ Health


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- ✓ Department Familiarization
- ✓ Interactive Lectures
- ✓ Proficiency Modules
- ✓ Local Visits
- ✓ Cultural Activities

The SIP plays a pivotal role in setting the stage for a successful and fulfilling college experience, providing students with the tools and support necessary for a smooth transition into their academic and social life

7.2. B.E. CSE (Cyber Security) Curriculum

Outcome-Based Education (OBE) with Choice Based Credit System (CBCS).



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Semester I

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Theory Courses									
-	-	Induction Program	-	-	-	-	-	-	-
1	U23MA202	Calculus and Linear Algebra	BS	3	1	0	0	4	4
2	U23CS301	ProblemSolving using C	ES	3	0	0	0	3	3
Theory cum Practical Courses									
3	U23HS181	TechnicalEnglish	HS	2	0	2	0	4	3
4	U23PH281	Physics for Information Science	BS	3	0	2	0	5	4
5	U23CS381	ApplicationDesignandDevelopment	ES	2	0	2	0	4	3
Practical Courses									
6	U23CS351	ProblemSolving using C Laboratory	ES	0	0	4	0	4	2
7	U23GE351	Engineering Practices Laboratory	ES	0	0	2	0	2	1
Professional Development Course									
8	U23EM751	Soft Skills	EM	0	0	2	0	2	1
Mandatory Course									
9	U23MC901	தமிழர்மரபு / Heritage of Tamils	HSMC	1	0	0	0	1	1
Total				14	1	14	0	29	22

Semester II

Sl. No.	Course Code	Course Name	Cate gory	Periods/wk				TC	C
				L	T	P	J		
Theory Courses									
1	U23CS401	Data Structures	PC	3	0	0	0	3	3
2	U23CS402	Object Oriented Programming using C++	PC	3	0	0	0	3	3
	U23NCC01	NCC Credit Course Level I [#]	OC	2	0	0	0	2	2
Theory cum Practical Courses									
3	U23HS5XX	Language Elective*	HS	2	0	2	0	4	3
4	U23SY481	Cyber Security Essentials	PC	3	0	0	0	3	3
Theory cum Practical with Project Course									
5	U23CS382	PythonProgramming	ES	2	0	2	2	6	4
Practical Courses									
6	U23CS451	DataStructuresLaboratory	PC	0	0	4	0	4	2
7	U23CS452	ObjectOrientedProgrammingusing C++ Laboratory	PC	0	0	2	0	2	1
Professional Development Course									
8	U23EM752	Logical Thinking	EM	0	0	2	0	2	1
Mandatory Course									
9	U23MC902	தமிழரும்தொழில்நுட்பமும் /Tamils and Technology	HSMC	1	0	0	0	1	1
Total				15	0	14	2	30	22

*-U23HS581: Business English (2-0-2-0-3); U23HS501: Basic Japanese (3-0-0-0-3); U23HS502: Basic German(3-0-0-0-3); #-Offered only for NCC students


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Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Theory Courses									
1	U23SY402	Cyber Forensics	PC	3	0	0	0	3	3
2	U23SYXXX	Professional Elective I*	PE	3	0	0	0	3	3
3	U23SYXXX	Professional Elective II*	PE	3	0	0	0	3	3
Theory cum Practical Courses									
4	U23SY483	Machine Learning in Cyber Security	PC	3	0	2	0	5	4
5	U23SY484	Secure Coding	PC	3	0	2	0	5	4
Theory cum Practical with Project Course									
6	U23CS493	Object Oriented Analysis and Design	PC	2	0	2	2	6	4
Practical Course									
7	U23SY452	Cyber Forensics Laboratory	PC	0	0	2	0	2	1
Professional Development Courses									
8	U23ICXXX	Industry Oriented Course I ^s	EM	0	0	2	0	2	1
9	U23EM754	Summer Internship	EM	-	-	-	-	-	1
Total				17	1	10	2	29	24

*- Electives Structure: 3 0 0 0 3 / 2 0 2 0 3; §- IOC Structure: 1 0 0 0 1 / 0 0 2 0 1.

Semester VI

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Theory Courses									
1	U23SY403	Cloud Security	PC	3	0	0	0	3	3
2	U23SYXXX	Professional Elective III*	PE	3	0	0	0	3	3
3	U23SY404	Formal Languages and Automata Theory	PC	3	0	0	0	3	3
Theory cum Practical Course									
5	U23IT483	Blockchain Technologies	PC	3	0	2	0	5	4
	U23NCC03	NCC Credit Course Level III [#]	OC	2	0	2	0	4	3 [#]
Theory cum Practical with Project Courses									
6	U23SY492	Cyber Data Science	PC	3	0	2	0	5	4
Practical Course									
7	U23SY453	Cloud Security Laboratory	PC	0	0	2	0	2	1
Project Work									
8	U23SY652	Innovative / Multi-Disciplinary Project	PW	0	0	0	2	2	1
Total				15	0	6	2	23	19

*- Electives Structure: 3 0 0 0 3 / 2 0 2 0 3; #-Offered only for NCC students

Semester VII

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Theory Courses									
1	U23CB103	Principles of Management	HS	3	0	0	0	3	3
2	U23CB104	Project Management and Finance	HS	1	0	0	0	1	1
3	U23SYXXX	Professional Elective IV	PE	3	0	0	0	3	3

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
4	U23OEXXX	Open Elective II*	OE	3	0	0	0	3	3
Theory cum Practical Course									
5	U23SY486	Ethical Hacking	PC	3	0	2	0	5	4
Project Work									
6	U23SY653	Project Work- Phase I	PW	0	0	0	6	6	3
Professional Development Course									
7	U23ICXXX	Industry Oriented Course II ^s	EM	0	0	2	0	2	1
Total				13	0	4	6	23	18

*- Electives Structure: 3 0 0 0 3 / 2 0 2 0 3. \$- IOC Structure: 1 0 0 0 1 / 0 0 2 0 1.

Semester VIII

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Project Work									
1	U23SY654	Project Work-Phase II	PW	0	0	0	16	16	8
Total				0	0	0	16	16	8

L→Lecture; T→Tutorial; P→Practical; J→Project; TC→Total Classes/wk; C→Credit.

CREDIT SUMMARY*

Sl. No.	Course Category	Credits per Semester								Credits	Credit %
		I	II	III	IV	V	VI	VII	VIII		
1	HS	3	3	-	-	-	-	4	-	10	6.1
2	BS	8	-	4	4	-	-	-	-	16	9.8
3	ES	9	4	4	-	-	-	-	-	17	10.4
4	PC	-	13	17	16	16	15	4	-	81	49.7
5	PE	-	-	-	-	6	3	3	-	12	7.4
6	OE	-	-	-	3	-	-	3	-	6	3.7
7	PW	-	-	-	-	-	1	3	8	12	7.4
8	EM	1	1	1	1	2	-	1	-	7	4.3
9	MC	-	-	NC	NC	-	-	-	-	0	0.0
10	HSMC	1	1	-	-	-	-	-	-	2	1.2
	OC	-	✓	-	✓	-	✓	✓	✓	-	-
Total		22	22	26	24	24	19	18	8	163	100

Total Number of Credits: 163

*Excluding NCC and Honours Courses


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7.3 Professional Elective Courses

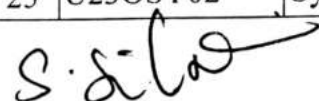
Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
Vertical 1— Cyber Security									
1	U23SY511	Wireless and Network Security	PE	3	0	0	0	3	3
2	U23SY512	Program Obfuscation	PE	3	0	0	0	3	3
3	U23SY513	Formal Methods for Security	PE	3	0	0	0	3	3
4	U23SY514	Hardware Security	PE	3	0	0	0	3	3
5	U23SY515	Biometrics and Security	PE	3	0	0	0	3	3
6	U23SY581	Information Security Risk Management	PE	2	0	2	0	4	3
7	U23SY582	Vulnerability Assessment and Penetration Testing	PE	2	0	2	0	4	3
8	U23SY583	Internet of Everything	PE	2	0	2	0	4	3
Vertical 2— Machine Learning									
1	U23AM511	Statistical Analysis and Computing	PE	3	0	0	0	3	3
2	U23AM581	Time Series Analysis and Forecasting	PE	2	0	2	0	4	3
3	U23AM582	Video Analytics	PE	2	0	2	0	4	3
4	U23AM583	Text and Speech Analytics	PE	2	0	2	0	4	3
5	U23AM584	Data Warehousing and Mining	PE	2	0	2	0	4	3
6	U23AM585	Generative AI	PE	2	0	2	0	4	3
7	U23AM586	Multi-Prompt Engineering	PE	2	0	2	0	4	3
8	U23AM587	Robot Kinematics and Dynamics	PE	2	0	2	0	4	3
9	U23AM588	Robotic Process Automation	PE	2	0	2	0	4	3
Vertical 3— Data Science									
1	U23AD511	Knowledge Engineering	PE	3	0	0	0	3	3
2	U23AD512	Cognitive Science	PE	3	0	0	0	3	3
3	U23AD513	Data and AI Ethics	PE	3	0	0	0	3	3
4	U23AD514	Information Retrieval	PE	3	0	0	0	3	3
5	U23AD581	Health Care Analytics	PE	2	0	2	0	4	3
6	U23AD582	Soft Computing Techniques	PE	2	0	2	0	4	3
7	U23AD583	Social Media Analytics	PE	2	0	2	0	4	3
8	U23AD584	Business Intelligence	PE	2	0	2	0	4	3
Vertical 4- Full Stack Development									
1	U23CS521	Web Application Security	PE	3	0	0	0	3	3
2	U23CS522	Cloud Services Management	PE	3	0	0	0	3	3
3	U23CS588	MVC Frameworks	PE	2	0	2	0	4	3
4	U23CS589	Flutter and Dart	PE	2	0	2	0	4	3
5	U23CS590	Docker and Kubernetes	PE	2	0	2	0	4	3
6	U23CS591	UI Design with Figma	PE	2	0	2	0	4	3
7	U23CS592	Groovy on Grails	PE	2	0	2	0	4	3
Vertical 5- - Cloud Computing									
1	U23IT521	Cloud Economics	PE	3	0	0	0	3	3
2	U23IT522	Cloud Networking and Connectivity	PE	3	0	0	0	3	3
3	U23IT523	Security on Cloud	PE	3	0	0	0	3	3
4	U23IT524	Compute Solutions and Serverless Services	PE	3	0	0	0	3	3
5	U23IT525	Cloud Storage Solutions	PE	3	0	0	0	3	3
6	U23IT526	Cloud Native Development and	PE	3	0	0	0	3	3


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Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
		Containers							
7	U23IT583	Cloud Virtualization	PE	2	0	2	0	4	3
8	U23IT584	Data Analytics on Cloud	PE	2	0	2	0	4	3
Vertical 6 - Software Engineering									
1	U23CB531	Software Quality Management	PE	3	0	0	0	3	3
2	U23CB532	Free and OpenSource Software	PE	3	0	0	0	3	3
3	U23CB535	Software Architecture	PE	3	0	0	0	3	3
4	U23CB589	Agile Software Development	PE	2	0	2	0	4	3
5	U23CB590	Advanced Software Testing	PE	2	0	2	0	4	3
6	U23CB591	Software Requirement Engineering	PE	2	0	2	0	4	3
7	U23CB592	Continuous Integration and Continuous Deployment	PE	2	0	2	0	4	3

7.4 Open Elective Courses

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
1	U23OAD81	Data Science Essentials	OE	2	0	2	0	4	3
2	U23OAD82	Machine Learning Techniques	OE	2	0	2	0	4	3
3	U23OAD83	Exploratory Data Analysis and Visualization	OE	2	0	2	0	4	3
4	U23OAD84	Foundations of Artificial Intelligence	OE	2	0	2	0	4	3
5	U23OCC81	Network Protocols	OE	2	0	2	0	4	3
6	U23OCC01	High Speed Networks	OE	3	0	0	0	3	3
7	U23OCC02	Introduction to Industrial Networking	OE	3	0	0	0	3	3
8	U23OCC03	Basics of Mobile Communication	OE	3	0	0	0	3	3
9	U23OCC04	Introduction to Wireless Communication Networks	OE	3	0	0	0	3	3
10	U23OCB81	Algorithmic Trading Strategies	OE	2	0	2	0	4	3
11	U23OCB82	Business Simulation	OE	2	0	2	0	4	3
12	U23OCB01	Principles of Taxation	OE	3	0	0	0	3	3
13	U23OCB83	Strategic Business Leader	OE	2	0	2	0	4	3
14	U23OCB02	Information Systems Control and Audit	OE	3	0	0	0	3	3
15	U23OCS81	Object Oriented Programming using Java	OE	2	0	2	0	4	3
16	U23OCS82	Database Technologies	OE	2	0	2	0	4	3
17	U23OCS83	Full Stack Technologies	OE	2	0	2	0	4	3
18	U23OCS84	Agile Software Practices	OE	2	0	2	0	4	3
19	U23OCS85	Fundamentals of Python Programming	OE	2	0	2	0	4	3
20	U23OAM01	Deep Learning Models	OE	3	0	0	3	3	3
21	U23OAM02	Video and Speech Analytics	OE	3	0	0	3	3	3
22	U23OAM03	Industrial Machine Learning	OE	3	0	0	3	3	3
23	U23OAM04	Machine Learning for Smart Cities	OE	3	0	0	3	3	3
24	U23OSY01	Foundations of Ethical Hacking	OE	3	0	0	0	3	3
25	U23OSY02	Cyber Security Auditing and Assurance	OE	3	0	0	0	3	3


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Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
26	U23OSY03	Application Security	OE	3	0	0	0	3	3
27	U23OEC01	Principles of Analog and Digital Communication	OE	3	0	0	0	3	3
28	U23OEC81	Introduction to VLSI Design	OE	2	0	2	0	4	3
29	U23OEC02	Basics of Biomedical Instrumentation	OE	3	0	0	0	3	3
30	U23OEC82	Introduction to Image Processing	OE	2	0	2	0	4	3
31	U23OEC83	Embedded C and RTOS	OE	2	0	2	0	4	3
32	U23OEC03	Drone Technology	OE	3	0	0	0	3	3
33	U23OEE81	Solid State Electronics	OE	2	0	2	0	4	3
34	U23OEE82	Non-Conventional Energy Resources	OE	2	0	2	0	4	3
35	U23OEE01	Energy Conservation Practices	OE	3	0	0	0	3	3
36	U23OEE83	Energy Auditing and Management	OE	2	0	2	0	4	3
37	U23OEE02	Introduction to Hybrid and Electric Vehicles	OE	3	0	0	0	3	3
38	U23OEE03	Design of Solar Photovoltaic Systems	OE	3	0	0	0	3	3
39	U23OEE84	PLC and SCADA	OE	2	0	2	0	4	3
40	U23OIT01	Introduction to Blockchain Technology	OE	3	0	0	0	3	3
41	U23OIT02	Fundamentals of IT Infrastructure Management	OE	3	0	0	0	3	3
42	U23OIT81	Basics of Cloud Technology	OE	2	0	2	0	4	3
43	U23OIT82	Introduction to Computer Networks	OE	2	0	2	0	4	3
44	U23OIT83	Game Programming Fundamentals	OE	2	0	2	0	4	3
45	U23OME01	Quality Management	OE	3	0	0	0	3	3
46	U23OME02	Industrial Safety Engineering	OE	3	0	0	0	3	3
47	U23OME03	Industry 4.0	OE	3	0	0	0	3	3
48	U23OME04	Machine Vision	OE	3	0	0	0	3	3
49	U23OME05	Product Distribution and Promotion Management	OE	3	0	0	0	3	3
50	U23OME06	Business Ethics, Corporate Social Responsibilities and Governance	OE	3	0	0	0	3	3
51	U23OME81	Product Design and Development	OE	2	0	2	0	4	3
52	U23OME82	Additive Manufacturing and Tooling	OE	2	0	2	0	4	3
53	U23OME83	Product Lifecycle Management	OE	2	0	2	0	4	3
54	U23OME84	Robotics and Expert Systems	OE	2	0	2	0	4	3

7.4 Industry Oriented Courses

Sl. No.	Course Code	Course Name	Category	Periods/wk				TC	C
				L	T	P	J		
1	U23ISY51	Gen AI In Cyber Security	EM	0	0	2	0	2	1
2	U23ISY52	Ransomware and Malware Analysis	EM	0	0	2	0	2	1
3	U23ISY53	Vulnerability Management	EM	0	0	2	0	2	1
4	U23ISY54	Cyber Security Threat Vectors and Mitigation	EM	0	0	2	0	2	1


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8.0 B.E. CSE (Cyber Security)SYLLABUS

SEMESTER I

U23MA202	Calculus and Linear Algebra	L	T	P	J	C
		3	1	0	0	4
1. Course Description:						
Calculus and Linear algebra is an integrated course designed to provide students with a solid foundation in two essential branches of mathematics. Calculus, which deals with rate of change and accumulation and linear algebra, which studies vector spaces and linear transformations. This course covers key topics in both calculus and linear algebra, emphasizing their connections and applications in various fields including physics, engineering, computer science and economics. Students will develop problem-solving skills and mathematical reasoning abilities through theoretical understanding and practical applications.						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. Familiarize the students with functions of several variables. 2. Acquaint the students with mathematical tools for evaluating multiple integrals. 3. Initiate the basic concepts in the vector space and its attributes. 4. Cultivate the knowledge in inner product spaces and its applications. 5. Enhance the knowledge in linear transformations. 						
3. Syllabus		45 +15 =60 Periods				
Unit-I: Differential Calculus		(9+3)				
Limits and Continuity; Derivatives: Total derivative, partial derivatives, differentiation of implicit functions; Jacobian, properties; Taylor's series; Maxima and minima of functions of two variables.						
Unit-II: Integral Calculus		(9+3)				
Double integrals: Integrals in cartesian and polar coordinates, area enclosed by plane curves, change of order of integration, change of variables between cartesian and polar co-ordinates.						
Unit-III: Vector Spaces		(9+3)				
Vector spaces: Subspaces, linear combinations, linear independence and linear dependence, basis and dimensions.						
Unit-IV: Inner Product Spaces		(9+3)				
Inner product: Norms, Gram-Schmidt orthogonalization process, QR decomposition, least square approximation.						
Unit-V: Linear Transformations and Diagonalization		(9+3)				
Linear transformation; Matrix representation of a linear transformations; Eigen values and Eigen vectors; Diagonalizability; Quadratic form to canonical form.						
List of Tutorials:						
<ol style="list-style-type: none"> 1. Working procedure, Basic commands and symbolic computation. (CO 1) 2. Drawing the curve for the given function $f(x)$ and the surface for the given function.(CO 1) 3. To find Partial derivative of a given function $f(x, y)$. (CO 1) 4. Evaluating Extreme values of a single variable function. (CO 1) 5. Evaluating Maxima and minima of functions of several variables. (CO 1) 6. Differentiation of various functions. (CO 1) 7. Integration - Definite and indefinite integrals - Constant and variable limits. (CO 2) 8. Understanding integration as Area under the curve. (CO 2) 						



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9. Solving several types of systems of linear equations. (CO 3)
10. Matrix Operations. (CO 3)
11. Shifting and scaling of vectors. (CO 3)
12. Matrix decomposition - QR decomposition. (CO 4)
13. Least Square method (case study). (CO 4)
14. Eigen values and Eigen vector computation. (CO 5)

Text Books:

1. Erwin Kreyszig, "Advanced Modern Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Ltd, Singapore, 2017.
2. Dennis G Zill, "Advanced Engineering Mathematics", 6th Edition, Jones & Bartlett India P Ltd., New Delhi, 2017.
3. Maurice D. Weir, Joel Hass, Christopher Heil, "Thomas' Calculus", 14th Edition, Pearson Education, New Delhi, 2018.
4. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley India, New Delhi, 2018.

References:

Reference Books:

1. Bali. N. P and Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Publications Ltd, 2011.
2. David C Lay, "Linear Algebra and its Applications", Pearson, New Delhi, 2016.
3. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, ANE Books, 2016.

Journal References:

1. Journal of Differential Equations:
<https://www.sciencedirect.com/journal/journal-of-differential-equations>
2. Journal of the Australian Mathematical Society:
<https://www.cambridge.org/core/journals/journal-of-the-australian-mathematical-society>
3. Linear Algebra and its Applications:
<https://www.sciencedirect.com/journal/linear-algebra-and-its-applications>

Web Resources:

- <https://www.youtube.com/watch?v=riXcZT2ICjA>
- <https://www.youtube.com/watch?v=1CBOwks7nII>
 - <https://www.youtube.com/watch?v=JnTa9XtvmfI>
 - <https://www.youtube.com/watch?v=kjBOesZCoqc>

MOOC/NPTEL/SWAYAM Courses:

- Matrix analysis with applications- NPTEL Course:
https://onlinecourses.nptel.ac.in/noc19_ma28/preview
- Matrix algebra for engineers-Coursera:
<https://www.coursera.org/learn/matrix-algebra-engineers>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23MA202.1	Classify the extreme values of functions of two variables.
U23MA202.2	Apply integration concepts to compute area of the given surfaces, integrals in cartesian and polar coordinates.
U23MA202.3	Implement the principles of vector space and its characteristics to address real time problems.

U23MA202.4	Examine orthonormal basis within inner product spaces concerning a specified vector.
U23MA202.5	Articulate the eigen values and eigen vectors of matrix representation of a linear transformation within a finite dimensional space.

U23CS301	Problem Solving using C	L	T	P	J	C
		3	0	0	0	3
1. Course Description:						
This course introduces students to the fundamental concepts of programming using the C language. The course covers essential topics such as basic C programming constructs, conditional and looping statements, modular programming, and advanced concepts like pointers, arrays, and structures. Through theoretical lectures, practical demonstrations, and coding exercises, students will develop problem-solving skills and learn how to design and implement efficient algorithms to solve a variety of complex problems.						
2. Course Objectives:						
<ol style="list-style-type: none"> Equip students with the skills to write robust, readable, and maintainable code for diverse applications. Instruct students on utilizing control structures and functions to manage program flow, make informed decisions, and automate repetitive tasks. Enhance students' abilities in optimizing memory usage and promoting code reusability. Guide students in efficiently organizing and processing data, enabling them to write clean, well-structured code that addresses real-world challenges. Train students in effectively working with strings, user-defined data types, and file operations. 						
3. Syllabus:						45 periods
Unit-I: C Fundamentals						(9)
Basic computer organization, Problem-solving techniques, Algorithm, Flowchart, Pseudocode; Introduction to C programming: Phases of a C program, Features of C, Keywords, Variable Name, Scope, Declaration, Coding Standards, Data Types and sizes: integer, float and character types, constants, Formatted I/O, Operators, Bitwise Manipulations, Expression Evaluation, Type Conversions, Preprocessor Directives						
Unit-II: Control Structures						(9)
Conditional and Branching Statements: if, if-else, else-if ladder, nested-if, switch constructs, range using switch, Looping constructs: for, while, do-while -break and continue- goto and Label						
Unit-III: Pointers and Functions						(9)
Pointer - Types of Pointers: NULL, Dangling, Generic Pointers, Wild pointer, Arithmetic Operations in Pointer, Pointer to pointer, Functions: The anatomy of a function, Types of functions, Pointers and Function Arguments: Call by Value and Call by Reference, Function Pointers, return statement, Recursion, Storage Classes						
Unit-IV: Arrays						(9)
Arrays: Declaring and initializing 1D arrays, Two-dimensional arrays, Multi-dimensional arrays, Variable Length Arrays, Dynamic Memory Allocation, Passing 1D and 2D Array as arguments, Pointers and Arrays, Array of pointers						
Unit-V: Strings, User-Defined Data Types and Files						(9)
Strings: Introduction – string handling functions, Two-dimensional array of strings, Structure: Basics of structure- Nested structures–Array of structures – Pointer to structures – Unions - Bit Fields-Files:						



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Basics - File Functions - Random Access Files

Text Books:

1. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. Kernighan B. W. and Ritchie D. M., "C Programming Language (ANSI C)", Prentice Hall of India Private Limited, New Delhi, 2010.

References:

Reference Books:

1. Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.
2. Simple Program Design: A Step-by-Step Approach, Fifth Edition by Lesley Anne Robertson

Video References:

- https://www.youtube.com/watch?v=EjavYOFoJJ0&list=PLdo5W4Nhv31a8UcMN9-5ghv8qyFWD9_S
- <https://www.youtube.com/watch?v=irqbmMNs2Bo>

MOOC/NPTEL /SWAYAM Courses:

- https://onlinecourses.nptel.ac.in/noc22_cs40/preview
- https://onlinecourses.nptel.ac.in/noc23_cs53/preview

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS301.1	Understand problem-solving techniques and typical programming constructs C
U23CS301.2	Apply looping and conditional constructs to solve real-world problems
U23CS301.3	Apply arrays and functions effectively to address complex programming challenges
U23CS301.4	Understand and apply best practices in pointers, memory allocation and error handling for modular programming efficiency
U23CS301.5	Choose and implement complex data structures using structures and Unions, applying advanced file operations in C for effective problem-solving

U23HS181	Technical English	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

This course aims to educate the first year BE/B.Tech. students in the context of technical communication and facilitate them to use vocabulary in different academic and professional scenarios. It also cultivates their LSRW skills, namely Listening, Speaking, Reading and Writing skills thereby, improving their proficiency in oral and written communication. It also covers all the areas of Grammar, Word formation, Summarizing, Report writing which are necessary for the students of Engineering and Technology.

2. Course Objectives:

1. Help students learn different reading techniques like skimming and scanning, so they can better understand and analyze various texts.
2. Improve students' skills in writing clear and organized sentences and paragraphs, and teach them how to write informal letters for different purposes.
3. Strengthen students' understanding of basic grammar rules, such as parts of speech, articles, and tenses, to make their writing and speaking more accurate.
4. Train students to listen carefully to audio materials and participate in speaking activities like introductions and role-plays to improve their communication skills.
5. Encourage students to use their language skills in everyday situations, like writing informal



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letters and doing role-plays, to build confidence and fluency in English.	
3. Syllabus:	30+30=60 Periods
Unit-I: Fundamentals of Language Skills	(6)
Types of Reading: Intensive and Extensive - Skimming and Scanning Techniques - Reading Comprehension Strategies; Word Formation Techniques - Sequence Words in Writing - Hints Development for Writing - Informal Letters: Congratulating, Apologizing, etc.; Grammar: Parts of Speech - Articles (Definite and Indefinite) - Tense; Listening Types - Listening to Audio files and answering; Speaking - Introducing oneself & family - Role Play	
Unit-II: Advanced Reading and Writing Strategies	(6)
Reading articles from Newspapers & Magazines - Cloze Exercises; Writing Instructions and Recommendations - Paragraph Writing Techniques; Grammar: Homonyms, Homophones, and Homographs - Subject - Verb Agreement - Modal Verbs - Question Types: Wh-type, Yes No, and Tag Questions; Listening for Specific Information: Announcements and Radio Broadcasts Speaking: Extempore - Just A Minute (JAM) Sessions	
Unit-III: Advanced Communication Skills	(6)
Reading for Specific Information & Identifying Lexical and Contextual Meaning; Writing Formal Letters: Seeking Permission for Industrial Visit - Letter of Invitation (Acceptance/Declination) - Arranging Jumbled Sentences; Grammar: Cause and Effect Expressions - Purpose and Function - Phrases - Compound Nouns; Listening to TED Talks & News Reading from English News Channels (CNN, NDTV, India Today, etc.) Speaking: Group Discussion	
Unit-IV: Effective Written Communication	(6)
Summarizing Techniques: Paraphrasing Skills - Note Making Strategies; Preparing Job Application - Email Etiquette and Writing Emails - Free Writing on Any Given Topic; Grammar: Phrasal Verbs - Types of Sentences (Simple, Compound, Complex) - Single Sentence Definitions; Listening and summarizing; Speaking: Narrating a Story	
Unit-V: Technical Presentation Skills	(6)
Reading practice based on Competitive Examinations; Writing: Preparing Transcripts for Speeches - Pictorial Representations: Flowcharts, Pie Charts, Bar Charts, Tabular Columns; Grammar: Single Word Substitutes - Spotting Errors; Listening to Eminent Personality Interviews & Other Forms of Interviews; Speaking - Compering, Welcome Address & Vote of Thanks	
List of Exercises:	30 periods
<ol style="list-style-type: none"> 1. Listening to Audio files and answering the questions. (CO 1) 2. Listening for specific information like announcements and Radio Broadcasts(CO 1) 3. Practice developing hints into full sentences or paragraphs. (CO 1) 4. Practice delivering short, impromptu speeches on various topics. (CO 2) 5. Listening to TED Talks & News Reading from English News Channels (CNN, NDTV, India Today etc.) (CO 1) 6. Listening to interviews of eminent personalities and analysing the content.(CO 4) 7. Practicing self-introduction in role play scenarios.(CO 3) 8. Participating in group discussions on various topics with emphasis on communication strategies and effective participation.(CO 3) 9. Exercises on narrating stories, focusing on structure and engagement.(CO 4) 10. Compering events, delivering Welcome Addresses, and practicing Vote of Thanks.(CO 5) 	



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Text Books:

1. Jack C. Richards, "Interchange Student's Book 1", Cambridge University Press; Fourth Edition, 2015.
2. S. N. Mahalakshmi, "Technical English for Engineers", V. K. Publications; Chennai, Eighth Edition, 2020.

References:**Reference Books:**

1. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw Hill Publishing Company; New Delhi, 2015.
2. Andrea J.Rutherford, "Pearson Education" Inc. and The Darling Kindersley Publishing Inc., 2020.
3. Raman, Meenakshi and Sharma, Sangeetha "Technical Communication Principles and Practice", 4. Oxford University Press; New Delhi, 2019.
4. Richards C. Jack, "Interchange", Fourth edition; Cambridge University Press, 2020.
5. Butterfield, Jeff, "Soft skills for Everyone", Sixth Indian Reprint, 2018.

Video References:

- <https://www.youtube.com/watch?v=tBtc6rpcMz4>
- <https://www.youtube.com/watch?v=L123cChDSKE>
- <https://www.youtube.com/watch?v=fyAtyAdCStM>

Web Resources:

- <https://leo.stcloudstate.edu/grammar/subverag.html>
- http://www.learningdifferences.com/Main%20Page/Topics/Compound%20Word%20Lists/Compound_Word_%20Lists_complete.htm
- <http://examples.yourdictionary.com/examples-of-active-and-passive-voice.html>
- <http://www.perfectyourenglish.com/grammar/numeral-adjectives.htm>
- https://en.wikipedia.org/wiki/Commonly_misspelled_English_words
- <https://www.englisch-hilfen.de/en/grammar/if.htm>
- <http://www.englishforeveryone.org/Topics/Reading-Comprehension.htm>

MOOC/ SWAYAM /NPTEL Courses:

- <https://www.udemy.com/topic/communication-skills/free/>
- <https://www.bbc.co.uk/learningenglish/english/course/how-to-speak-english>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23HS181.1	Apply basic reading techniques, construct clear sentences for informal correspondence, and enhance grammar and listening skills for effective communication.
U23HS181.2	Analyze complex texts, formulate precise instructions and recommendations, and utilize advanced grammar in spoken communication.
U23HS181.3	Simplify specific and contextual information, compose formal letters, and actively engage in group discussions.
U23HS181.4	Interpret and take notes proficiently, compose professional documents and emails, and demonstrate strong listening skills.
U23HS181.5	Analyze and create detailed technical documents and visual aids, and deliver formal presentations and conduct interviews with confidence.



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U23PH281	Physics for Information Science	L	T	P	J	C
		3	0	2	0	4
1. Course Description:						
Physics for information science is a fundamental course designed to provide engineering students with a strong foundation in the field of semiconductors, lasers, optical fibers, magnetic materials as well as quantum computing and their applications in the realm of information science to cater the need of non-circuit branch students to realize the feasible solutions involving latest technologies and related services.						
2. Course Objectives:						
<ol style="list-style-type: none"> Equip the students with a deep understanding of the properties of semiconducting materials and devices. Facilitate the students to gain insights into the physics of laser and fiber optic communication. Establish a solid foundation in the fundamentals of optical materials and their engineering applications. Develop a thorough understanding of magnetic materials and storage applications. Enable the students to realize the concept of the performance of optoelectronic devices and quantum computing. 						
3. Syllabus 45 + 30=75 Periods						
Unit-I: Basics of Semiconductor Devices						(9)
Semiconductors: Properties; Classification: Elemental and Compound semiconductors; Intrinsic semiconductors: Number of electrons in conduction band, number of holes in valance band, carrier concentration, Electrical conductivity, Band gap determination; Extrinsic semiconductors: N-type, P-type; PN junction diode: biasing, V-I characteristics; Hall effect: Determination of Hall coefficient, Applications.						
Unit-II: Laser and Fibre Optics						(9)
Lasers: population of energy levels, Einstein's A and B coefficients derivation; Resonant cavity, optical amplification (qualitative); Semiconductor lasers: Homo junction, hetero junction. Fiber optics: optical fiber principle, numerical aperture, acceptance angle; Types of optical fibres (material, refractive index, mode); Losses associated with optical fibers; Fibre optic sensors: Pressure and displacement.						
Unit-III: Optical Properties of Materials						(9)
Optical materials: Classification; Carrier generation, recombination processes; Absorption, emission scattering of light in metals, insulators, semiconductors (concepts only); Phototransistor; Solar cell; LED, Organic LED; Optical data storage techniques.						
Unit-IV: Magnetic Properties and Data Storage						(9)
Magnetic materials: Classification of dia, para, ferro magnetic; Origin of magnetic moment, Bohr magneton; Ferromagnetism: Domain theory, different types of energies involved in the domain growth; Hysteresis; Hard and soft magnetic materials, applications. Magnetic semiconductors, Magnetic principle in computer data storage, Magnetic hard disc (GMR sensor).						
Unit-V: Optoelectronic Devices and Quantum Computing						(9)
Quantum confinement; Quantum structures: Quantum wells, wire, dots; Quantum dot lasers; Single Electron Transistor (SET); Opto-electronic switches; Charge Coupled Devices; Quantum computing: Introduction, Classical bits, Quantum bits; Superposition, Entanglement. Quantum gates: Pauli's X,Y,Z, Hadamard, CNOT, Advantages, applications.						



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List of Experiments:

1. Calculate the energy band gap of a given semiconductor diode. (CO 1)
2. Construct the p-n junction circuit and measure the knee voltage and breakdown voltage from its forward and reverse bias V-I characteristics.(CO 1)
3. Estimate the wavelength of LASER using grating and measure the particle size using Laser.(CO 2)
4. Compute the numerical aperture and estimate the acceptance angle of various optical fibers.(CO 2)
5. Analyse the input and output characteristics of aNPN transistor setting in the common emitter (CE) mode.(CO 3)
6. Compute the V-I Characteristics of LED and measure the Knee Voltage and Planck's Constant.(CO 3)
7. Compute and analyse the energy loss using B-H curve of a ferromagnetic material.(CO 4)

Text Books:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3. Avathanulu M.N and Kshirsagar P.G, "A text book of Engineering Physics", S. Chand and company, 11th Edition, 2014.
4. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

References:**Reference Books:**

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. J. P. Srivastava, Elements of Solid State Physics, Prentice Hall of India, 2014.
3. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
4. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nano electronics, Cambridge Univ.Press, 2008.
5. G.W. Hanson, Fundamentals of Nano electronics, Pearson Education (Indian Edition) 2009.

Journals:

1. <https://journals.sagepub.com/home/jis>
2. <https://scholars.direct/journal.php?jid=information-science>

Video References:

1. <https://www.youtube.com/watch?v=KMcsjCXfLQw&list=PLfIFNJ1DPG4nRPL5qsXn1UWTgAyy5ZE6->
2. <https://www.youtube.com/watch?v=Ww9wcs3yNWI>
3. <https://www.youtube.com/watch?v=CXFtbpYaBXw&list=PLQzUXa8lZVq8lfZN5836sohUpRCt2b6oB>
4. <https://www.youtube.com/watch?v=uAS3c2zAD70&list=PL0L0Fvp2iRZGNVcMt62zIW5N6Ao5Tj2r2>
5. <https://www.youtube.com/watch?v=WWjldCmRteg>

MOOC/SWAYAM/NPTEL Courses:

1. https://onlinecourses.nptel.ac.in/noc21_ph14/preview
2. <https://study.com/academy/lesson/crystalline-structure-definition-structure-bonding.html>
3. <https://study.com/academy/lesson/semiconductors-superconductors-definition-properties.html#:~:text=Lesson%20Summary,A%20superconductor%20is%20a%20material%20that%20acts%20strangely%20when%20cooled,a%20conductor%20and%20an%20insulator.>
4. https://onlinecourses.nptel.ac.in/noc22_ph37/preview



4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23PH281.1	Construct the knowledge on the basics of semiconducting materials, their behaviour and applications in various devices.
U23PH281.2	Explore the fundamentals of laser and optical fibres and to realize their typical parameters.
U23PH281.3	Infer the properties of optical materials and their optoelectronic applications.
U23PH281.4	Categorize the magnetic materials and investigate their role in data storage techniques.
U23PH281.5	Interpret the functioning of optoelectronic devices and the essentials of quantum computing.

U23CS381	Application Design and Development	L	T	P	J	C
		2	0	2	0	3
1. Course Description:						
<p>Application Design and Development is a comprehensive integrated course that blends theoretical understanding with practical hands-on experience in creating diverse applications. Students will delve into essential web development concepts using HTML, CSS, and JavaScript, mastering the foundations of building interactive and responsive web interfaces. Additionally, they will learn version control using Git and GitHub, enabling collaborative development and effective management of project iterations.</p> <p>Furthermore, students will explore mobile application development using MIT App Inventor, gaming application development with Construct 2, and image/video editing using Blender tools. Through a combination of theoretical lectures, interactive labs, and project-based learning, students will gain the skills necessary to design, develop, and deploy various types of applications.</p>						
2. Course Objectives:						
<ol style="list-style-type: none"> To design and build visually appealing and interactive web pages using HTML and CSS, creating a strong foundation for web development To make students create dynamic and interactive web pages using JavaScript, enhancing user experience and adding functionality to web applications To create and manage Git repositories and how to collaborate using GitHub, including forking, cloning, and pull requests To develop mobile applications for Android devices using MIT App Inventor's visual blocks programming To create 2D games using Construct 2 and edit multimedia content using Blender 						
3. Syllabus (30+30 = 60 Periods)						
Unit-I: HTML and CSS (6)						
<p>Software Development: SDLC (Waterfall Model)- Phases - Methods and Practices- Introduction to web- Standards and Terminologies. HTML: Introduction and versions-HTML 5-standards and tags- Head and Body-List-Labels-Tables-Forms-Videos and Audios-Figure, Figure Captions, Images CSS: Introduction-Embedded Types-CSS Selectors-Borders, Margins, Paddings-Colors and Backgrounds- Introduction to Bootstrap-Tailwind CSS</p>						

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Unit-II: Interactive Web Design using JavaScript	(6)
Introduction-Java Script adding Techniques-Variables and Operators- Conditional and Control Statements- Data Types and Functions-Events-Form Validation-Page Redirect-Java Script Exception Handling-Document Object Model (DOM)	(6)
Unit-III: Git, Git Hub and Shell Scripting	(6)
Introduction to Git and GitHub-Terminologies-Local Repository Actions- Remote Repository Actions- Advanced Repository Actions-Branching-Merging-Software Developers Communities: Google Developers Group, Google Student Developers Community, Linux Developer Community, Stack Overflow, Kaggle Shell Scripting: Processing (PS) and Listing (LS)- File Creations and Handling-Users and Groups	(6)
Unit-IV: Mobile Application Development with MITAI	(6)
Types of Mobile OS (Android and IOS)-Architecture- Phases of Mobile Application Development - MIT app inventor-Components-Viewer-Properties – Publishing an app	(6)
Unit-V: Template-Driven Applications and Multimedia	(6)
Content Management System: Dynamic content flow - Collection fields – Search Engine Optimization, Multimedia: Design with Canva and Blender- Image and Video Editing –Game Development with Construct 2	(6)
List of Experiments	(30)
<ol style="list-style-type: none"> 1. Develop a visually appealing static website with an intuitive user interface with multimedia content such as text, images and videos using HTML, CSS and JavaScript (CO1) 2. Create a simple form to collect the name, address, email ID and phone number from the user and use JavaScript to validate each field before submitting the form (CO1) 3. Create an interactive quiz that allows the user to select answers to multiple-choice questions. Use JavaScript to calculate the user's score and provide feedback based on their performance (CO1) 4. Create a simple animation using CSS and JavaScript. Use CSS to define the animation's properties, such as duration and timing and use JavaScript to trigger the animation in response to user input or other events (CO2) 5. Create a local repository using Git and perform basic operations such as initializing the repository, adding files, committing changes, and creating and managing multiple branches to organize and track changes (CO3) 6. Create a shell script that can automate file management tasks such as processing, listing, creation and handling of files and user and group management tasks (CO3) 7. Develop mobile applications using MITAI (Simple calculator, Step counter, a Weather app that retrieves current weather information from an API, Talk to Me, Translation App) (C04) <ol style="list-style-type: none"> a) Design a poster for an event using Canva templates (CO4) b) Create a visual infographic using Canva tools to present data and information (CO4) 8. Develop a simple 2D game using a Construct visual interface and event system (CO4) 9. Model a 3D object using Blender modelling tools and techniques. Animate a short scene or character using Blender animation tools and a timeline (CO5) 	
Text Books:	
<ol style="list-style-type: none"> 1. Internet & World Wide Web How to Program, 5th edition, by Paul Deitel Harvey Deitel, Abbey Deitel, Pearson Publication, 2018. 2. App Inventor 2: Create Your Own Android Apps 2nd Edition by David Wolber, Hal Abelson, Ellen Spertus, Liz Looney, 2014. 	
Reference Books:	
<ol style="list-style-type: none"> 1. CS50's Web Programming with Python and JavaScript - https://cs50.harvard.edu/web/2020 2. Get Coding! Learn HTML, CSS & JavaScript & Build a Website, App & Game – by Young 	



Rewired State, Walker Books, 2016.

3. Version Control with Git, by Jon Loeliger, Matthew McCullough, 2nd Edition, 2012.

Web References:

- https://www.w3schools.com/html/html_css.asp
- <https://www.javatpoint.com/javascript-tutorial>
- <https://www.freecodecamp.org/news/introduction-to-git-and-github/>
- <https://appinventor.mit.edu/explore/ai2/tutorials>
- https://www.construct.net/en/tutorials/beginners_guide_construct_47
- <https://www.blender.org/support/tutorials/>

MOOC/NPTEL/SWAYAM Courses:

- <https://in.coursera.org/learn/html-css-javascript-for-web-developers>
- <https://amigoscode.com/p/git-github>
- Ultimate-web-design-course <https://university.webflow.com/courses/ultimate-web-design-course>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS381.1	Utilize HTML5 and CSS to develop responsive web
U23CS381.2	Create Interactive web applications using JavaScript
U23CS381.3	Analyze and apply GIT and GIT HUB operations and advanced repository actions
U23CS381.4	Create mobile applications using the MIT app inventor
U23CS381.5	Create simple game applications using Construct

U23CS351	ProblemSolving using C Laboratory	L	T	P	J	C
		0	0	4	0	2

1. Course Description:

The ProblemSolvingusing C Laboratory is a practical course designed to complement theoretical knowledge with hands-on experience in programming using the C language. Through a series of laboratory sessions, students will delve into the basic concepts of C programming, including conditional and looping statements, modular programming, and advanced topics such as pointers, arrays, and structures. By actively engaging in coding exercises and projects, students will develop problem-solving skills, algorithmic thinking, and proficiency in implementing efficient solutions to various computational problems.

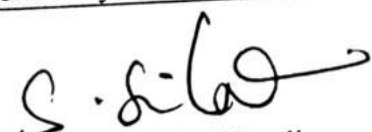
2. Course Objectives:

1. Instruct students on developing robust, readable, and maintainable code for a variety of applications.
2. Teach students to effectively use control structures and functions to manage program flow, make decisions, and automate repetitive tasks.
3. Enhance students' ability to optimize memory usage and promote code reusability in their programs.
4. Guide students in organizing and processing data efficiently, enabling them to write clean, structured code that addresses real-world problems.
5. Train students in working proficiently with strings, user-defined data types, and file operations.

60 Periods

3. List of Experiments

1. Develop flow charts and solve simple real-life or scientific or technical problems (Traffic signal control / Water level controller / Temperature control system / Automatic washing machine control system / Automatic Street light control system / Electricity Billing / Retail shop billing)


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- /Computing Electrical Current in Three Phase AC circuits) (Minimum 3 problems) (CO1)
2. Implementation of applications of input and output statements. (Integer, char, Float, string input and output, ASCII value of character, User details) (CO1)
 3. Implementation operators and expressions (Centigrade to Fahrenheit, Quotient and Remainder, Kilometres per hour to miles per hour, Hour and Minutes, Profit Calculator) (CO1)
 4. Implementation of real-time applications using conditional statements. (Vowel or Consonant, Eligible for casting vote, Leap year or not, Display the description for the given grade, Display number of days in a month, Calculator, Triangle type, Roots of a quadratic equation) (CO1)
 5. Implementation of technical applications using iterative loops (Display first N natural numbers, Read N numbers and find their sum and average, find cube of the number up to a given integer, Multiplication table, Sum of N natural numbers, Sum of N natural odd numbers, Pattern printing) (CO2)
 6. Implementation of the one-dimensional array (Display the array elements, Elements in reverse order, Sum of array elements, make a copy of array elements, Maximum and minimum, odd sum and even sum) (CO2)
 7. Implementation of a two-dimensional and multi-dimensional array (sum, subtraction, transpose, multiplication, frequency of even numbers, print diagonals, sum of diagonal elements, compare) (CO2)
 8. Implementation of Functions in the program (Factorial, largest number, area of shape, sum of digits, prime number or not) (CO2)
 9. Implementation of real-time applications using recursion (factorial, Fibonacci series, count digits of a number, length of string, prime or not, GCD, sum of all digits, palindrome) (CO2)
 10. Implementation of a pointer in applications (swap two numbers, print string, read array elements, double pointer, find the maximum number, palindrome, reverse array, dynamic memory allocation) (CO3)
 11. Implementation of strings handling functions with and without library functions (compare two strings, reverse, concatenate, copy, palindrome, count number of characters, number of words, find, replace) (CO4)
 12. Implementation of file-handling operations (read, write, append file, compare two files, read student details and store into files) (CO4)
 13. Implementations of Structure in real-time applications (Accept & display employee details, Calculate total payment of workers, Library operations, Menu-driven program for employee structure) (CO5)
 14. Implementations of Union in programs (Accept & display employee details, Calculate total payment of workers, Library operations, Menu-driven program for employee structure) (CO5)
 15. Mini Project: Develop an application for any real-world problem

Reference Books:

1. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. Kernighan B. W. and Ritchie D. M., "C Programming Language (ANSI C)", Prentice Hall of India Private Limited, New Delhi, 2010.
3. Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.
4. Simple Program Design: A Step-by-Step Approach, Fifth Edition by Lesley Anne Robertson

Video References:

- https://www.youtube.com/watch?v=EjavYOFoJJ0&list=PLdo5W4Nhv31a8UcMN9-35ghv8qyFWD9_S



- <https://www.youtube.com/watch?v=irqbmMNs2Bo>

MOOC/NPTEL /SWAYAM Courses:

- <https://www.udemy.com/course/c-programming-2019-master-the-basics>
- <https://www.tutorialspoint.com/cprogramming>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS351.1	Design solutions for real-world problems with programming constructs
U23CS351.2	Solve complex programming problems with arrays and functions
U23CS351.3	Implement dynamic memory addressing techniques with Pointers
U23CS351.4	Implement various error-handling techniques for file operations
U23CS351.5	Implement complex data structures such as structures and unions in C to manage and organize data effectively

U23GE351	Engineering Practices Laboratory	L	T	P	J	C
		0	0	2	0	1
1. Course Description:						
<p>The course encompasses a comprehensive set of practical units aimed at providing hands-on experience in Computer Science, Mechanical, Electrical and Electronics Engineering fields.</p> <p>Computer Science and Engineering Practices: The students will be engaged in Computer assembly and disassembly, honing troubleshooting skills for both hardware and software issues.</p> <p>Mechanical Engineering Practices: The students will be delving into Mechanical Engineering practices which include plumbing, basic machining operations and rapid prototyping with 3D printing. The exploration extends to the assembly of a centrifugal pump, hands-on exercises involving pump/motor, submersible pump sets and refrigeration & air-conditioning systems.</p> <p>Electrical Engineering Practices: The students will be focusing on Electrical Engineering practices which involve UPS connections, domestic wiring, safety precautions and the design of solar PV systems.</p> <p>Electronics Engineering Practices: The students will be focusing on Electronics Engineering practices which include soldering techniques, a study of smartphone components and practical projects in home automation. Through this multifaceted course, students gain a well-rounded understanding of essential skills in Computer Science, Mechanical, Electrical & Electronics preparing them for diverse applications in those fields.</p>						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. To impart knowledge on computer assembling, disassembling and troubleshooting. 2. To provide exposure to the students with rapid prototyping with 3D printing and plumbing operations. 3. To gain practical experience in UPS connections, domestic house wiring and solar PV systems. 4. To expose the students to understanding home automation, smartphone operation and soldering and desoldering techniques. 						



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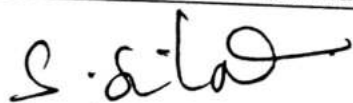
30 Periods	
3. Syllabus	
Unit-I: Computer Science and Engineering Practices	(7)
1. Troubleshooting Desktops and PCs 2. Disassembly and Assembly of Desktops and PCs 3. Setting up Basic Computer Networks 4. Demonstration of AR/VR Technologies and Their Applications in Engineering Design, Simulation, and Training	
Unit-II: Mechanical Engineering Practices	(8)
1. Hands-on exercise on plumbing connection of a residential building involving minor troubleshooting 2. 3D Printing of simple engineering objects without a support structure 3. 3D Printing of simple engineering objects with support structure 4. Hands-on exercise on basic connections and maintenance with minor troubleshooting of Refrigeration System (Study)	
Unit-III: Electrical Engineering Practices	(7)
1. UPS Connection - Hands-on exercise on basic electrical connections with UPS Connection 2. Domestic Wiring - Hands-on exercise on basic domestic wiring 3. Safety Precautions - Hands-on exercise on electrical earthing and safety precautions 4. Renewable Energy - Design of Solar PV System for Residence (Study)	
Unit-IV: Electronics Engineering Practices	(8)
1. Manual soldering of electronic components onto PCB 2. Analyse Smartphone component integration, design choices and their effects on performance. 3. Design and Building of Simple Home Automation System	

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23GE351.1	Perform the basic troubleshooting of the PC including assembly and disassembly.
U23GE351.2	Carry out minor plumbing troubleshooting in a residential building & print 3D components with or without support materials.
U23GE351.3	Carry out minor troubleshooting and maintenance tasks in a Refrigeration System.
U23GE351.4	Perform basic domestic wiring of a residential building with provision of inverter and safety measures and Design solar PV System for residence.
U23GE351.5	Execute basic home automation projects.

U23EM751	Soft Skills	L	T	P	J	C
		0	0	2	0	1
1. Course Description:						
This course on Soft Skills is designed to enhance the professional development of engineering students by refining essential interpersonal and communication skills. It focuses on cultivating critical attributes such as effective communication, active listening, teamwork, leadership, and time						



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management. The course also emphasizes the importance of professional etiquette, advanced communication techniques, technical writing, and the ability to navigate formal and informal contexts. By integrating these elements, students will develop the competencies necessary for successful collaboration, decision-making, and professional growth in the engineering field.

2. Course Objectives:

1. Develop foundational language skills by reinforcing key communication principles.
2. Instill positive behavioural traits to prepare students for future interactions in the corporate environment.
3. Equip students with the knowledge and skills needed to communicate ideas on social issues, promoting a sense of responsibility and active citizenship.
4. Enhance leadership abilities, teamwork strategies, and the capacity to foster effective connections through impactful communication.
5. Strengthen confidence and public speaking skills by offering experiential learning and techniques to overcome presentation anxiety and communicate effectively in front of an audience.

3. Syllabus:

30 Periods

Unit-I: Personality and Professional Development Skills

(6)

Interpersonal skills: communication skills, active listening, teamwork, empathy, leadership, motivation, social skills – effective body language – workplace etiquette – types of speeches: memorized speech, manuscript speech, impromptu, and extempore.

Unit-II: Advanced Communication Skills

(6)

Word and sentence stress – clear individual sounds – intonation patterns – pronunciation – mother tongue intrusion – tongue twisters - conversation practice: discourse markers, slang, colloquial expressions, collocation - making mini presentations – extending on conversations – collaborative task.

Unit-III: Effective Communication Skills

(6)

Verbal and non-verbal communication - formal and informal English – grammatical features: impersonal passives, nominal compounds, third persons, empty verbs, present tense, imperatives, active voice, jargon, cliches – presentation skills - resume preparation - group discussions – mock interviews.

Unit-IV: Team Skills And Interpersonal Communication

(6)

Personal skills: time management, motivating others, assessing alternatives and making decisions, accurate written work, organisational skills, attention to detail, negotiation and mediation skills – public speaking - panel discussion – debates

Unit-V: Engineering Journalism

(6)

Technical writing style: accuracy, conciseness, clarity, objectivity – abstract writing – technical documents writing - blogs - editing - copyrights - plagiarism

References:

Reference Books:

1. Norman Lewis, "Word power made easy".2020.
2. Sylvia Reyes," Team Building: The Ultimate Guide to Build & Manage Winning Teams", MC Graw Hill, 2014.
3. Dan Clay, how to write the perfect resume 2018.
4. Tyler Hayden," Communication Activities: A Team Building Activity Book", 2019.
5. Ian Tuhovsky, "Communication Skills Training: A Practical Guide to Improving Your Social



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- Intelligence, 2019.
6. Presentation, Persuasion and Public Speaking (Positive Psychology Coaching Series Book, 2015).

Magazine References:

1. The IUP Journal of Soft Skills
2. <https://iupindia.in/softskills.asp>
3. Soft Skills Personality Development for Life Success
4. <https://reader.magzter.com/preview/41f6by5blmhou4q0k43xgh4388150/438815>

Video References:

- https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCYtvXh0E_ybOO1_q&feature=shared
- https://youtube.com/playlist?list=PLzf4HHIsQFwJZel_j2PUy0pwjVUgj7KIJ&feature=shared
- <https://m.youtube.com/watch?feature=shared&v=DUIsNJtg2L8>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO.No.	Course Outcome
U23EM751.1	Understand and apply interpersonal skills to enhance professional interactions and goal-setting.
U23EM751.2	Demonstrate clear and effective communication in reports and presentations to showcase professional skills.
U23EM751.3	Utilize advanced communication techniques to improve verbal and written effectiveness.
U23EM751.4	Analyze team dynamics and personal skills to enhance individual and group performance.
U23EM751.5	Create accurate and concise technical documents to uphold high standards in engineering journalism

U23MC901	தமிழர்மரபு / Heritage of Tamils	L	T	P	J	C
		1	0	0	0	1
1. Course Description / பாடநெறிவிளக்கம்:						
<p>This course is taught to provide insight to the students into the rich culture and heritage of the state. The students should know the valued things such as historic buildings that have been passed down from previous generations and relating to things of Tamil historical and cultural value that are worthy of preservation. This course explains the growth of nationalism, the growth of the Tamil language, various religious reformers, the spread of the Dravidian movement and its possible impact on society, the role of the self-respect movement, educational development in Tamilnadu since independence and the growth of fine arts in Tamilnadu.</p> <p>மாநிலத்தின்வளமானகலாச்சாரம்மற்றும்பாரம்பரியம்பற்றியநுண்ணறிவைமாணவர்களுக்குவழங்கஇந்தபாடநெறிகற்பிக்கப்படுகிறது.</p> <p>முந்தையதலைமுறையினரிடமிருந்துபெறப்பட்டவரலாற்றுக்கட்டிடங்கள்மற்றும்தமிழ்வரலாற்றுமற்றும்கலாச்சாரமதிப்புள்ளவிஷயங்கள்பாதுகாக்கப்படவேண்டியமதிப்புமிக்கவிஷயங்களை மாணவர்கள்அறிந்துகொள்ளவேண்டும்.</p> <p>தமிழ்நாட்டின்தேசியத்தின்வளர்ச்சி, பல்வேறுசமயசீர்திருத்தவாதிகள், திர்மொழியின்வளர்ச்சி, பல்வேறுசமயசீர்திருத்தவாதிகள், திராவிடஇயக்கத்தின்பரவல்மற்றும்சமுதாயத்தில்அதன்தாக்கம்.</p>						


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தமிழர்களின்வீரவிளையாட்டுகள்.

Unit-IV / அலகு-IV: Thinaï Concept of Tamils / தமிழர்களின் திணைக்கோட்பாடுகள்

(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.

தமிழகத்தின்தாவரங்களும், விலங்குகளும் -
தொல்காப்பியம்மற்றும்சங்கஇலக்கியத்தில்அகம்மற்றும்புறக்கோட்பாடுகள் -
தமிழர்கள்போற்றியஅறக்கோட்பாடு - சங்ககாலத்தில்தமிழகத்தில்எழுத்தறிவும், கல்வியும் -
சங்ககாலநகரங்களும்துறைமுகங்களும் - சங்ககாலத்தில்ஏற்றுமதிமற்றும்இறக்குமதி -
கடல்கடந்தநாடுகளில்சோழர்களின்வெற்றி.

Unit-V/ அலகு-V: Contribution Of Tamils To Indian National Movement and Indian Culture / இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர்களின்பங்களிப்பு (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.

இந்தியவிடுதலைப்போரில்தமிழர்களின்பங்கு -
இந்தியாவின்பிற்ப்பகுதியில்தமிழ்ப்பண்பாட்டின்தாக்கம் - சுயமரியாதைஇயக்கம் -
இந்தியமருத்துவத்தில், சித்தமருத்துவத்தின்பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் -
தமிழ்ப்புத்தகங்களின்அச்சுவரலாறு.

Text Books:

1. தமிழகவரலாறு - மக்களும்பயன்பாடுகளும்- கேகேபிள்ளை (தமிழகபாடநூல்கழகம் மற்றும்கல்வியல்பணிகள்கழகம்).
2. கணினித்தமிழ் - முனைவர்இல .சுந்தரம் (விகடன்பிரசுரம்).
3. கீழடி -வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).
4. பொருறை -ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு).
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.

References:

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

4. Course Outcomes/ பாடநெறிமுடிவுகள்:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome / பாடநெறிமுடிவுகள்
U23MC901. 1	To know about the language families in India, the impact of the religions, and the contribution of Bharathiar and Bharathidhasan. இந்தியாவில்உள்ளமொழிகுடும்பங்கள், மதங்களின்தாக்கம், பாரதியார்மற்றும்பாரதிதாசன்ஆகியோரின்பங்களிப்புபற்றிதெரிந்துகொள்வது


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U23MC901.2	Observe the growth of sculpture making of musical instruments and the role of temples in socio and economic lives. தமிழர்களின் வாழ்வில் இசைக்கருவிகள், சிற்பங்களை உருவாக்கும் முறைகள், சமூக பொருளாதார வளர்ச்சி மற்றும் கோவில்களின் பங்களிப்பு பற்றி அறிந்து கொள்வது.
U23MC901.3	Understand the significance of folklore and martial arts. நாட்டுப் புறவியல் மற்றும் தற்காப்புக் கலைகளின் முக்கியத்துவத்தைப் புரிந்து கொள்வது.
U23MC901.4	Learn the Sangam literature, Sangam age and overseas conquest of Cholas. சங்க இலக்கியம், சங்ககாலம் மற்றும் சோழர்களின் வெற்றிகள் ஆகியவற்றைக் கற்றுக்கொள்வது.
U23MC901.5	Understand the contribution of Tamils to the Indian freedom struggle and the role of Siddha medicines. இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு, சித்தமருந்துகளின் பங்கு ஆகியவற்றைப் புரிந்து கொள்வது.

SEMESTER II

U23CS401	Data Structures	L	T	P	J	C
		3	0	0	0	3
1. Course Description:						
This course provides a comprehensive introduction to data structures. Students will delve into the principles behind organizing and manipulating data efficiently, covering a wide array of topics including lists, stacks, queues, sorting algorithms, searching techniques, hashing, trees, and graphs. Through a combination of theoretical lectures, practical coding exercises, and real-world applications, students will gain a solid understanding of how to select and implement the appropriate data structures and algorithms to solve complex computational problems.						
2. Course Objectives:						
<ol style="list-style-type: none"> To build and work with linear and nonlinear data structures like arrays, linked lists, stacks, queues, trees, and graphs. To discover data structures to solve real-world problems and scenarios, demonstrating an understanding of trade-offs and limitations To equip students with skills in designing, implementing, and analyzing tree-based solutions to complex problems To familiarize and work with algorithms, including traversal, shortest paths, and network flow, to solve complex problems To implement and analyze sorting, searching, and hashing techniques to optimize data retrieval and manipulation in various contexts 						
3. Syllabus						45 periods
Unit-I: Linked Lists						(9)
Arrays vs Linked list; Linked lists: types, singly linked list, doubly linked list, singly circular linked list, doubly circular linked list, operations, insertion, deletion, find, reverse, modifying linked list; Floyd's cycle finding algorithm: slow pointer and fast pointer						
Unit-II: Stacks and Queue						(9)
Stack: implementation using array and linked list, Operations: push, pop; Applications: infix to						



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postfix conversion, processing function calls; Queue: implementation using array and linked list, enqueue, dequeue, priority queue, circular queue; Applications: call log management (9)

Unit-III: Trees

Terminologies; Binary Trees: implementation, traversals, expression trees, cousins of a binary tree; Binary Search Trees: construction, insertion, deletion, searching, find-min, find-max; AVL Trees: insertion, deletion; Priority Queues: heaps; Applications: dictionary, text processing (9)

Unit-IV: Graphs

Representation; Types; Traversals: Depth First Search (DFS), Breadth First Search (BFS); Dijkstra's algorithm; Topological sort; Minimum Spanning Tree (MST): Prim's, Kruskal's algorithm; Applications: traffic redirection problem, travelling salesman problem (9)

Unit-V: Sorting, Searching and Hashing

Internal sorting: bubble, insertion, quick; External sorting: merge sort; Searching: linear search, binary search; Hashing: hash table, hash functions, collision resolution techniques; Applications: Telephone Directories, Spell Checker, Design of Game Boards

Text Books:

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019
2. Seymour Lipschutz, "Data Structures using C", First Edition, McGraw Hill Education, 2017

References:

Reference Books:

1. Narasimha Karumanchi "Data Structures and Algorithms Made Easy" Fifth Edition, Career Monk publications, 2023.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2020.

Video References:

- <https://www.geeksforgeeks.org/data-structures>
- <https://www.javatpoint.com/data-structure-tutorial>
- <https://www.udemy.com/course/datastructurescncpp/>

MOOC/NPTEL /SWAYAM Course:

- <https://in.coursera.org/learn/data-structures?action=enroll>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS401.1	Apply the concepts of linked lists by demonstrating an understanding of their implementation and usage to solve given problems
U23CS401.2	Construct stacks and queues using arrays and linked lists and apply these structures to appropriate scenarios
U23CS401.3	Implement tree data structures and their operations to enhance data management and retrieval systems
U23CS401.4	Assess graph-based algorithms to solve complex problems requiring efficient data traversal and manipulation
U23CS401.5	Examine sorting, searching and hashing algorithms to organize and retrieve data effectively



U23CS402	Object Oriented Programming using C++	L	T	P	J	C
		3	0	0	0	3
1. Course Description:						
This course serves as an intensive exploration of the principles and practices of object-oriented programming (OOP) using the C++ programming language. Students will embark on a journey through the core concepts of OOP, including classes and objects, inheritance, polymorphism, and dynamic memory allocation. Additionally, the course will delve into advanced topics such as the Standard Template Library (STL), lambda expressions, and concurrency. Through hands-on coding exercises, projects, and real-world examples, students will gain a solid understanding of how to design, implement, and maintain object-oriented C++ programs efficiently.						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. Teach students the foundational principles of C++ programming. 2. Instruct students on the core concepts of Object-Oriented Programming (OOP) in C++. 3. Guide students in understanding and applying inheritance and polymorphism in C++. 4. Enable students to implement common data structures and containers using C++. 5. Train students in developing concurrent applications using C++. 						
3. Syllabus						45 periods
Unit-I: Foundations of C++						(9)
Introduction to C++: features, identifiers, data types, namespace, keywords, operators, input & output, streams, control statements; arrays; strings; functions: inline functions, default arguments; references & pointers; dynamic memory management						
Unit-II: Classes and Objects						(9)
OOP Mechanisms: classes and objects, access specifiers, constructors, destructors & object lifetime, copy constructor & copy assignment operator; static members; structs & enumeration; friend function & friend class						
Unit-III: Inheritance and Polymorphism						(9)
Inheritance & its types; aggregation; abstract classes; polymorphism: static and dynamic binding, virtual function table, function overloading, operator overloading; type casting; cast operators						
Unit-IV: Standard Template Libraries						(9)
STL: components: containers, algorithms, functions, iterators; containers: array, vector, deque, list, forward list, stack, queue, set, multiset map, multimap, unordered set, unordered multiset, unordered map, unordered multimap; file handling						
Unit-V: Lambda and Concurrency						(9)
Exception & its types; concurrency: atomic, thread, mutex; lambda in C++; resource management by smart pointers; C++ series: rvalue, lvalue& perfect forwarding; templates in C++ : features & types						
Text Books:						
<ol style="list-style-type: none"> 1. C++20 - The Complete Guide by Nicolai M. Josuttis, 2022 2. C++: The Complete Reference by Herbert Schildt, 4th Edition, 2017 						
Reference Books:						
<ol style="list-style-type: none"> 1. Modern C++ Tutorial: C++11/14/17/20 On the Fly by Changkun Ou, 2023 2. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 by Scott Meyers, 2015 						
Web References:						
<ul style="list-style-type: none"> • https://cplusplus.com/ • https://google.github.io/styleguide/cppguide.html 						



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MOOC/NPTEL /SWAYAM Courses:

- <https://www.udemy.com/course/cpp-deep-dive>
- https://onlinecourses.nptel.ac.in/noc23_cs78/course
- https://onlinecourses.nptel.ac.in/noc21_cs02/preview

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS402.1	Demonstrate problem-solving skills by writing C++ programs for simple applications
U23CS402.2	Design and implement simple classes with attributes, methods and appropriate access modifiers
U23CS402.3	Illustrate the concepts of inheritance and polymorphism in real-time objects
U23CS402.4	Evaluate and choose the appropriate STL (vectors, lists, maps, etc.) for real-time applications
U23CS402.5	Apply the modern concepts of C++ in real-time concurrent processing

U23NCC01	NCC Credit Course Level I	L	T	P	J	C
		2	0	0	0	2
1. Course Description:						
The NCC Course is designed to instil discipline, leadership, and a sense of social responsibility in participants. Through a blend of theory and practical activities, students learn to respect cultural diversity, manage time effectively, and handle stress efficiently. They develop teamwork skills and engage in social service initiatives, fostering a well-rounded approach to personal and community development.						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. Provide a comprehensive understanding of the NCC's structure and objectives. 2. Foster national integration and the NCC's role in nation-building. 3. Develop leadership and personality development skills. 4. Encourage active participation in social service and community development. 5. Enhance awareness of safety protocols and key government initiatives. 						
3. Syllabus:						
Unit-I: NCC General						30 Periods
						(5)
Aims, Objectives & Organization of NCC - Incentives - Duties of NCC Cadet - NCC Camps: Types & Conduct						
Unit-II: National Integration and Awareness						(5)
National Integration: Importance & Necessity - Factors Affecting National Integration - Unity in Diversity & Role of NCC in Nation Building - Threats to National Security						
Unit-III: Personality Development						(6)
Self-awareness, Empathy, Critical & Creative Thinking, Decision-making and Problem-Solving - Communication Skills - Group Discussion: Stress & Emotions, Time Management, Team Work - Career Counseling, SSB Procedure & Interview Skills - Public Speaking						
Unit-IV: Leadership						(7)
Traits, Indicators, Motivation, Moral Values, Honour code - Case Studies: Shivaji, Jhansi Ki Rani,						

APJ Abdul Kalam, Tippu Sultan, Rabindranath Tagore, Ratan Tata	
Unit-V: Social Service and Community Development	(7)
Basics - Rural Development Programmes, NGOs, Contribution of Youth – Swachh Bharat Abhiyan – Drug Abuse, Tree Plantation Traffic Awareness, Digital Awareness, Beti Padhao Beti Bachao, Women Health & Sanitation - Protection of Children and Women Safety - Road / Rail Travel Safety - New Initiatives - Cyber and Mobile Security Awareness	
Text Book:	
1. National Cadet Corps “Cadets Hand Book – Army(Common Subjects)”	
Web Reference:	
• https://indiancc.nic.in/	

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23NCC01.1	Demonstrate the conduct of NCC cadets, exhibiting discipline and leadership qualities, respect and appreciate the diversity of Indian culture, and fostering a sense of unity amidst differences.
U23NCC01.2	Conduct a comprehensive SWOT analysis to identify personal strengths and weaknesses, and implement strategies to overcome weaknesses, enhancing overall performance.
U23NCC01.3	Utilize various strategies for stress management, ensuring mental well-being and resilience in challenging situations
U23NCC01.4	Collaborate effectively within a team, demonstrating teamwork skills to achieve common objectives.
U23NCC01.5	Engage in social service activities on different occasions, contributing positively to the community and fostering a sense of social responsibility

U23HS581	Business English	L	T	P	J	C
		2	0	2	0	3
1. Course Description:						
This course is designed to make the learners understand the importance and scope of Business Communication. The Learners will be introduced to a range of various situations, which will enable them to utilize the business terms profusely. It also enhances their competency to emerge successfully in the corporate world. Further, this course will enable them to do effective presentations by gathering relevant information, determining audience needs and defining presentation purpose.						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. Develop strategies and skills to enhance their ability to read and comprehend business communication. 2. Strengthen their listening skills which will help them to perform effectively in the business world. 3. Develop their speaking skills to analyze and respond appropriately. 4. Foster their ability to excel in written business communication. 5. Build their confidence to participate in business meetings and interviews. 						
3. Syllabus						30+30=60 Periods


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Unit-I: Introduction to Business Communication	(6)
Basics of Business Communication - Types of Business Communication: Internal and External - The Communication Process and Barriers - Business Vocabulary: Common Terms and Phrases; Grammar: Sentence Structure and Types of Sentences - Punctuation in Business Writing; Listening: Listening to business conversations and identifying key information; Speaking: Role-play exercises simulating business meetings and phone calls; Reading: Analyzing business emails and memos; Writing: Drafting professional emails and business letters.	
Unit-II: Business	(6)
Writing Business Emails, Memos, and Letters - Writing Reports and Proposals - Creating Agendas and Minutes of Meetings; Grammar: Active and Passive Voice - Modal Verbs for Politeness and Formality; Listening: Listening to sample business discussions and note-taking; Speaking: Presenting ideas and reports in meetings; Reading: Reading and analyzing business proposals; Writing: Composing various forms of business correspondence.	
Unit-III: Negotiation and Persuasion	(6)
Techniques of Persuasion in Business - Negotiation Strategies and Tactics - Understanding Cultural Differences in Negotiation - Conflict Resolution and Handling Objections; Grammar: Conditional Sentences in Business Scenarios - Use of Conjunctions and Linking Words; Listening: Listening to negotiation dialogues and identifying key tactics; Speaking: Role-playing negotiation scenarios; Reading: Analyzing case studies on successful negotiations; Writing: Drafting negotiation emails and proposals.	
Unit-IV: Presentations and Public Speaking	(6)
Planning and Structuring Business Presentations - Using Visual Aids Effectively - Public Speaking Techniques - Handling Q&A Sessions; Grammar: Use of Cohesive Devices and Transitions - Clauses of Reason, Purpose, and Result; Listening: Listening to business presentations and taking notes; Speaking: Delivering business presentations; Reading: Reviewing presentation slides and materials; Writing: Preparing presentation scripts and speaker notes.	
Unit-V: Business Reports and Documentation	(6)
Writing and Structuring Business Reports - Writing Executive Summaries - Creating Business Plans - Documenting Processes and Procedures; Grammar: Complex Sentence Structures - Use of Passive Voice in Reports - Reported Speech in Business Contexts; Listening: Listening to report summaries and identifying main points; Speaking: Presenting a summary of a business report; Reading: Analyzing business reports and identifying key sections; Writing: Drafting business reports and executive summaries.	
List of Exercises:	(30)
<ol style="list-style-type: none"> 1. Listening to business conversations and identifying key information. (CO 1) 2. Role-play exercises simulating business meetings and phone calls. (CO 2) 3. Listening to sample business discussions and note-taking. (CO 2) 4. Presenting ideas and reports in meetings. (CO 4) 5. Listening to negotiation dialogues and identifying key tactics. (CO 3) 6. Role-playing negotiation scenarios. (CO 3) 7. Listening to business presentations and taking notes. (CO 4) 8. Delivering business presentations. (CO 4) 9. Listening to report summaries and identifying main points. (CO 5) 	


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10. Presenting a summary of a business report. (CO 5)

Text Books:

1. Business Communication: Building Critical Skills" by Kitty O. Locker and Stephen Kyo Kaczmarek, McGraw-Hill Education.
2. Business Communication Today" by Courtland L. Bovee and John V. Thill, Pearson.

References:

ReferenceBooks:

1. Essentials of Business Communication" by Mary Ellen Guffey and Dana Loewy, Cengage Learning.
2. The Business Communication Handbook" by Judith Dwyer, Pearson Australia.
3. Technical Communication: A Reader-Centered Approach" by Paul V. Anderson, Cengage Learning.
4. Guide to Managerial Communication: Effective Business Writing and Speaking" by Mary Munter and Lynn Hamilton, Pearson.
5. Effective Business Writing: Strategies, Suggestions and Examples" by Maryann V. Piotrowski, HarperCollins Publishers.

Video References:

- <https://www.youtube.com/watch?v=V8uF1EoIneE>
- <https://www.youtube.com/watch?v=moIucWGgvMc>
- <https://www.youtube.com/watch?v=o9aVjBHEEbU>

Web Resources:

- <https://learnenglish.britishcouncil.org/business-english>
- <https://research.com/education/useful-links-for-learning-and-teaching-english-and-teaching>
- <https://www.talaera.com/learn/>
- <http://www.perfectyourengish.com/grammar/numeral-adjectives.htm>
- https://en.wikipedia.org/wiki/Commonly_misspelled_English_words
- <https://www.englisch-hilfen.de/en/grammar/if.htm>
- <http://www.englishforeveryone.org/Topics/Reading-Comprehension.htm>

MOOC/ SWAYAM / NPTEL Courses:

- https://onlinecourses.nptel.ac.in/noc22_hs05/preview
- https://onlinecourses.nptel.ac.in/noc23_hs72/preview

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23HS581.1	Develop fundamental professional communication skills to effectively navigate and overcome barriers in business conversations.
U23HS581.2	Construct professional emails, memos, and letters, and draft formal business reports and proposals.
U23HS581.3	Develop skills in negotiation and persuasion, recognize cultural differences, and use conflict resolution strategies in business.


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U23HS581.4	Plan and deliver well-structured business presentations with effective visual aids.
U23HS581.5	Build organized business reports, executive summaries, and documentation with precision and clarity.

U23HS501	Basic Japanese	L	T	P	J	C
		3	0	0	0	3

1. Course Description:

The primary objective of this course is to provide a solid foundation in speaking, listening, reading, and writing Japanese. Through interactive lessons and practical exercises, you'll learn essential vocabulary, grammar structures, and pronunciation. Additionally this course will introduce the various facets of the Japanese culture with cultural insights and real-life scenarios, thereby enhancing their awareness of the cultural subtleties inherent in the language.

2. Course Objectives:

1. Develop proficiency in basic Japanese language skills including speaking, listening, reading and writing to facilitate effective communication in everyday situations.
2. Acquire a solid understanding of the fundamental Japanese grammar structures, vocabularies and pronunciations to construct simple sentences and engage in basic conversations.
3. Enhance language proficiency through interactive activities, role-plays and real-life scenarios, fostering practical language usage and confidence in communication.
4. Build a foundation for further language study and cultural exploration, enabling the students to pursue advanced language proficiency and deeper cultural understanding.

3. Syllabus

45 Periods

Unit-I: Introduction to Japanese Scripts and Basic Greetings

(9)

Japanese Scripts (Hiragana & Katakana) – Daily greetings and expressions – Introduction to grammar particles – N1 wa N2desu - N1 wa N2ja arimasen – Phrase/Sentence ka – N1 mo N2desu - N1 no N2desu – Honorific suffixes (san, kun, chan) – Demonstrative words (Ko, So, A & Do series) – Soudesu – Soudesuka – Soudesune – Sou jaarimasen/Chigaimasu – S1 ka S2 ka - N1(noun) wa N2(place)desu – Numbers – Days of the week – Days of the month

Unit-II: Introduction to Concept of Time

(9)

Ji, fun, pun – Ima wa nan ji desuka – Introduction to verbs (group I, group II, group III verbs) – Verb tense forms – V masu – V mashita – V masen – V masendeshita – N(time) ni V - N1 kara N2made - N1 to N2- N to V – S ne – N(place) e ikimasu/kimasu/kaerimasu – Doko(e) moikimasen/ikimasendeshita – itsu – S yo - Introduction to de particle – N(place) de V – N(vehicle) de ikimasu/kimasu/kaerimasu – N(tool) de V – N o V(transitive) – N o Shimasu – Usage of nan and nani – V masenka – V mashou, mashouka – Honorific prefixes(o/go) – “word/sentence” wa ~go de nan desuka – N(person) niagemasu/moraimasu/kuremasu – V mou mashita.

Unit-III: Introduction to Adjectives

(9)

I ending adjectives – na ending adjectives – forms of adjectives(negative form, past form) – I ending adjective →ku/Na ending adjective→ninarimasu – degrees of adjectives – S1 ga S2 – N ga adjective – N ga arimasu/wakarimasu – degrees of adverbs – degrees of quantity – S1 kara S2 – Doushite – N1(place) ni N2(noun) ga arimasu – N1(noun) wa N2(place) niarimasu/imasu – N1(noun) no N2(position) – N1 ya N2 nado.

Unit-IV: Introduction to Counters

(9)

Counters for objects – Counters for person – Ikutsu – nan+counter suffix – kurai and gurai – Quantifier(period) ni frequency counter(kai) – Quantifier/Noun+dake - N1 wa N2 yori “adjective”


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desu - N1 to N2to Dochira ga "adjective" desuka - N no naka de nani/doko/dare/itsu ga "adjective" desuka - Interrogatives ka/mo/demo.

Unit-V: Verb Conjugations and their Usages

(9)

5.1: V masu form and its usages

N ga hoshiidesu - V masu form tai desu - V masu form niikimasu/kimasu/kaerimasu - V masu form mashouka.

5.2: V te form and its usages

V te form kudasai - V te form imasu - V te form mo iidesu - V te form wa ikimasen - shirimasu, shirimasen, shitte imasu - te form of adjectives - V1 te form kara V2 - douyatte - V te form agemasu/kuremasu/moraimasu

5.3: V nai form and its usages

V nai form de kudasai - V nai form kerebanarimasen - V nai form to - V nai form kutemoidesu - N(time) madeni V.

5.4: V dictionary form and its usages

V dictionary form koto ga dekimasu - Shumi wa N suru/V dictionary form kotodesu - N no/Quantifier(time)/V1 dictionary form maeni V2 - nakanaka - zehi/zettai/mochiron - V dictionary form jikan/youji/yakusoku.

5.5: V ta form and its usages

V ta form koto ga arimasu - V ta ri, V ta riShimasu - usage of plain form and polite form - kedo - noun modification using V plain form - V plain form/N no toki ~.

5.6: If clause

V dictionary form to~ - V ta form ra~ - V te form/I adj→kute/Na adj→de/N de mo~ - moshi/ikura~.

Text Books:

1. Minna no Nihongo, Japanese for Everyone: Elementary main textbook 1-1 & 1-2". 1st edition, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
2. "Basic Kanji 320", published by Meguro Language Centre, Tokyo.

References:

Reference Books:

1. Genki: An Integrated Course in Elementary Japanese, Eri Banno, Yoko Ikeda, and Yutaka Ohno, The Japan Times, 2011.
2. Nihongo So-matome: JLPT N5 grammar" authored and published by Ask Publications, 2021 edition.

Web Resources:

- www.japaneselifestyle.com
- www.learn-japanese.info/
- www.kanjisite.com/
- www.learn-hiragana-katakana.com/typing-hiragana-characters/

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23HS501.1	Recognize and write the Japanese alphabet without errors

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U23HS501.2	Extend the conversation using basic sounds in the Japanese language
U23HS501.3	Explain the concept of time by learning verbs, tenses and vocabularies.
U23HS501.4	Make use of the appropriate vocabulary required for simple conversations in the Japanese language.
U23HS501.5	Comprehend the conversation and give the correct meaning

U23HS502	Basic German	L	T	P	J	C
		3	0	0	0	3

1. Course Description:

This German language course offers a structured approach to learning German, spanning from basic introductions to more complex grammatical concepts and practical applications. Beginning with an introduction to German scripts and daily greetings, participants progress through units covering essential grammar topics, vocabulary expansion, and pronunciation exercises. Throughout the course, students engage in speaking activities, such as introducing themselves, ordering food, and describing their surroundings, while also focusing on listening comprehension and reading comprehension.

By the end of the course, participants will have gained proficiency in basic conversational German, acquired foundational knowledge of German grammar and vocabulary, and developed the skills necessary to navigate everyday situations in a German-speaking environment.

2. Course Objectives:

1. Basic German introduces learners to essential language components such as vocabulary, grammar, pronunciation, and basic conversational phrases.
2. Through interactive lessons and practical exercises, students develop the ability to communicate in basic German for everyday scenarios including greetings, introductions, shopping, dining, and navigating daily life situations.
3. Additionally, learners become familiar with the German alphabet, basic sentence structure, and common expressions, facilitating basic reading and writing skills.

3. Syllabus

45 Periods

Unit-I: Basic Introduction to German Scripts

(9)

Theme and Text (Introduction to German - German script, Deutsche Namen, Daily Greetings and Expressions) – Grammar ('wh' questions, das Alphabet)– Speak Action (Buchstabieren, sich und andere vorstellen nach Namen und Herkunft fragen, internationale Wörter auf Deutsch verstehen, jemanden begrüßen)– pronunciation (Buchstabieren J,V,W,Y, - Long vowels A,E,I,O,U - Pronunciation of Ä,Ü,Ö) – To learn (internationale Wörter in Texten finden, Wörter sortieren)

Theme and Text (Gespräche im café, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Fragesätze mit wie, woher, wo, was Verben in präsens Singular und Plural, das Verb Sein, Personalpronomen und Verben)– Speak Action (eine Gespräch beginnen sich und andere vorstellen zählen, etwas bestellen und bezahlen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktable ergänzen, mit einem Redemittelkasten arbeiten)

Unit-II: Numbers and Nominative Case

(9)

Theme and Text (Numbers – 1 to 12 (Eins bis Zwölf) – 20, 30, 40, 90 (zwanzig-Neunzig) – All Numbers (1-10000) – German Currency (Euro) – Basic Mathematics (plus, Minus, Malen, Geteilt durch)) – Grammar (Introduction of verbs –Have Verb – To Come, To Speak, To Read, To Drive, To Fly, To write, To Eat, To sleep, To take etc.,)

Theme and Text (Communication in course) – Grammar (Singular and Plural, Artikel: der,das,die/ein,eine, verneinung: kein, keine, Komposita: das Kursbuch) – Speak Action (Gegenständen fragen/ Gegenstände benennen im kurs:) – pronunciation (word accent Marking, Umlaute ö ä ü hören und



<p>sprechen) – To learn (Lernkarten schreiben, Memotipps, eine Regel selbst finden) Theme and Text (City, Town, Language: Nachbar, Sprachen, Sehenswürdigkeiten in Europa) – Grammar (Past tense for Sein, W-Frage, Aussagesatz und Satzfrage) – Speak Action (about city and siteseeing) – pronunciation (Satzakzent in Frage- und Aussagesätzen) – To learn (eine Regel ergänzen, eine Grammatiktafel erarbeiten, Notizen machen)</p>	
Unit-III: Akkusative Case and Prepositions	
(9)	
<p>Theme and Text (Menschen und Häuser, Furniture catalogue, E-Mail, House information) – Grammar (possesivartikel im Nominativ, Artikel im Akkusativ, Adjektiveinsatz, Graduierung mit zu) – Speak Action (Wohnung beschreiben about persons and things) – pronunciation (consonant - ch) – To learn (wortschatzsystematisch)</p> <p>Theme and Text (Termine - Appointment and punctuality in Germany) – Grammar (questions with wann?, Preposition (am, um, von... bis), verneinung mit nicht, trennbare verben, präteritum von haben) – Speak Action (Daily plan making, time commitment, excuse for late coming) – pronunciation (consonants- p,b,t,d / k,g) – To learn (Rollenkartenarbeiten)</p> <p>Theme and Text (orientation in the working area, go for work, floor plan city plan, office and computer) – Grammar (preposition: in, neben, unter, auf, vor, hinter, an, zwischen, bei und mit + Dativ) – Speak Action (workplace, work, giving appointments) – pronunciation (consonants: f,w und v) – To learn (Making notice in the calendar)</p>	
Unit-IV: Dativ Case and Prepositions	
(9)	
<p>Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and irregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order)</p> <p>Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, postcard, Excursion programme) – Grammar (preposition: in, durch, über + Akkusativ: zu, an... vorbei + Dativ, Modalverb wollen) – Speak Action (Tourism, culture, postcard preparation, travel description) – pronunciation (r and l) – To learn (plaket making)</p> <p>Theme and Text (Beruf und all Tag, Visitenkarten, wörterbuch) – Grammar – Speak Action (profession, statistic speaking) – pronunciation (n, ng and nk) – To learn (wörterbuch, text information in tabel)</p>	
Unit-V: Adjectives and Pronunciation	
(9)	
<p>Theme and Text (Haushaltstipp, kochrezept, maße und gewichte, Mahlzeiten und Gerichte) – Grammar (jeden Tag, manchmal, nie, Question - welche, Comparison – viel, gut, gern) – Speak Action (about eat, drink question and answers) – pronunciation (e, en, el, er) – To learn (Text auswerten und zusammenfassen)</p> <p>Theme and Text (Clothing, colour, weather) – Grammar (Adjektive im Akkusativ, unbestimmter Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farbeninterkulturelle)</p> <p>Theme and Text (in supermarket, purchase, House Maintenance, Emotions, Sports, Body parts) – Grammar (Modal Verb) – Speak Action (Body parts) – To learn (Rollenkartenarbeiten)</p>	
Text Books:	
<ol style="list-style-type: none"> 1. Funk, Kuhn, Demme, "Studio D A1 Deutsch als Fremdsprache" Goyal Publishers and Distributors; 2016 2. Hueber, "Fit for Goethe- Zertifikat A1 (Start Deutsch 1)" Goyal Publishers and Distributors; 2016 	
References:	
Reference Books:	

S. S. Goyal

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1. Stefanie Dengler, "Netzwerk Deutsch Als Fremdsprache A1" by Goyal Publishers & Distributors Pvt Ltd
2. Fran Martin, "Grammar Tables for Student of German" by Independently Published, 2017

Web Resources:

- www.memrise.com/courses/english/german/
- www.deutsch-lernen.com/
- www.duolingo.com

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23HS502.1	Recognize and write the German alphabet
U23HS502.2	Speak using basic sounds of the German language
U23HS502.3	Apply appropriate vocabulary needed for simple conversation in the German language
U23HS502.4	Apply appropriate grammar to write and speak in the German language
U23HS502.5	Comprehend the conversation and give the correct meaning

U23SY481	Cyber Security Essentials	L	T	P	J	C
		3	0	2	0	4
1. Course Description:						
The Cyber Security Essentials course provides a comprehensive introduction to the fundamental concepts, principles, and practices of cyber security. This course is designed to equip students with the knowledge and skills necessary to understand and navigate the complex landscape of cyber threats, vulnerabilities, and risk management. Through theoretical learning and practical exercises, students will gain insights into the core aspects of cyber security, including network security, cryptography, security policies, and incident response.						
2. Course Objectives:						
<ol style="list-style-type: none"> 1. To learn the foundational principles of cyber forensics 2. To apply machine learning techniques to cyber security problems 3. To understand the key concepts of model of cloud security 4. To understand the role of data science in cyber security 5. To comprehend the basics of ethical hacking 						
3.Syllabus		45 + 30 = 75 Periods				
Unit-I: Introduction to Cyber forensics		(9)				
Overview of Cyber forensics-Importance of Cyber forensics in Cyber security-Legal and Ethical Issues in Cyber forensics-Types and Sources of Digital Evidence-Collection and Preservation of Digital Evidence-Forensic Tools and Software-Hardware Tools for Forensics-Data Recovery Techniques-Case Studies and Practical Applications						
Unit-II: Machine Learning in Cyber security		(9)				
Introduction to Machine Learning-Basic Concepts and Algorithms in Machine Learning-Supervised vs. Unsupervised Learning-Machine Learning for Anomaly Detection-Malware Classification using Machine Learning-Tools and Frameworks for Machine Learning-Python Libraries (e.g., Scikit-Learn, TensorFlow)- Practical Implementation of Machine Learning Models-Adversarial Machine Learning						


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and Future Trends	
Unit-III: Cloud Security Essentials	(9)
Introduction to Cloud Computing-Cloud Service Models (IaaS, PaaS, SaaS)-Cloud Deployment Models (Public, Private, Hybrid)-Security Threats in Cloud Computing-Vulnerabilities in Cloud Environments-Security Controls and Best Practices for Cloud Security-Identity and Access Management (IAM) in the Cloud-Data Protection and Encryption in Cloud Computing-Compliance and Regulatory Issues in Cloud Security	
Unit-IV: Cyber Data Science Essentials	(9)
Introduction to Cyber Data Science-Role of Data Science in Cyber security-Key Concepts and Techniques in Data Science-Data Sources and Types in Cyber security-Data Collection Methods-Data Cleaning and Pre-processing Techniques-Statistical Methods for Data Analysis-Visualization Techniques for Cyber Security Data-Predictive Analytics and Threat Intelligence	
Unit-V: Ethical Hacking Basics	(9)
Introduction to Ethical Hacking-Ethical vs. Unethical Hacking-Legal and Ethical Considerations in Ethical Hacking-Phases of Ethical Hacking-Reconnaissance Techniques-Scanning and Enumeration Techniques- Exploitation Methods-Post-Exploitation Strategies-Reporting and Remediation of Vulnerabilities	
List of Experiments	(30 Periods)
<ol style="list-style-type: none"> 1. Develop a Python program that prompts the user to enter a file name, retrieves the following metadata, and displays it: <ul style="list-style-type: none"> • File name • File size (in bytes) • Creation date • Last modified date <p>Ensure robust error handling for cases like file not found.</p> 2. Create the Python program that: <ul style="list-style-type: none"> • Prompts the user to enter a filename and a keyword or pattern to search. • Reads the file's contents and counts occurrences of the specified keyword or pattern. • Handles errors gracefully (e.g., file not found, invalid input). 3. Develop a Python program to implement an anomaly detection algorithm for identifying unusual patterns or outliers in cybersecurity data. 4. Develop a Python program to train a supervised learning model for classifying cybersecurity instances (e.g., malware vs. benign files). 5. Develop a Python program to implement basic encryption and decryption techniques for ensuring data security in cloud computing environments. <p>Skills Developed:</p> <ul style="list-style-type: none"> • Implementing encryption algorithms (e.g., AES) • Key generation and management • Python programming for data security 6. Develop a Python program to simulate basic identity and access management controls in a cloud computing environment. <p>Skills Developed:</p> <ul style="list-style-type: none"> • IAM concepts and principles • User management and role assignment • Python programming for IAM simulations 7. Develop a Python program to retrieve data from a cloud storage service (e.g., AWS S3, Google Cloud Storage) for subsequent analysis. <p>Skills Developed:</p> <ul style="list-style-type: none"> • Data handling and manipulation • Usage of cloud APIs for data retrieval 	



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- Python programming for cloud-based data operations
8. Develop a Python program to preprocess data using cloud-based tools and services for efficient analysis.

Skills Developed:

- Data pre-processing techniques
- Usage of cloud computing platforms and services
- Python programming for cloud-based data operations

9. Mini Project :

Title: Web Application Security Testing

Objective: Conduct security testing on a web application to identify and mitigate common vulnerabilities.

Skills Developed:

Web application security, penetration testing, and OWASP Top 10 vulnerabilities.

Text Books:

1. Maras, M. (2014). Computer Forensics: Cybercriminals, Laws, and Evidence. United States: Jones & Bartlett Learning.
2. Tsukerman, E. (2019). Machine Learning for Cyber security Cookbook: Over 80 Recipes on how to Implement Machine Learning Algorithms for Building Security Systems Using Python. United Kingdom: Packt Publishing.
3. Mather, T., Kumaraswamy, S., Latif, S. (2009). Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance. United Kingdom: O'Reilly Media.

References:

Reference Books:

1. Jacobs, J., Rudis, B. (2014). Data-Driven Security: Analysis, Visualization and Dashboards. Germany: Wiley.
2. Engebretson, P. (2013). The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy. Netherlands: Elsevier Science.

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23SY481.1	Comprehend the significance of Cyber Forensics
U23SY481.2	Implement practical machine learning models for cyber security applications
U23SY481.3	Apply security controls and best practices for securing cloud environments and access management techniques in cloud settings.
U23SY481.4	Demonstrate the role of data science in cyber security and identify key concepts and techniques used in cyber data science.
U23SY481.5	Analyse the legal frameworks and ethical guidelines that govern ethical hacking, ensuring their practices are compliant with relevant laws and professional standards.

U23CS382	Python Programming	L	T	P	J	C
		2	0	2	2	4

1. Course Description:

This course covers the fundamental concepts and practical applications of Python programming. Students will explore topics ranging from basic data types and expressions to advanced data


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manipulation and visualization techniques. The course will delve into programming paradigms, emphasizing Python's versatility in supporting imperative, functional, and object-oriented programming styles. Through hands-on exercises, projects, and real-world examples, students will develop a strong foundation in Python programming, enabling them to write efficient, readable, and maintainable code for various applications.

2. Course Objectives:

1. To make students to write efficient, readable, and well-structured code
2. To choose and use data structures such as lists, tuples, dictionaries and sets in Python programs
3. To make students effectively organize, structure, and manage Python code using files, modules, and packages
4. To implement object-oriented programming constructs in Python
5. To use libraries for data analysis in Python and use Django framework for web application development

3. Syllabus periods

30+30+30=90

Unit-I: Python Constructs

(6)

Introduction: Python Interpreter and interactive mode, Comments, Identifiers and Keywords; Data Types; Variables and Expressions; Operators; Conditional Statements; Looping Statements; Fruitful Functions; Lambda Function

Illustrative Programs: Financial application, sandwich vowel, and Chocolate Distribution Algorithm

Unit-II: Lists, Tuples, Dictionaries and Set

(6)

Lists: operations - Processing Array elements, slices, methods, loop, mutability, aliasing, cloning, parameters, lists as arrays; Tuples: assignment, tuple as return value; Dictionaries: operations and methods; Sets: operations;

Illustrative Programs: Dutch National Flag Algorithm, Count and Say Problem and Kadane's Algorithm

Unit-III: Files, Modules and Packages

(6)

Files: text files, reading and writing files; Format Operator; Command Line Arguments; Error and Exception Handling; Modules; Packages; Locating path of modules – Python Date – Python Regex

Illustrative Programs: Bank Management application using File concept

Unit-IV: OOP and Databases

(6)

Object, class, constructor, inheritance, abstraction, polymorphism, encapsulation; MongoDB: Environmental Setup, creating new Database, CRUD Operations, Python DB connectivity

Illustrative Programs: Event management using MongoDB, Real Estate management using MongoDB

Unit-V: Data Analysis and Web Frameworks

(6)

NumPy: Basics of NumPy Arrays; Computations: Universal Functions; Aggregations: Min-Max and Everything in Between; Pandas: Objects, Data Indexing and Selection, Data Operations, Handling Missing Data; Matplotlib: Types of plots, Simple Line Plots, Boxplots, Simple Scatter Plots; Django: Overview, Introduction to MVC and MVT architecture in Web development, Django folder structure, generic views, HTML templates

Illustrative Programs: Graph Plotting for performance Analysis, form design, webpage design

List of Experiments

(30)

1. Create a Python application that uses expressions and control flow statements to automate a



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- common task. Ensure that your application is user-friendly and robust to different inputs. (CO1)
2. Suggested Problems: Swap two numbers without a temporary variable, Quadratic Equation, Valid Palindrome
 3. Implement a Python program that simulates a real-world system or process using conditions and iterative loops. (CO1)
 4. Suggested Problems: check whether an alphabet is a vowel or consonant, the sum of all even numbers from 0 to n, factorial of a number (CO1)
 5. Implementation of Strings in the program.
 6. Suggested Problems: Determine if string halves are alike, palindrome, character count, replacing characters
 7. Implementation of real-time/technical applications using Lists and Tuples.(CO2)
 8. Suggested Problems: Minimum Index Sum of Two Lists concatenate two lists index-wise, Tuple with the same product, Copy specific elements from one Tuple to a new tuple)
 9. Implementation of real-time applications using Sets and Dictionaries. (CO2,CO3)
 10. Suggested Problems: Magic Dictionary, Longest Word in Dictionary, Set Mismatch and Smallest Number in Finite Set
 11. Implementation of Functions in the program. (CO3)
 12. Suggested Problems: Factorial, largest number in a list, area of shape
 13. Implementation of file-handling operations. (CO4)
 14. Suggested Problems: copy from one file to another, wordcount, longest word
 15. Implementation of applications of standard libraries. (CO4)
 16. Suggested Problems: Handle scalars to work on the NumPy array, insert values at random positions in an array, Convert the index of a series into a column of a data frame, combine many series to form a data frame, get frequency counts of unique items of a series, Union of two arrays, convert a NumPy array to a data frame of a given shape, Plotting datasets.
 17. Implementation of OOP concepts in Python (CO5)

Project

(30)

- Develop a web application for any real-world problem

Text Books:

1. Al Sweigart, "Automate the Boring Stuff with Python: Practical Programming for Total Beginners," 2nd Edition, No Starch Press, 2019
2. Liang Y. Daniel, "Introduction to Programming Using Python," Pearson Education, 2017
3. Jake Vander Pla, "Python Data Science Handbook," O'Reilly (<https://jakevdp.github.io/PythonDataScienceHandbook>)
4. William S Vincent, "Django for Beginners: Build Websites with Python and Django," Welcome to Code Publishers, 2020.

References:

Reference Books:

1. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach," Pearson India Education Services Pvt. Ltd., 2016
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," 2nd Edition, Updated for Python 3, Shroff O'Reilly Publishers, 2016
3. Timothy A. Budd, "Exploring Python," Mc-Graw Hill Education (India) Private Ltd., 2015

Video References:

- <https://www.codecademy.com/catalog/language/python>
- <https://www.geeksforgeeks.org/python-programming-language-tutorial/>

MOOC/NPTEL/SWAYAM Courses:

- <https://nptel.ac.in/courses/106/106/145>
- https://onlinecourses.nptel.ac.in/noc24_cs45 preview

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS382.1	Apply syntax and semantics of Python programming language for developing real-world applications
U23CS382.2	Analyse Python solutions by implementing lists, tuples and dictionaries
U23CS382.3	Create file system applications with built-in functions
U23CS382.4	Apply principles of OOP and MongoDB
U23CS382.5	Analyse data manipulation techniques and develop web pages with the Django Framework

U23CS451	Data Structures Laboratory	L	T	P	J	C
		0	0	4	0	2

1. Course Description:

The Data Structure Laboratory is a hands-on course designed to complement theoretical knowledge with practical implementation skills in data structures. Through a series of lab sessions, students will work on implementing code and projects focusing on lists, stacks, queues, sorting algorithms, searching techniques, hashing, trees and graph data structures. By actively engaging in coding exercises and projects, students will deepen their understanding of the course, enhance their programming skills, and gain valuable experience applicable across various computer science and engineering domains.

2. Course Objectives:

1. To build and work with linear and nonlinear data structures like arrays, linked lists, stacks, queues, trees, and graphs.
2. To discover data structures to solve real-world problems and scenarios, demonstrating an understanding of trade-offs and limitations
3. To equip students' skills in designing, implementing, and analyzing tree-based solutions to complex problems
4. To familiarize and work with algorithms, including traversal, shortest paths, and network flow, to solve complex problems
5. To implement and analyze sorting, searching, and hashing techniques to optimize data retrieval and manipulation in various contexts

3. List of Experiments**(60)**

1. Develop a Multimedia Library Management System that organizes and manages various types of multimedia content such as audio, video, and images. Each type of content requires a different approach for efficient management. Choose a suitable linked list operation for each multimedia category's specific needs. (C01)
2. Demonstration of applications of Linked List (Reversal Problems, Segregation of Even and Odd nodes in Linked List, Palindrome checking using Linked List, Loop Detection, Sorting the bitonic using doubly linked list) (CO1)
3. Build a critical software project for a large healthcare organization that processes and manages a


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high volume of patient data, requiring efficient and reliable data structures for task management, resource allocation, and communication. Select appropriate data structures (stacks and queues) for specific use cases, considering their performance characteristics, flexibility, and memory usage. (CO2)

4. Demonstration of applications of Stack and Queue (Evaluating Postfix Expressions, Infix to Postfix conversion, Balancing symbols and Postfix evaluation, Wild card pattern matching)(CO2)
5. Develop a movie recommendation system for a popular streaming platform that recommends movies to users based on their past watching history and preferences. Use a binary tree data structure to store and search for movies based on different criteria efficiently. (CO3)
6. Build an online bookstore with a vast collection of books to manage the inventory efficiently and provide a seamless user experience with the help of a Binary Search Tree (BST) data structure.(CO3)
7. Demonstration of applications of Trees (Segment Tree and Range Minimum Query on the Constructed Segment Tree, Maximum depth of Binary tree) (CO3)
8. Design a network for any food delivery partner to understand how people are connected, and how information flows through the network and identify influential users using graph traversal algorithms. (CO4)
9. Construct a travel management system that aims to streamline the planning and organization of travel itineraries for a travel agency. The system utilizes various graph algorithms (Topological Sort, Connected Graph and Ticket Itinerary) to efficiently manage the complexities of travel planning. (CO4)
10. Design a food delivery app for a bustling city. Thousands of orders flow daily, and ensuring fast and efficient delivery is crucial for customer satisfaction. Use Dijkstra's algorithm to find the shortest paths for delivery drivers, optimizing their routes and minimizing delivery times.(CO5)
11. Design an optimized network infrastructure of an organization that connects the various departments within the organization using the minimum amount of cabling to reduce costs and enhance network efficiency. Implement Prim's and Kruskal's algorithms for finding the Minimum Spanning Tree (MST) for the network. (CO5)
12. Create a Student Grade Management System for a university that efficiently organizes and displays student grades for various courses. The system should employ different sorting algorithms to cater to diverse requirements and optimize the display of grades. Choose the suitable sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Merge Sort) for quick grade overview, mark entry, course ranking and overall grade report. (CO5)
13. Develop a Product Inventory Management System for a retail company that handles a large number of products to implement efficient searching techniques to retrieve information about products in the inventory quickly. Select the appropriate searching technique (Linear Search, Binary Search) for quick product lookup, inventory sorting, and retrieval. (CO5)
14. Demonstration of applications of hashing (Single swap sorted array, Anagram Checking and Range Minimum Query Using Sparse Table, Merge two sorted arrays) (CO5)

References Books:

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019
2. Narasimha Karumanchi "Data Structures and Algorithms Made Easy" Fifth Edition, Career Monk publications,2017
3. Seymour Lipschutz, "Data Structures using C", First Edition, McGraw Hill Education, 2017

Web Resources:

- <https://www.geeksforgeeks.org/data-structures>
- <https://www.javatpoint.com/data-structure-tutorial>

MOOC/NPTEL /SWAYAM Courses:


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- <https://www.udemy.com/course/datastructuresncpp/>
- <https://in.coursera.org/learn/data-structures?action=enroll>

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS451.1	Solve Problems by applying the concepts of Linked Lists
U23CS451.2	Implement Stacks and Queues with Array and LinkedList and solve problems with Stacks and Queues
U23CS451.3	Implement tree data structures and demonstrate tree operations such as insertion, deletion, traversal and balancing
U23CS451.4	Implement the graph-based algorithms to solve complex problems requiring efficient data traversal and manipulation
U23CS451.5	Apply sorting, searching and hashing algorithms to organize and retrieve data effectively

U23CS452	Object-Oriented Programming using C++ Laboratory	L	T	P	J	C
		0	0	2	0	1

1. Course Description:

Object-Oriented Programming (OOP) Using C++ Laboratory is a practical course aimed at reinforcing theoretical concepts through implementation and real-world applications. Students will engage in coding assignments and projects focusing on core OOP principles, including inheritance, polymorphism, encapsulation and abstraction implemented in the C++ programming language. Additionally, students will explore common data structures and containers, leveraging their understanding of OOP to design and implement efficient solutions. Through a series of real-time application projects, students will apply their knowledge to solve complex problems, gaining valuable experience in software development and engineering practices.

2. Course Objectives:

1. Instruct students in the foundational principles of C++.
2. Teach students the key concepts of Object-Oriented Programming (OOP) in C++.
3. Guide students in understanding and applying inheritance and polymorphism in C++.
4. Enable students to implement standard data structures and containers in C++.
5. Train students to develop concurrent applications using C++.

3. List of Experiments

30 periods

1. Data types, variables, and constants:
 - i. Compose a C++ program that demonstrates proficient utilization of various data types, variables, and constants to ensure efficient and purposeful data handling within the program(CO1)
2. Control Flow Statements:
 - i. Develop a C++ program that simulates the modern warehouse automation system. It demonstrates its ability to monitor inventory levels, process incoming and outgoing shipments to effectively manage the execution flow, and generate real-time reports to optimize warehouse operations(CO1)
3. Operators and Expressions:
 - i. Create a comprehensive C++ program that allows users to perform various operations on their stock holdings. The program should provide functionality for buying and selling



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stocks, calculating portfolio performance metrics, and making investment decisions based on given criteria(CO1)

4. Functions, Pointers and Arrays:
Implement a bank management system with C++ functions to handle transactions, account balances, and user authentication, thereby enhancing modularity, code reusability, and the overall efficiency of the program.(CO2)
5. Develop a C++ program that uses pointers to swap the values of two integers. Use type casting to access and manipulate the values through pointers.(CO2)
6. Develop a C++ program to implement a student grade tracker using arrays. Create an array to store the grades of multiple students and implement functions to calculate the average, find the highest and lowest grades, and display the overall performance.(CO2)
7. String Handling:
 - i. Design a C++ program that generates personalized greeting strings based on user input. The greeting system requires creating a string consisting of a user's chosen greeting phrase replicated multiple times. If the chosen greeting is less than three characters, then the program should return n copies of the entire phrase.(CO3)
 - ii. Develop a secure access card generation system using string manipulation functions. Build a C++ program that generates a string consisting of four copies of the first two characters of the employee's name functions and produces a clear identification code.(CO3)
8. Design a C++ program for a dynamic blogging platform with an advanced content management system. Implement a feature that generates unique content identifiers for blog posts based on the author's name and the topic of the post.(CO3)
9. Object-Oriented Concepts:
 - i. Develop a C++ program to create a library catalog system using classes and objects. Implement member functions to display book information and manage the catalog.
 - ii. Develop a C++ program to simulate an online shopping cart using classes and objects. Define a class Implement member functions to add products to the cart, calculate the total cost, and display the items in the cart.
 - iii. Develop a C++ program that showcases inheritance by creating a hierarchy of vehicles. Implement a base class Vehicle and derive two classes, Car and Motorcycle, from it. Each derived class should have specific attributes and extended functionalities.
 - iv. Create a C++ program that demonstrates polymorphism by implementing a shape hierarchy and calculating the area of different shapes through a common interface(CO3)
10. Standard Template Library (STL):
 - i. Develop a C++ program that uses dynamic memory allocation and a linked list structure to manage an Employee Database. Implement operations such as inserting a new employee, deleting an employee, and updating employee information. Ensure proper memory management to avoid memory leaks. (CO4)
11. Create a C++ program that uses dynamic memory allocation to implement a stack for managing Undo/Redo history. Implement operations such as pushing a state onto the stack (undo) and popping a state off the stack (redo). (CO4)
12. Develop a C++ program that uses dynamic memory allocation to implement a queue for managing a print queue. Implement operations such as enqueueing a print job and dequeuing a print job. (CO4)
13. Design a C++ program to manage product inventory using a vector of product objects. Sort products based on their prices using a sort operation and allow users to search for a product by name using binary search. (CO4)
14. Design a C++ program for managing course enrolments in an online learning platform using a

tree data structure implemented with map operation. This program should allow users to add new courses, enrol students in courses, and efficiently search for available courses based on enrolment status and capacity using the lower bound algorithm. (CO5)

15. File handling:

- i. Design a C++ program that reads a given text file, counts the number of words present, and displays the result. (CO5)

16. Project work:

Design and implement a practical application using C++ and OOP concepts.

Text Books:

1. C++20 - The Complete Guide by Nicolai M. Josuttis, 2022
2. The C++ Standard Library - A Tutorial and Reference, 2nd Edition by Nicolai M. Josuttis, 2012

Reference Books:

3. Modern C++ Tutorial: C++11/14/17/20 On the Fly by Changkun Ou, 2023
4. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 by Scott Meyers, 2015

Web Resources:

- <https://www.tutorialspoint.com/cplusplus/index.htm>
- <https://www.javatpoint.com/cpp-tutorial>

MOOC/NPTEL /SWAYAM Courses:

- https://onlinecourses.nptel.ac.in/noc21_cs02/preview
- https://onlinecourses.nptel.ac.in/noc22_cs42/preview

4. Course Outcomes:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome
U23CS452.1	Develop and demonstrate problem-solving for simple applications
U23CS452.2	Design and implement simple classes in C++ with well-defined attributes, methods, and appropriate access modifiers
U23CS452.3	Apply the concepts of inheritance and polymorphism by creating and managing class hierarchies and demonstrate runtime polymorphism
U23CS452.4	Implement appropriate Standard Template Library (STL) containers for various real-time applications
U23CS452.5	Implement real-time concurrent processing solutions by applying threads, mutexes and asynchronous programming

U23EM752	Logical Thinking	L	T	P	J	C
		0	0	2	0	1

1. Course Description:

This course aims to help students build strong skills in logical thinking, reasoning and problem-solving. They will learn to analyze and evaluate arguments, spot logical fallacies and create clear and convincing arguments. Through lectures and practical exercises, students will develop the critical thinking needed to tackle engineering problems methodically and precisely. They will also understand the importance of logical thinking in designing and implementing engineering solutions, making them more effective engineers.


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2. Course Objectives:	
<ol style="list-style-type: none"> 1. Apply logical algorithms to tackle complex problem-solving scenarios. 2. Develop analytical skills for optimizing costs in logical operations. 3. Master time and resource management through logical approaches. 4. Strengthen quantitative reasoning for data-driven decision-making. 5. Enhance logical and visual reasoning to solve intricate problems effectively. 	
3. Syllabus	30 Periods
Unit-I: Fundamental Skills for Problem Solving	(6)
Application of Problem-Solving in real life, Different algorithms in problem-solving: Brute force approach, Pattern finding method and Deep Learning Approach. Numbers System: Primes and factors, factors and factorials, divisibility rule, unit digit calculation and power cycle method, remainder concepts, HCF and LCM.	
Unit-II: Critical Analysis of Cost Management	(6)
Fundamentals of Finance: Percentages, Fluctuations in percentage, Profit and Loss, Pricing Logics, Retail Pricing Strategy; Interest calculation: Cash Flow and Taxes; Simple and Compound interest calculation, Puzzle related to interest changes and Case Studies.	
Unit-III: Time and Work Management	(6)
Fundamentals of Human Resources and Operations: Resources allocation, Time and Work, Puzzle involving backtracking, All possible routes, Pipes and Cisterns.	
Unit-IV: Quantitative Reasoning and Data Interpretation	(6)
Fundamentals of statistics: Mean, Median and Mode, Real-life life application of statistics, Application of Ratios and Proportions in business problems, Partnerships; Geometry: 2D, 3D Visualization.	
Unit-V: Logical and Visual Reasoning	(6)
Paradigm shift and its application: Syllogism, Cube 3D visualization problems, Blood Relation, Coding decoding: Basics and Advanced. Visual reasoning: Patterns, Paper folding, Case Studies and Puzzles.	
References:	
Reference Books:	
<ol style="list-style-type: none"> 1. Dr R S Aggarwal, Quantitative Aptitude, Revised Edition, S.Chand Publishing Company Ltd(s), 2022 2. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, 10th Edition, Tata McGraw-Hill Publishing Company Ltd, 2022 	
Online References:	
<ul style="list-style-type: none"> • https://www.hackerearth.com/ • https://www.geeksforgeeks.org/ • https://www.indiabix.com/ 	
4. Course Outcomes:	
After successful completion of the course, the student should be able to:	



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CO. No.	Course Outcome
U23EM752.1	Apply logical algorithms and mathematical methods to solve real-world problems.
U23EM752.2	Analyze and evaluate cost management strategies in various contexts.
U23EM752.3	Apply principles of time management and work efficiency in practical situations.
U23EM752.4	Use quantitative methods and interpret data to make informed decisions.
U23EM752.5	Create solutions to complex logical and visual reasoning problems by applying advanced reasoning techniques

U23MC902	Tamil and Technology / தமிழரும் தொழில்நுட்பமும்	L	T	P	J	C
		1	0	0	0	1

1. Course Description:

The intersection of Tamils and technology refers to the field of agricultural technology, focusing on the use of modern tools and techniques to enhance farming practices and increase agricultural productivity.

2. Course Objectives:

- To increase agricultural productivity and profitability by implementing innovative solutions that optimize resource usage, minimize losses, and enhance crop yields.
- To automate the irrigation systems to adjust water usage based on real-time data on soil moisture levels, weather forecasts, and crop water requirements.

3. Syllabus:

15 Periods

Unit-I: Weaving and Ceramic Technology / நெசவு மற்றும் பாணைத் தொழில்நுட்பம் (3)

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

சங்ககாலத்தில் நெசவுத் தொழில்- பாணைத் தொழில்நுட்பம்- கருப்புசிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல்குறியீடுகள்.

Unit-II: Design and Construction Technology / வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் (3)

Designing and Structural construction of Houses & Designs in household materials during the 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.

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு- சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்- மாமல்லபுரச் சிற்பங்களும்- கோவில்களும்- சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள்- நாயக்கர்காலக்கோயில்கள்- மாதிரிகட்டமைப்புகள் பற்றி அறிதல். மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால்- செட்டிநாட்டு வீடுகள்- பிரிட்டிஷ் காலத்தில் சென்னையில் இந் தோ- சாரோசெனிக்கட்டிடக்கலை

Unit-III: Manufacturing Technology / உற்பத்தித் தொழில்நுட்பம் (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 beads - Archeological evidence - Gem stone types described in

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Silappathikaram.

கப்பல்கட்டும்கலை- உலோகவியல்- இரும்புத்தொழிற்சாலை -இரும்பைஉருக்குதல். எஃகு-
வரலாற்றுச்சான்றுகளாகசெம்புமற்றும்தங்கநாணயங்கள்- நாணயங்கள்அச்சடித்தல்-
மணியுருவாக்கும்தொழிற்சாலைகள்- கல்மணிகள்- கண்ணாடிமணிகள்- சுடுமண்மணிகள்-
சங்குமணிகள்- எலும்புத்துண்டுகள்- தொல்லியல்சான்றுகள்-
சிலப்பதிகாரத்தில்மணிகளின்வகைகள்.

Unit-IV: Agriculture and Irrigation Technology /

(3)

வேளாண்மைமற்றும்நீர்ப்பாசனத்தொழில்நுட்பம்

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

அணை, ஏரி, குளங்கள், மதகு- சோழர்காலக்குழுழித்தூம்பின்முக்கியத்துவம்-
கால்நடைபராமரிப்பு- கால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள்-
வேளாண்மைமற்றும்வேளாண்மைச்சார்ந்தசெயல்பாடுகள்- கடல்சார்அறிவு-
மீன்வளம்முத்துமற்றும்முத்துக்குளித்தல்- பெருங்கடல்குறித்தபண்டையஅறிவு-
அறிவுசார்சமூகம்.

Unit-V: Scientific Tamil and Tamil Computing / அறிவியல்தமிழ்மற்றும்கணித்தமிழ்

(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.

அறிவியல்தமிழின்வளர்ச்சி-கணித்தமிழ்வளர்ச்சி- தமிழ்நூல்களையின்பதிப்புசெய்தல்-
தமிழ்மென்பொருட்கள்உருவாக்கம்- தமிழ்இணையக்கல்விக்கழகம்- தமிழ்மின்னூலகம்-
இணையத்தில்தமிழ்அகராதிகள்- சொற்குவைத்திட்டம்.

Text Books:

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


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References:**Reference Books:**

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

4. Course Outcomes/ பாலநெறிமுடிவுகள்:

After successful completion of the course, the student should be able to:

CO. No.	Course Outcome / பாலநெறிமுடிவுகள்
U23MC902.1	Describe about the weaving industry in sangam age and ceramic technology. சங்ககாலத்தில் நெசவுத்தொழில் மற்றும் பீங்கான் தொழில்நுட்பம் பற்றி விரிவாக அறிந்து கொள்ளுதல்.
U23MC902.2	Observe the design of houses, sculptures and construction of temples. வீடுகளின்வடிவமைப்பு, சிற்பங்கள் மற்றும் கோவில்களின் கட்டுமானத்தைப் பற்றி தெரிந்து கொள்ளுதல்.
U23MC902.3	Relate the various manufacturing materials and stone types in Silappathikaram. சிலப்பதிகாரத்தில் உள்ள பல்வேறு உற்பத்திப்பொருட்கள் மற்றும் கல்வகைகளைப் பற்றி புரிந்து கொள்ளுதல்.
U23MC902.4	Understand the significance of agriculture and irrigation technology in the ancient period. பண்டையகாலத்தில் விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் முக்கியத்துவத்தை புரிந்து கொள்ளுதல்.
U23MC902.5	Explain the growth of scientific Tamil, Tamil computing and the digitization of Tamil books. அறிவியல் தமிழின் வளர்ச்சி, தமிழ்க்கணினி, தமிழ்நூல்களின் டிஜிட்டல் மயமாக்கல் ஆகியவற்றை விரிவாக தெரிந்துகொள்ளுதல்.



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