Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Udumalai Road, Pollachi, Coimbatore District - 642003
Established in 1998 ♦ Approved by AICTE ♦ Affiliated to Anna University
(A DIVISION OF NIA EDUCATIONAL INSTITUTIONS)
An Autonomous Institution
Since 2011
NAAC A++ GRADE
Cycle 3 (2023-2030)
The Highest Grade

Curriculum and Syllabi

B.E. Computer Science and Engineering

Semesters I to IV

Regulations 2023

Programme : B.E. Computer Science and Engineering
Curriculum and Syllabi : Semesters I to IV
Recommended by Board of Studies on :
Approved by Academic Council on :

Action	**Responsibility**	**Signature of Authorized Signatory**
Designed and Developed by	BoS Computer Science and Engineering	
Compiled by	Office of the Controller of Examinations	
Approved by	Principal	

Dr. Mahalingam College of Engineering and Technology, Pollachi 642003.

(An autonomous institution approved by AICTE and affiliated to Anna University)

Department of Computer Science and Engineering

Vision

To develop engineers with global employability, entrepreneurship capability, research focus and social responsibility

Mission

- To develop internationally competent engineers in dynamic IT field by providing state-of-art academic environment and industry driven curriculum
- To motivate and guide students to take up higher studies and establish entrepreneurial ventures
- To enrich the department through committed and technically sound faculty team with research focus in thrust areas
- To undertake societal problems and provide solutions through technical innovations and projects in association with the industry, society and professional bodies

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Programme Educational Objectives (PEOs)

B.E. Computer Science and Engineering graduates will:

PEO1.Domain expertise: Possess expertise and emerge as key players in IT integrated domains.

PEO2.Computing skills and ethics: Employ computing skills to solve societal and environmental issues in an ethical manner.

PEO3.Lifelong learning and research: Involve in lifelong learning and research to meet the demands of global technology.

Programme Outcomes (POs) - Regulations 2023

On successful completion of B.E. Computer Science and Engineering programme, graduating students/graduates will be able to:

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

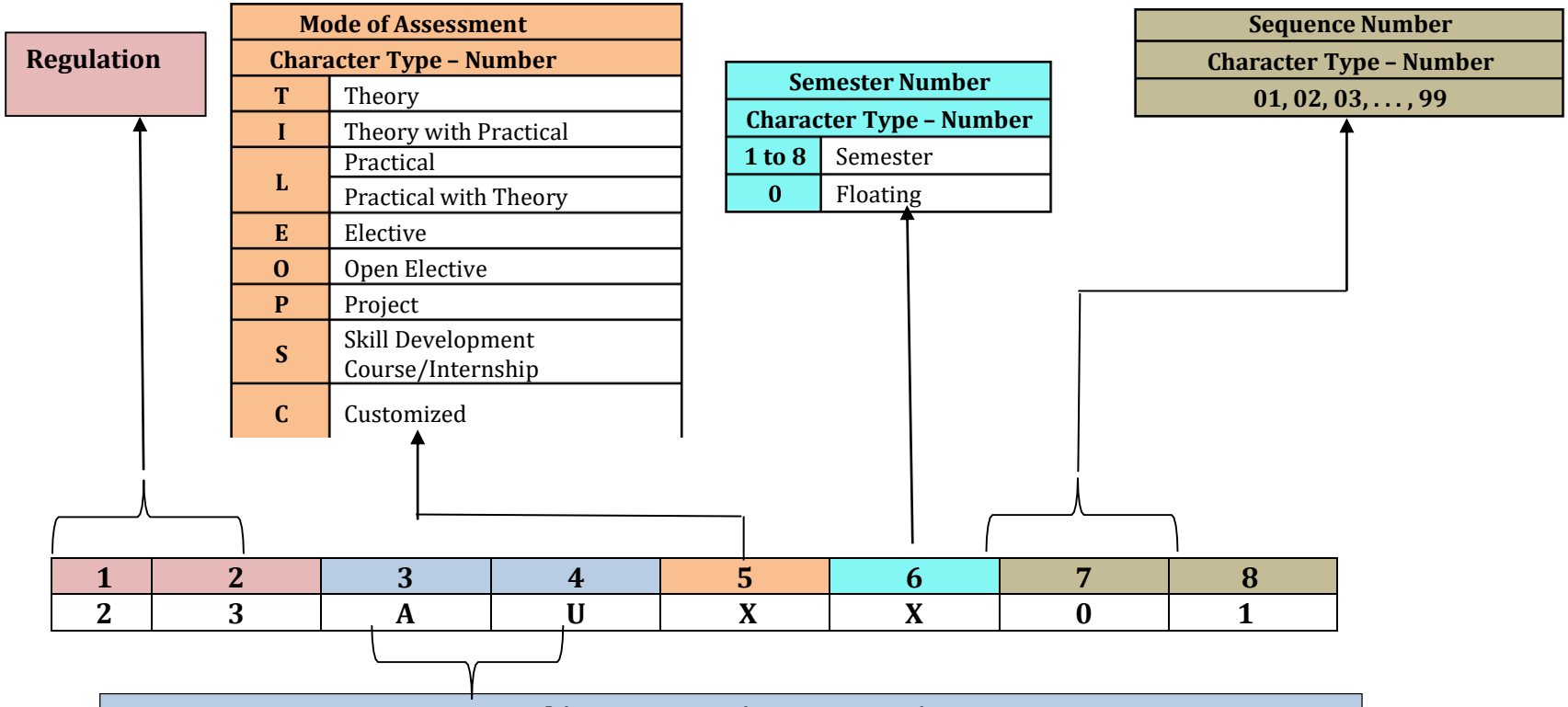
Programme Specific Outcomes (PSOs) - Regulations 2023

On successful completion of B.E. Computer Science and Engineering programme, graduating students/graduates will be able to:

PSO1. Systems engineering: Employ software engineering principles in the design and development of efficient systems

PSO2. Knowledge engineering: Apply data analytics techniques for solving real world problems

Dr. Mahalingam College of Engineering and Technology, Pollachi
2023 Regulations - Course Code Generation Procedure for UG Courses



AD	Artificial Intelligence & Data Science	**ME**	Mechanical
AM	CSE (Artificial Intelligence & Machine Learning)	**SC**	CSE (Cyber Security)
AU	Automobile	**PH**	Physics
CE	Civil	**CH**	Chemistry
CS	Computer Science	**EN**	English
EA	Advanced Communication Technology	**MA**	Mathematics
EC	Electronics and Communication	**ES**	Employability Skills
EE	Electrical and Electronics	**VA**	Value Added Course
EV	VLSI Design & Technology	**SA**	Studio Activities
IT	Information Technology		

Programme: B.E. Computer Science and Engineering
2023 Regulations (For 2023 Batch Only)
Curriculum for Semesters I to II

Course Type	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	ALL
Minor	23MAI103	Linear Algebra and Infinite Series	3	0	2	4	100	AD,AM,CS,IT &SC
Major	23CST101	Problem Solving using C	3	0	0	3	100	AD,AM,CS,IT &SC
Multi Disciplinary	23EEI101	Basics of Electrical and Electronics Engineering	3	0	2	4	100	AD,AM,CS,IT &SC
Multi Disciplinary	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD,AM,AU,CS,EA, EC,EE,EV,IT,ME, SC
SEC	23CSL101	Problem Solving using C Laboratory	0	0	3	1.5	100	AD,AM,CS,IT &SC
VAC	23VAL102	Wellness for Students	0	0	2	1	100	ALL
VAC	23VAT101	தமிழர்மரபு/Heritage of Tamils	1	0	0	1	100	ALL
AEC	23SAL101	Studio Activities	0	0	2	-	-	ALL
		Total	**13**	**0**	**16**	**20**	**800**	-

Semester II

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201/	Communication Skills II	2	0	2	3	100	ALL
	23FLT201/	Foreign Language-Japanese	3	0	0			
	23FLT202	Foreign Language-German						
Minor	23MAI203	Calculus and Transforms	3	0	2	4	100	AD,AM,CS,IT&SC
Minor	23PHT001	Physics for Information Sciences	3	0	0	3	100	AD,AM,CS,IT&SC
Major	23ITT201	Data Structures	3	0	0	3	100	AD,AM,CS,IT&SC
Multi Disciplinary	23EEI201	Digital System Design	2	0	2	3	100	AD,AM,CS,IT&SC
Minor	23PHL001	Physics for Information Sciences Laboratory	0	0	3	1.5	100	AD,AM,CS,IT&SC
SEC	23ITL201	Data Structures Laboratory	0	0	3	1.5	100	AD,AM,CS,IT&SC
SEC	23CSL201	IT Practices Laboratory	0	0	4	2	100	AD,AM,CS,IT&SC
SEC	23ESL201	Professional Skills 1:Problem solving skills & Logical Thinking 1	0	0	2	1	100	ALL
VAC	23VAT201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	1	100	ALL
Multi Disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	ALL
AEC	23SAL201	Studio Activities	0	0	2	-	-	ALL
		Total	**15**	**0**	**20**	**23**	**1100**	

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024

BOS Chairman

Programme: B.E. Computer Science and Engineering
2023 Regulations (From 2024 Batch Onwards)
Curriculum for Semesters I to IV

Course Type	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	ALL
Minor	23MAI103	Linear Algebra and Infinite Series	3	0	2	4	100	AD,AM,CS,IT &SC
Major	23CST101	Problem Solving using C	3	0	0	3	100	AD,AM,CS,IT &SC
Multi Disciplinary	23EEI102	Introduction to Electrical and Electronics Engineering	3	0	2	4	100	AD,AM,CS,IT &SC
Multi Disciplinary	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD,AM,AU,CS,EA, EC,EE,EV,IT,ME, SC
SEC	23CSL101	Problem Solving using C Laboratory	0	0	3	1.5	100	AD,AM,CS,IT &SC
VAC	23VAL102	Wellness for Students	0	0	2	1	100	ALL
VAC	23VAT101	தமிழர்மரபு /Heritage of Tamils	1	0	0	1	100	ALL
AEC	23SAL101	Studio Activities	0	0	2	-	-	ALL
		Total	**13**	**0**	**16**	**20**	**800**	-

Semester II

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201/	Communication Skills II	2	0	2	3	100	ALL
	23FLT201/	Foreign Language-Japanese	3	0	0			
	23FLT202	Foreign Language-German						
Minor	23MAI203	Calculus and Transforms	3	0	2	4	100	AD,AM,CS,IT&SC
Minor	23PHT001	Physics for Information Sciences	3	0	0	3	100	AD,AM,CS,IT&SC
Major	23ITT201	Data Structures	3	0	0	3	100	AD,AM,CS,IT&SC
Multi Disciplinary	23EEI201	Digital System Design	2	0	2	3	100	AD,AM,CS,IT&SC
Minor	23PHL001	Physics for Information Sciences Laboratory	0	0	3	1.5	100	AD,AM,CS,IT&SC
SEC	23ITL201	Data Structures Laboratory	0	0	3	1.5	100	AD,AM,CS,IT&SC
SEC	23CSL201	IT Practices Laboratory	0	0	4	2	100	AD,AM,CS,IT&SC
SEC	23ESL201	Professional Skills 1:Problem solving skills & Logical Thinking 1	0	0	2	1	100	ALL
VAC	23VAT201	தமிழரும்தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	100	ALL
Multi Disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	ALL
AEC	23SAL201	Studio Activities	0	0	2	-	-	ALL
		Total	**15**	**0**	**20**	**23**	**1100**	

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024

BOS Chairman

Semester III

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT305	Discrete Mathematics	3	1	0	4	100	AM,CS,IT&SC
Major	23CST301	Design and Analysis of Algorithms	3	1	0	4	100	CS & AD
Minor	23CST302	Computer Architecture	3	0	0	3	100	CS & AD
Major	23CSI301	Database Systems	3	0	2	4	100	CS & AD
Major	23CST303	Java Programming	3	0	0	3	100	-
Major	23CSL301	Java Programming Laboratory	0	0	3	1.5	100	-
SEC	23ESL301	Professional Skills 2: Problem solving skills & Logical Thinking 2	0	0	2	1	100	ALL
VAC	23VAT301	Universal Human Values 2 :Understanding Harmony	2	1	0	3	100	ALL
AEC	23SAL301	Studio Activities	0	0	2	-	-	ALL
		Total	**17**	**3**	**9**	**23.5**	**800**	

Semester IV

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT401	Probability and Statistics	3	1	0	4	100	AM,AU,CS,EC, EE,IT,ME&SC
Major	23CSI401	Computer Network Technology	3	0	2	4	100	-
Major	23CST401	Operating Systems	3	0	0	3	100	-
Major	23CST402	Data Warehousing and Mining	3	0	0	3	100	-
Minor	23EEI401	Microcontrollers and IoT	3	0	2	4	100	-
Major	23CSL401	Python Programming Laboratory	1	0	3	2.5	100	-
SEC	23ESL401	Professional Skills 3: Professional Development and Etiquette	0	0	2	1	100	-
AEC	23SAL401	Studio Activities	0	0	2	-	-	ALL
		Total	**16**	**1**	**11**	**21.5**	**700**	

Course Code	CourseTitle	Duration	Credits	Marks
XXXXXXXX	Internship - 1/Community Internship /Skill Development	2 Weeks	1	100

Passed in 18th Board of Studies Meeting held on 29.12.2023
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BOS Chairman

Tentative Curriculum for Semester V to VIII

Semester V

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Formal Languages and Automata Theory	3	1	0	4	100	-
Major	23XXXXXX	Object Oriented Software Engineering	3	0	2	4	100	-
Major	23XXXXXX	Cyber Security	3	0	0	3	100	ALL
Major	23XXXXXX	Professional Elective – I	2	0	2	3	100	-
Major	23XXXXXX	Professional Elective – II	2	0	2	3	100	-
Major	23XXXXXX	Internet Programming Laboratory	1	0	3	2.5	100	-
Project	23XXXXXX	Reverse Engineering Project	0	0	6	3	100	-
SEC	23XXXXXX	Professional Skills 4	0	0	2	1	100	-
AEC	23SAL501	Studio Activities	0	0	2	-	-	ALL
		Total	**14**	**1**	**19**	**23.5**	**800**	

Semester VI

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Compiler Design	3	0	2	4	100	-
Major	23XXXXXX	Artificial Intelligence	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – III	2	0	2	3	100	-
Major	23XXXXXX	Professional Elective – IV	2	0	2	3	100	-
Minor	23XXXXXX	Open Elective - I	3	0	0	3	100	-
Major	23XXXXXX	Artificial Intelligence Laboratory	0	0	3	1.5	100	-
SEC	23XXXXXX	Professional Skills 5	0	0	2	1	100	-
AEC	23SAL601	Studio Activities	0	0	2	-	-	ALL
		Total	**13**	**0**	**13**	**18.5**	**700**	

Course Code	Course Title	Duration	Credits	Marks
23XXXXXX	Internship – 2 / Community Internship /Skill Development	4 Weeks	2	100

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BOS Chairman

Semester VII

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Cloud Technology	2	0	2	3	100	-
Major	23XXXXXX	Agile Methodologies	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – V	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – VI	3	0	0	3	100	-
Minor	23XXXXXX	Open Elective – II	3	0	0	3	100	-
Major	23XXXXXX	Open Source Software Development Laboratory	0	0	4	2	100	-
Project	23XXXXXX	Project Phase-I	0	0	8	-	-	-
		Total	**14**	**0**	**14**	**17**	**700**	

Semester VIII

Course Type	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Project	23XXXXXX	Project Phase-II	0	0	20	10	200	-
Internship	23XXXXXX	Internship-3 / Skill Development	8 Weeks			4	100	-
		Total	**0**	**0**	**20**	**14**	**300**	

Total Credits: 164

Passed in 18th Board of Studies Meeting held on 29.12.2023
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BOS Chairman

Vertical wise Electives

Vertical I Data Science							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23XXXXXX	Data Science in Bioinformatics	3	0	0	3	100	
23XXXXXX	Social Network Analytics	3	0	0	3	100	
23XXXXXX	Information Retrieval Techniques	2	0	2	3	100	-
23XXXXXX	Big Data Analytics	2	0	2	3	100	-
23XXXXXX	Text and web Mining	2	0	2	3	100	-
23XXXXXX	Data Visualization Techniques	2	0	2	3	100	-
23XXXXXX	Data Analytics	2	0	2	3	100	-
23XXXXXX	Healthcare Analytics	2	0	2	3	100	-

Vertical II Artificial Intelligence & Machine Learning							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23XXXXXX	Cognitive Science	3	0	0	3	100	
23XXXXXX	Bio Inspired Computing	3	0	0	3	100	
23XXXXXX	Soft Computing Techniques	2	0	2	3	100	-
23XXXXXX	Deep Learning Methods	2	0	2	3	100	-
23XXXXXX	Natural Language Processing	2	0	2	3	100	-
23XXXXXX	Generative AI	2	0	2	3	100	-
23XXXXXX	Machine Learning	2	0	2	3	100	-
23XXXXXX	Prompt Engineering	2	0	2	3	100	-

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BOS Chairman

Vertical III Networks & Security							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23XXXXXX	Distributed Systems	3	0	0	3	100	
23XXXXXX	Information Security	3	0	0	3	100	
23XXXXXX	Cryptographic Techniques	2	0	2	3	100	-
23XXXXXX	Embedded Systems	2	0	2	3	100	-
23XXXXXX	Quantum Computing	2	0	2	3	100	-
23XXXXXX	Malware Analysis	2	0	2	3	100	-
23XXXXXX	Block Chain Technology	2	0	2	3	100	-
23XXXXXX	Edge Computing	2	0	2	3	100	-

Vertical IV Software Development							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23XXXXXX	Reliability Engineering	3	0	0	3	100	-
23XXXXXX	Software Quality Assurance and Testing	3	0	0	3	100	-
23XXXXXX	Design Patterns	2	0	2	3	100	-
23XXXXXX	Foundation Skills in Integrated Product Development	2	0	2	3	100	-
23XXXXXX	Advanced Java Programming	2	0	2	3	100	-
23XXXXXX	Full Stack Development	2	0	2	3	100	-
23XXXXXX	Devops Technologies	2	0	2	3	100	-
23XXXXXX	Robotic Process Automation Design	2	0	2	3	100	-

Passed in 18th Board of Studies Meeting held on 29.12.2023
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BOS Chairman

Vertical V Human Computer Interaction							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23XXXXXX	Human Computer Interaction	3	0	0	3	100	-
23XXXXXX	Wearable Technology	3	0	0	3	100	-
23XXXXXX	Digital Image Processing Techniques	2	0	2	3	100	-
23XXXXXX	Graphics and Visualization	2	0	2	3	100	-
23XXXXXX	Multimedia Systems	2	0	2	3	100	-
23XXXXXX	Game Design and Development	2	0	2	3	100	-
23XXXXXX	UI / UX design	2	0	2	3	100	-
23XXXXXX	Mixed Reality	2	0	2	3	100	-

Open Electives							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23XXXXXX	Management Information System	3	0	0	3	100	-
23XXXXXX	Computer Forensics	3	0	0	3	100	-
23XXXXXX	Human Computer Interaction	3	0	0	3	100	-
23XXXXXX	Green Computing	3	0	0	3	100	-
23XXXXXX	Bio Informatics	3	0	0	3	100	-
23XXXXXX	Object Oriented Programming	3	0	0	3	100	-

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BOS Chairman

SEMESTER I

Course Code:23VAL101		Course Title: Induction Program (Common to all B.E/B.Tech Programmes)
Course Category: VAC		Course Level: Introductory
Duration: 3 weeks	Mandatory Non-Credit Course	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and the society.

List of Activities:

1. History of Institution and Management: Overview on NIA Educational Institutions – Growth of MCET – Examination Process –OBE Practices –Code of Conduct – Centre of Excellence.
2. Lectures, interaction sessions and Motivational Talks by Eminent people, Alumni, Employer and Industry Experts
3. Familiarisation of Department / Branch:HoD's & Senior Interaction- Department Association
4. Universal Human Value Modules : Aspirations and concerns, Self Management, Relationships Social and Natural Environment.
5. Orientation on Professional Skills Courses
6. Proficiency Modules : Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cells, Clubs and its events
8. Creative Arts : Painting, Music and Dance
9. Physical Activity :Games, Sports and Yoga
10. Group Visits: Visit to local area and Campus Tour

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 : Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

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

High : 3, Medium :2, Low: 1

Text Book(s):

T1. Reading material, Workbook prepared by PS team of the college

Reference Book(s):

R1. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster Uk, 2004.

R2. Vethathiri Maharishi Institute For Spiritual and Intuitional Education, aliyar, “value education for harmonious life (Manavalakalai Yoga)”, Vethathri Publications, Erode, 2010.

R3. Dr.R.Nagarathna, Dr.H.R. Nagendra, “ Integrated approach of yoga therapy for positive ealth”, Swami Vivekananada Yoga Prakashana Bangalore,2008 Ed.

Web References:

1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
2. https://www.youtube.com/watch?v=P4vjfEVk&list=PLWDeKF97v9SO0frdgmpaghDMjkom1eudx
3. https://fdp-si.aicte-india.org/download/AboutSIP/About%20SIP.pdf

Course Code: 23ENI101	Course Title: Communication Skills I (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total Contact Hours:60	Max Marks:100

Course Objectives:

The course is intended to impart formal and informal language effectively and accurately in various real-life contexts on par with B1 level of CEFR Scale.

Module I **20 Hours**

Grammar: Synonyms & Antonyms -Tense forms - Modals - Passives – Reported Speech – Comparatives and Descriptive adjectives.

Listening: Listening for gist and specific information - Listening to past events, experiences and job preferences - Listening to descriptions of monuments - Listening for excuses - Listening to description: transportation systems and public places.

Speaking: Introducing oneself - Exchanging personal information – Effective Conversations: Role Play Situations (Describing personality traits - Describing landmarks, monuments and festivals - Making polite requests and excuses - Discussing facts - Asking for and giving information – Expressing wishes - Talking about lifestyle changes - Talking about transportation and its problems - Describing positive and negative features of things and places - Making comparisons)

Reading: Skimming and Scanning - Reading Comprehension - Reading and comprehending online posts and emails – Case Studies

Writing: Letter writing (Permission letters - Online cover letter for job applications) - Instructions - Recommendations - Write a blog (General) - Report Writing (Industrial Visit Report and Event Reports) - formal and informal emails.

Module II **20 Hours**

Grammar: Sequence adverbs - Phrasal verbs - Relative clauses – Imperatives - Infinitives - Conditionals.

Listening: Listening to review of food items - Listening to results of surveys- Listening to motivational talks & podcasts

Speaking: Expressing likes and dislikes - Describing a favourite snack - Giving advices and **suggestions - Speculating about past and future Events – Group Discussion**

Reading: Reading different expository texts - Reading to factual texts - Print and online media- Reading Comprehension

Writing: Process Descriptions – Email Writing (Requesting for information) - Reviewing Movie – Social media feeds/posts (Any Social Media)

List of Experiments: **20 Hours**

1. Mini Presentation and Picture Prompt Discussion
2. Debate Tournament
3. Listening, Mind Mapping & Summarization
4. Listening to Stories and Providing the Innovative Climax
5. Reading Comprehension
6. Writing - Interpretation of Visuals

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Utilize the basic English grammar and vocabulary to acquire professional communication skills.	Apply
CO2: Develop listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same	Apply
CO3: Read and write social media posts and comments	Apply
CO4: Perform as a member of a team and engage in individual presentation	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Textbooks:

T1. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s book 2”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

T2. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s Book 1”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

Reference Book(s):

R1. David Bohlke, Jack C. Richards, “Four Corners”, 2nd Edition, Cambridge University Press,2018.

R2. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Graham Burton,Empower B1 – Student's Book, Cambridge University Press, 2020.

R3. Raymond Murphy, "Intermediate English Grammar" 30th Edition, Cambridge University Press,2022.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code: 23MAI103		Course Title: Linear Algebra and Infinite Series	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:0:2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on Linear Algebra, vector spaces, sequences and series in mathematics to have a strong foundation in science and engineering.

Module I **23 Hours**

Solutions to System of Linear Algebraic Equations: Matrices- Rank of a matrix - Consistency of a system of linear equations- Row echelon form-Row reduced echelon form-Gauss elimination method- Crout's method.

Basis and Dimension of Vector Spaces: Vector spaces -Linear Independent and dependent of vectors-Basis, dimension, row space, column space, null space, rank nullity theorem.

Orthogonality and Inner Product Space: Inner product of vectors-Inner product spaces-length of a vector, distance between two vectors, orthogonality of vectors-orthogonal projection of a vector-Gram-Schmidt process- orthonormal basis.

Module II **22 Hours**

Eigen Values and Eigen Vectors: Eigen values and vectors-symmetric, skew symmetric and orthogonal matrices- Diagonalization of matrix through orthogonal transformation- Reduction of quadratic forms to canonical form-rank ,index, signature and nature of quadratic forms-Singular Value decomposition.

Sequences and Series: Sequences-definitions and examples- Series-Tests for convergence-comparison test, integral test, Cauchy's root test, Alembert's ratio test- Alternating series – Leibnitz's test.

List of Experiments: **30 Hours**

1. Introduction to MATLAB
2. Row Echelon form and Row reduced Echelon form of a matrix.

3. Rank of a matrix and solution of a system of linear algebraic equations.
4. Dimension of row space, column space and null space.
5. Gram-Schmidt Orthogonalization.
6. Eigenvalues and Eigenvectors of matrices.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply matrix techniques for solving system of linear equations and Apply the process of orthogonalization to find orthogonal vectors.	Apply
CO2: Determine the canonical form of a quadratic form using orthogonal transformation in Science and Engineering problem solving.	Apply
CO3: Apply different tests to find convergence and divergence of series in the problem solving.	Apply
CO4: Demonstrate the understanding of linear algebra concepts through modern tool.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & sons, 2010.

T2. David C Lay, Linear Algebra and its Applications, 3rd edition, Pearson India, 2011.

T3. Howard Anton, Chris Rorres, Elementary Linear Algebra Applications version,11th Edition, Wiley India edition, 2013.

Reference Book(s):

R1. T. Veerarajan, Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, 2019.

R2. V. Krsihnamurthy, V. P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111106051
2. https://www.classcentral.com/course/matrix-algebra-engineers-11986

Course Code: 23CST101		Course Title: Problem Solving using C	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week)	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives: The course is intended to impart knowledge on basic concepts of C.

Module I **23 Hours**

C Programming Basics: General Problem solving strategy – Program development cycle - Problem Solving Techniques : Algorithm, Pseudocode and Flow Chart - Overview of C – Structure of C program – C Character set – keywords - Identifiers – Variables and Constants – Data types – typedef- Type conversion – Operators and Expressions – Managing formatted and unformatted Input & Output operation.

Control Structures: Storage classes - Statements: Selection statements - Jump statements - Iteration statements.

Arrays: Characteristics of Array – Single-dimensional array – Two-dimensional array – Array Operations – Applications: Linear search, Selection sort, Matrix Operations.

Functions: Declaration & Definition – Return statement – Classification of functions – Parameter passing methods: call by value – call by reference – Passing Array to a Function– Returning Array from a function – Recursion.

Module II **22 Hours**

Strings: Declaration and Initialization of string – Display of strings with different formats – String library Functions – String conversion functions.

Pointers: Features - Types of Pointers: Null and Void pointer – Operations on pointers – Pointers to an Array.

Structures: Declaration & Initialization of Structures – Structure within Structure – Array of Structures – Pointer to Structures.

Union: Declaration & Initialization of Union – Enumerations.

Files: Introduction to Files – Streams and File Types – File operations (Open, close, read, write) – Command line arguments.

Preprocessor Directives: Macro Expansion, File Inclusion, Conditional Compilation.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the fundamental concepts of programming, such as variables, data types, control structures, and functions.	Understand
CO2: Design and develop C programs for real-world applications	Apply
CO3: Apply problem solving skills and knowledge of C programming constructs to solve a given problem.	Apply
CO4: Analyze and debug C programs to identify and fix errors.	Analyze
CO5: Apply modular programming techniques to break down complex programs into smaller, manageable modules.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Yashavant P.Kanetkar, “Let Us C”, 19th Edition, BPB Publications, 2022.

T2. Ashok N.Kamthane, Amit.N.Kamthane, “Programming in C”, 3rd Edition, Pearson Education, 2015.

Reference Book(s):

R1. Ajay Mittal, “Programming in C - A Practical Approach”, 3rd Edition, Pearson Education, 2010.

R2. Brian W.Kernighan and Dennis M.Ritchie,”The C Programming Language” 2nd Edition, Pearson Education, 2015.

R3. Venit S, and Drake E, “Prelude to Programming Concepts and Design”,6th Edition, Pearson Education, 2014

R4.Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, 2nd Edition, Oxford University Press, 2013.

Web References:

1. http://www.cprogramming.com/
2. http://www.c4learn.com/

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Course Code: 23EEI101	Course Title: Basics of Electrical and Electronics Engineering (Common to AD,AM,CS,IT and SC) (For 2023 Batch Only)		
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on engineering fundamentals of DC&AC circuits, Electrical machines, Electron devices, Carpentry and plumbing.

Module I **22 Hours**

Fundamentals of DC Circuits: Definition, symbol and unit of quantities – Active and Passive elements – Ohm's Law: statement, – Kirchhoff's Laws: statement and illustration – Resistance in series and voltage division rule – Resistance in parallel and current division rule – Star to Delta and Delta to Star transformation- circuit simplification.

AC Fundamentals: Magnetic Circuits: Definition of magnetic quantities – Law of electromagnetic induction – Generation of single phase alternating EMF – Terminology – 3 **Phase System**: 3-Wire and 4 Wire system – Root Mean Square (RMS) – Average value of AC- DC Machines: DC Generator and DC Motor: Construction, Working Principle.

Module II **23 Hours**

AC Machines: Single phase transformer: Construction, working principle - Single phase induction motor: Capacitor start and run -Three phase induction motor: An introduction.

Semiconductor Devices: Theory of Semiconductor: PN junction diode, Forward Bias Conduction, Reverse Bias Conduction, V-I Characteristics – Bipolar Junction Transistor: Operation of NPN and PNP Transistor, Common Emitter Configuration – MOSFET: construction and working principle.

Opto-Electronic Devices and Transducers: Opto-Electronic Devices: Working principle of Photoconductive Cell, Photovoltaic Cell-solar cell Transducers: Capacitive and Inductive Transducer, Thermistors, Piezoelectric and Photoelectric Transducer.

List of Experiments **30 Hours**

Electrical & Electronics:

1) Identification of resistor and capacitor values
2) Soldering practice of simple circuit and checking the continuity
3) Fluorescent tube, staircase and house wiring
4) Characteristics of PN Diode

Civil & Mechanical:

1) Make a wooden Tee joint to the required dimension
2) Make a tray in sheet metal to the required dimension
3) Assemble the pipeline connections with different joining components for the given layout

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Apply the basic laws and simplification techniques of electrical Engineering in DC and AC Circuits.	Apply
CO2: Summarize the construction and working of Motors, Generator and transformer.	Understand
CO3: Analyze the characteristics of diodes and transistors based on its construction and working principle.	Analyze
CO4: Summarize the working of opto-electronic devices and transducers	Understand
CO5: Examine and report the analysis of different resistors, capacitors, house wiring concepts, wooden joints and pipeline connection.	Analyze

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Textbooks:

T1. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering”, McGraw Hill India Limited, New Delhi, 2014.

T2. S. K. Sadhev, “Basic Electrical Engineering and Electronics”, Tata Mcgraw Hill, 2017.

Reference Book(s):

R1. B.L Theraja, “Fundamental of Electrical Engineering and Electronics”, S.Chand Limited, 2022.

R2. J.B.Gupta, “Basic Electrical and Electronics Engineering”, S.K.Kataria & Sons, 2013.

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, 2nd Edition, PHI Learning Private Limited New Delhi, 2010.

Web References:

1. https://www.nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105112
3. https://archive.nptel.ac.in/courses/108/101/108101091

Course Code: 23EEI102		Course Title: Introduction to Electrical and Electronics Engineering (Common to AD,AM,CS,IT & SC) (From 2024 Batch Onwards)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on engineering fundamentals of electric circuits, Electrical machines, and Electron devices.

Module I **23 Hours**

Fundamentals of DC Circuits: Definition, symbol and unit of quantities – Active and Passive elements – Ohm's Law: statement, – Kirchhoff's Laws: statement and illustration – Resistance in series and voltage division rule – Resistance in parallel and current division rule –circuit simplification.

AC Fundamentals: AC Terminologies – Law of electromagnetic induction – Generation of single phase alternating EMF – Root Mean Square (RMS) – Average value of AC

Electrical Machines: Construction and Working Principle of DC shunt Motor, Stepper Motor and single phase transformer

Module II **22 Hours**

Semiconductor Devices: PN junction diode, Forward Bias Conduction, Reverse Bias Conduction, V-I Characteristics – Half wave and Full wave rectifier using diodes – SMPS – UPS - Bipolar Junction Transistor: Operation of NPN and PNP Transistor, Common Emitter Configuration

Opto-Electronic Devices and Transducers: Opto-Electronic Devices: Working principle of Photoconductive Cell, Photovoltaic Cell – LED&LCD display - Thermistors, Thermocouple, and Piezoelectric Transducers.

Fuses – Circuit breaker: MCB, MCCB – Energy efficiency star rating.

List of Experiments **30 Hours**

1. Identification of resistor and capacitor values.
2. Soldering practice of simple circuit and checking the continuity.
3. Staircase and house wiring.
4. Characteristics of PN Diode.
5. Half wave and full wave rectifier using diodes.
6. Characteristics of CE configuration transistor.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply the basic laws and simplification techniques in electrical engineering using electric circuits.	Apply
CO2: Make use of the basic laws and principles of electric circuits in analysis of the electrical machines viz.,Motors & transformers, UPS and SMPS	Analyze
CO3: Analyse the Diodes, Transistors, Opto-Electronic Devices and Transducers based on its construction and working principle**.**	Analyze
CO4: Investigate and report the analysis of different resistors, capacitors, house wiring concepts.	Evaluate

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Textbook(s):

T1. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering”, McGraw Hill India Limited, New Delhi, 2014.

T2. S. K. Sadhev, “Basic Electrical Engineering and Electronics”, Tata Mcgraw Hill, 2017.

Reference Book(s):

R1. B.L Theraja, “Fundamental of Electrical Engineering and Electronics”, S.Chand Limited, 2006.

R2. J.B.Gupta, “Basic Electrical and Electronics Engineering”, S.K.Kataria & Sons, 2009.

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, 2nd Edition, PHI Learning Private Limited New Delhi, 2010.

Web References:

1. https://www.nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105112
3. https://archive.nptel.ac.in/courses/108/101/108101091

Course Code: 23MEL001		Course Title: Engineering Drawing (Common to AD,AM,AU,CS,EA ,EC,EE,EV,IT,ME, SC)	
Course Category: Multi-Disciplinary		Course Level: Introductory	
L:T:P(Hours/Week)1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to

- To impart knowledge on basic dimensioning. 2D and 3 D drawings such as points, lines, planes and solids on first quadrant.

Module I **8 Hours**

Basics of Engineering Drawing: Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Basic Geometrical constructions –Orthographic projection-Free hand Sketching.

Projection of Points, Lines: First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces by rotating object method.

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination).

Module II **7 Hours**

Sectioned Solids: Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Development of Surfaces: Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders using straight line and radial line method.

Isometric Projection: Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination).

List of Experiments **45 Hours**

1. Lettering & Dimensioning
2. Projection of Points & Lines
3. Orthographic projections
4. Projection of Simple Solids
5. Projection of Section of Simple Solids
6. Development of Surfaces
7. Isometric Projections

Course Outcomes	**Cognitve Level**
At the end of this course, students will be able to:	
CO 1: Apply the concepts related to free hand sketching, orthographic and Isometric projection in first quadrant.	Understand
CO2: Apply the concepts and draw projections of points in four different quadrants and lines located first quadrant.	Apply
CO3: Apply the concepts and draw projections and sections of simple solids using rotatingobject method.	Apply
CO4: Apply the concepts and draw lateral surface of simple solids using straight line andradial line development methods.	Apply
CO5: Apply the concepts and draw isometric view of simple solids and truncated solids using principles of isometric projection.	Apply
CO6: Conduct experiments to demonstrate concepts, implement and analyze the drawing concepts using engineering tool: Using AutoCAD.	Analyze

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Textbook:

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", TataMcGraw Hill India, New Delhi, 3rd edition, 2019.

Reference Book(s):

R1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill India,NewDelhi, 2nd edition, 2014.

R2. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" TataMcGraw India, New Delhi, 3rd edition, 2010.

R3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House,Gujarat, 54th edition, 2023.

Publications Of Bureau Of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
2. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
3. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods. The mode ofdelivery is like practical.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.coursera.org/specializations/autodesk-cad-cam-cae-mechanical-engineering

Course Code: 23CSL101		Course Title: Problem Solving using C Laboratory	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0:0:3	Credits: 1.5	Total Contact Hours: 45	Max Marks:100

Course Objectives:

The course is intended to enable the students for writing simple programs in C.

List of Experiments:

1. Develop Algorithm, Flowchart and Pseudo code for given problem.
2. Develop C programs using data types, I/O statements, Operators and Expressions.
3. Develop C programs using Decision-making constructs.
4. Implement C programs using looping statements.
5. Design C programs to implement the concept of arrays.
6. Design C programs to implement the concept of strings
7. Develop C programs using functions.
8. Develop C programs using pointers.
9. Implement the concept of structures using C.
10. Implement C programs to perform file operations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate proficiency in using development environments, compilers, and debugging tools for C programming	Apply
CO2: Apply C programming concepts to practical programming tasks	Apply
CO3: Demonstrate an understanding of the importance of code efficiency and optimization in C programming	Analyze
CO4: Work as a team in a laboratory environment to develop and demonstrate projects with an oral presentation	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Reference Book(s):

R1. Ashok N.Kamthane, Amit.N.Kamthane, “Programming in C”, 3rd Edition, Pearson Education, 2015.

R2. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Pearson Education, 2013.

R3. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

R4. ReemaThareja, “Programming in C”, Oxford University Press, 2nd, 2016.

Web References:

1. https://electronicsforu.com/resources/15-free-c-programming-ebooks
2. https://www.fromdev.com/2013/10/c-programming-tutorials.html
3. https://books.goalkicker.com/CBook/

Course Code: 23VAL102		Course Title: Wellness for Students (Common to all B.E/B.Tech Programmes)	
Course Category: VAC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0 :2	Credits:1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on setting SMART goals for academic, career and life, applying time management techniques, articulating the importance of wellness for success in life and understanding the dimensions of wellbeing and relevant practices.

Module I **15 Hours**

GOAL SETTING: Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

TIME MANAGEMENT - TOOLS AND TECHNIQUES Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination.

CONCEPT OF WELLNESS – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

Module II **15 Hours**

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

PRACTICES FOR MENTAL WELLNESS

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC Meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

PUTTING INTO PRACTICE

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Set well-articulated goals for academics, career, and personal aspirations	Apply
CO2: Apply time management techniques to complete planned tasks on time	Apply
CO3: Explain the concept of wellness and its importance to be successful in career and life	Apply
CO4: Explain the dimensions of wellness and practices that can promote wellness	Apply
CO5: Demonstrate the practices that can promote wellness	Valuing

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book:

T1. Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster UK, Aug 1997.

R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster UK, 2004.

R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, Ed. (2010).

R4. Dr. R. Nagarathna, Dr. H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R5. Tony Buzan, Harper Collins, “The Power of Physical Intelligence English”

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:50

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்ள இயலும்.

CO.2இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்ள இயலும்.

தமிழர் மரபு

அலகு 1 – மொழி மற்றும் இலக்கியம் 3

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

அலகு 2 – மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 – நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 – தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக் கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 – இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள்– தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Passed in 17th Board of Studies Meeting held on 13.04.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 BOS Chairman

TEXT - CUM REFERENCE BOOKS

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

Course Articulation Matrix

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

Passed in 17th Board of Studies Meeting held on 13.04.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 BOS Chairman

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:50

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.
2. Understand the Contribution of Tamils to Indian National Movement and Indian Culture.

HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

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

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

UNIT III FOLK AND MARTIAL ARTS **3**

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

UNIT IV THINAI CONCEPT OF TAMILS **3**

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

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

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

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.	Understand
CO.2 Understand the Contribution of Tamils to Indian National Movement and Indian Culture.	Understand

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization 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.

Passed in 17th Board of Studies Meeting held on 13.04.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 BOS Chairman

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

Passed in 17th Board of Studies Meeting held on 13.04.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 BOS Chairman

SEMESTER II

Course Code: 23ENI201	Course Title: Communication Skills II (Common to all B.E/ B.Tech Programmes)		
Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total ContactHours:60	Max Marks:100

Course Objectives:

The course is intended to impart effective and accurate language in business correspondence on par with B2 level of CEFR Scale.

Module I **20 Hours**

Grammar: Linking Words - Collocations –Sentence Completion - Articles –Adverbs – Indefinite Pronoun

Listening: Listening to short conversations - Listening for gist and summarizing - Listening for detail - Responding to straightforward questions.

Speaking: Making statements of facts - Agreeing and disagreeing to opinions - Respond to queries - Group Discussion.

Reading: Read and select (phrasal verbs & relative clause)- Cloze Test - Gapped sentences - Multiple- choice gap-fill

Writing: Paragraph Writing: Descriptive, narrative, persuasive and argumentative - Emails: Giving information - Making enquiries - Responding to enquiries - Power Point Presentation

Module II **20 Hours**

Grammar: Expressions of cause and result – Concord - Error Spotting (Parts of Speech & Indian English) - Prepositions

Listening: Listening for identifying main points - Responding to a range of questions about different topics - Listening to identify relevant information

Speaking: Empathetic Enunciation – Situation handling – Visual Interpretation - - Short presentations

Reading: Intensive Reading: Comprehending business articles, reports and proposals and company websites-- Open gap-fill - Extended reading

Writing: – Report Writing - Memo – Complaint letter - Business Letters (Seeking permission & Providing Information)

List of Experiments: **20 Hours**

1. Listening to Monologue and Extended Listening Activity I
2. Listening to Monologue and Extended Listening Activity II
3. Expressing Opinions and Situational based speaking
4. Mini Presentation and Visual Interpretation
5. Reading Comprehension
6. Writing letter, email and report

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the common errors in written and spoken correspondence	Apply
CO2: Develop listening, reading and speaking skills through task based activities in listening, reading comprehension, recapitulation, interpretation and discussion.	Apply
CO3 : Read business correspondences like memo, Email, letter, proposals and write reports and website entries and product launches	Apply
CO4: Perform as an individual and member of a team and engage effectively in group discussion and individual presentation.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Textbooks:

T1. Guy Brook- Hart, “Business Benchmark Upper Intermediate”, 2nd Edition, South Asian, Cambridge University Press, 2020.

T2. Norman Whitby, “Business Benchmark pre-intermediate to Intermediate”, 2nd Edition, South Asian, Cambridge University Press, 2014.

Reference Book(s):

R1. Hewings Martin - Advanced Grammar in use Upper-intermediate Proficiency, CUP,3rd Edition,2013.

R2. Clark David – Essential BULATS (Business Language Testing Service), CUP, 2006.

R3. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Rachel Godfrey,Gareth Davies, Empower B1+ – Student's Book, Cambridge University Press,2015.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaski

Course Code:23FLT201	Course Title: Foreign Language - Japanese (Common to all B.E/B.Tech Programmes)		
Course Category: AES		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course objectives intended to:

1. Express a basic exposure on Japanese language and culture
2. Express thoughts and communicate in the beginner level of Japanese with native Japanese speaker
3. Identify the kanji etymology as well as use it in basic vocabulary required for the JLPT/NAT 5 examination level
4. Read and write 100 kanji of the official JLPT N5
5. Choose the appropriate verb forms for learning and practicing the Japanese language

UNIT I Introduction to Japan and greetings 9 Hours

Japan : Land and culture - Introduction to Japanese language – Greetings – Seasons - Days of the week - Months of the year – Dates of the month - Self introduction – Numbers (Upto 99,999) – Expressing time – Conversation audio and video.

Listening: Listening to Greetings - Listening for Specific Information: Numbers, Time. **Speaking**: Self-Introduction

UNIT II Building vocabulary 9 Hours

Family relationships - Colours - Parts of body - Profession - Directions - Time expressions (today, tomorrow, yesterday, day before, day after) - Japanese housing and living style - Food and transport (vocabulary) - Stationery, fruits and vegetables

Listening: Listening for Specific Information: Directions, Family Members, Parts of body **Speaking:** Introducing one's family.

UNIT III Writing systems 9 Hours

Hiragana Chart 1 - vowels and consonants and related vocabulary – Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary – Introduction to Kanji – Basic Vocabulary – Basic Conversational Phrases.

Listening: Listening to Japanese Alphabet Pronunciation, Simple Conversation. **Speaking:** Pair Activity (Day to day situational conversation)

UNIT IV Kanji and preposition 9 Hours

Katakana script and related vocabulary – Basic kanjis: naka, ue, shita, kawa , yama , numbers (1- 10, 100, 1000, 10,000 and yen) , person, man, woman, child, tree , book , hidari, migi, kuchi , 4 directions - Usage of particles wa, no, mo and ka and exercises - Usage of kore, sore, are, kono, sono, ano, arimasu and imasu - Particles – ni (location) and ga , donata and dare - Particles ni (time), kara, made , ne , koko, soko, asoko and doko - Directions : kochira, sochira, achira and dochira , associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)

Listening: Listening to conversation with related particles

UNIT V Verb forms 9 Hours

Introduction to Verbs - Verbs –Past tense, negative - i-ending and na-ending adjectives introduction - ~masen ka, mashou - Usage of particles de, e , o, to, ga(but) and exercises - Adjectives (present/past – affirmative and negative) – Counters - ~te form

Listening: Listening to different counters, simple conversations with verbs and adjectives. Speaking: Pair Activity (Explaining one's daily routine by using appropriate particles and verbs)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Recognize and write Japanese alphabet	Understand
CO2: Comprehend the conversation and give correct meaning	Understand
CO3: Apply appropriate vocabulary needed for simple conversation in Japanese language	Apply
CO4: Apply appropriate grammar to write and speak in Japanese language	Apply
CO5: Speak using words of the Japanese language	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Genki 1 Textbook: An Integrated Course in Elementary Japanese by Eri Banno, Yoko Ikeda, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, Kyoko Tokashiki published by The Japan Times

T2. Genki 1 Workbook: An Integrated Course in Elementary Japanese by Eri Banno published by The Japan Times

Reference(s):

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
2. Japanese for Everyone: Elementary Main Textbook1-2, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
3. www.japaneselifestyle.com
4. www.learn-japanese.info/
5. www.learn.hiragana-katakana.com/typing-hiragana-characters/
6. www.kanjisite.com/

Course Code:23FLT202		Course Title: Foreign Language - German (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course is intended to:

1. Listen and understand numbers, names and dialogues of a native speaker on par with A1 level.
2. Speak and introduce self in simple sentences to convey their opinion and ideas on par with A1 level.
3. Read simple passages and given text on par with A1 level.
4. Write letter and simple sentences on par with A1 level.

UNIT I BASIC INTRODUCTION TO GERMAN SCRIPTS 9 Hours

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 caf'e, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Frägesatze 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 bezhalen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktabelle ergänzen, mit einem Redemittelkasten arbeiten)

UNIT II NUMBERS AND NOMINATIVE CASE 9 Hours

Theme and Text (Numbers – 1 to 12 (Eins bis Zwolf) – 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 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 Grammatiktabelle erarbeiten, Notizen machen)

UNIT III AKKUSATIVE CASE AND PREPOSITIONS 9 Hours

Theme and Text (Menschen und Hauser, Furniture catalogue, E-Mail, House information) – Grammar (possesivartikel im Nominativ, Artikel im Akkusativ, Adjektive im satz, Graduierung mit zu)– Speak Action (Whonung bescreiben about perons and things)– pronunciation (consonant - ch) – To learn (wortschatz systematisch)

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 (Rollenkarten arbeiten)

Theme and Text (orientation in 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 + Datic)– Speak Action (work place, work, giving appointments)– pronunciation (consonants: f,w und v) – To learn (Making notice in calender)

UNIT IV DATIV CASE AND PREPOSITIONS 9 Hours

Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and iregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order)

Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, post card, 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)Theme and Text (Beruf und all Tag, Visiten karten, wörterbuch) – Grammar – Speak Action (profession, statistic speaking) – pronunciation (n,ng and nk)– To learn (wörterbuch , text information in tabel)

UNIT V ADJECTIVES AND PRONUNCIATION 9 Hours

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)

Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmer Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)

Theme and Text (in super market,purchase, House Maintainence, Emotion, Sports, Body parts) – Grammar (Modal Verb) – Speak Action (Body parts) – To learn (Rollenkarten arbeiten)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Recognize and write German alphabet, numbers. Recognize and write German alphabet, numbers.	Understand
C02: Comprehend the conversation and give correct meaning. Comprehend the conversation and give correct meaning	Understand
CO3: Apply appropriate grammar and vocabulary to write and speak. Apply appropriate grammar and vocabulary to write and speak.	Apply
CO4: Apply appropriate cases and texts to listen, write and speak Apply appropriate cases and texts to listen, write and speak.	Apply
CO5: Speak and read using words of the German language Speak and read using words of the German language	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Text book(s):

T1. Netzwerk, “Deutsch als Fremdsprache” by Stefanie Dengler, Paul Rusch, Helen Schmitz published by Goyal Publishers & Distributors Pvt Ltd;

T2. Funk, Kuhn, Demme, “Studio D A1 Deutsch als Fremdsprache” published by Goyal Publishers & Distributors Pvt Ltd;

Reference:

R1. Hueber, “Fit for Goethe- Zertifikat A1 (Start Deutsch 1)” by Goyal Publishers And Distributors; 2016

Course Code: 23MAI203		Course Title: Calculus and Transforms (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) : 3 0 2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on differential calculus, vector calculus, ordinary differential equations, Fourier Series and Z transform to devise engineering solutions to solve real world problems.

Module I **23 Hours**

Differential Calculus: Curvature-Cartesian and Polar coordinates- radius of curvature-center of curvature- circle of curvature- Evolutes and Involutes.

Multivariable Calculus: Partial derivatives-total derivatives-Jacobian- maxima and minima and saddle points- Constrained maxima and minima: Method of Lagrange multipliers--Gradient- directional derivative- curl and divergence.

Ordinary Differential Equations of Second and Higher Orders: Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation, Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations.

Module II **22 Hours**

Fourier Series: Dirichlet's condition -Fourier series – Even and odd functions- Half range sine and cosine series - Parseval's identity -Harmonic Analysis.

Z Transforms: Z transform- region of convergence- properties of z transforms- inverse transform-Solution to homogeneous linear constant difference equations

List of Experiments(Using Python): **30 Hours**

1. Find the radius of curvature of a given curve.
2. Find the extremum value of a given function.
3. Compute second order ordinary differential equation.
4. Find the Fourier series of a periodic function.
5. Compute solution of difference equation using z transform.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply differential calculus to find curvature of a curve, Jacobian, extremum of functions of several variables and vector quantities to solve problems in Science and Engineering.	Apply
CO2: Solve the second and higher order ordinary differential equations using various techniques.	Apply
CO3: Determine the Fourier series of periodic functions and solve finite difference equations using Z-transforms.	Apply
CO4: Develop programs using calculus and transforms concepts through modern tool.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & sons, 2010.

T2. B.S.Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2015.

Reference Book(s):

R1. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, New Delhi, 2019.

R2. Srimanta Pal & Subodh C. Bhunia. “Engineering Mathematics”, 1st Edition, Oxford University Press, 2015.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111104092
2. https://www.classcentral.com/course/differential-equations-engineers-13258

Course Code: 23PHT001		Course Title: Physics for Information Sciences (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to impart the knowledge on working mechanism of laser, fiber optics, display devices and introduce the concepts of integrated circuits, nanotechnology and quantum computing

Module I **22 Hours**

Laser: Characteristics of laser light- Einstein's theory of matter and radiation – A & B Coefficients- Stimulated and spontaneous emission of radiation - Population inversion and pumping methods – Types of laser: Nd: YAG laser and Carbon di oxide (CO_2) molecular gas laser - Semiconductor laser (Homo junction and hetero junction) – Applications: Hologram and Holographic data storage (record/read).

Fiber Optics: Optical fibers – Principle of light propagation through optical fibers - Expressions for numerical aperture and acceptance angle - Types of optical fibers based on material, refractive index, and mode of propagation- Fabrication of optical fiber: Double crucible method- Dispersion and attenuation in optical fiber - Photo detectors: PN, PIN & Avalanche photo diodes- Fiber optic communication system and its advantages.

Nano Technology: Introduction – Importance of Nanotechnology – Nanomaterials – Nanoparticles – Synthesis of Nanoparticles: High-energy ball milling (top-down approach) – Sol-gel process (bottom-up approach) – Application of Nanomaterials.

Module II **23 Hours**

Quantum Computing: Introduction to Quantum Computing - Uses and Benefits of Quantum Computing - Features of Quantum Computing : Superposition, Entanglement, Decoherence - Limitations of Quantum Computing – Comparison of Quantum Computer with Classical Computer - Quantum Computers In Development : Google, IBM, Microsoft and others.

Integrated Circuits: Introduction to semiconductors: Intrinsic and extrinsic semiconductors- Advantages of Integrated circuits (ICs) over discrete components- IC classification- Construction of bipolar transistor: Silicon Wafer Preparation - Epitaxial growth - Oxidation- Photolithography- Isolation diffusion - Base diffusion - Emitter diffusion - Contact mask- Aluminium metallization – Passivation- Structures of integrated PNP transistor.

Display Devices: Human vision - Red, Blue, and Green (RGB) color scheme – Primary and secondary colors- Color addition and subtraction-Optical Emissions: Luminescence, photoluminescence, cathodoluminescence- electroluminescence -Injection electro Luminescence- Displays (Working principles): Plasma display, LED display, Liquid crystal display (LCD) and Numeric display.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the basic concepts of laser, fiber optics and nanotechnology to solve different optical parameters.	Apply
CO2: Perform as a member of team in analysing the concepts of laser, fiber optics and nanotechnology involved in engineering applications related to science and technology and make a presentation.	Apply
CO3: Interpret the concepts of nanomaterials, IC fabrication techniques and display devices and apply it for different real-life applications.	Apply
CO4: Perform as a member of team in articulating the modern technologies behind nanotechnology, integrated circuits and display devices.	Apply

Course Articulation Matrix

CO Vs PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-		-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	1	3	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	1	3	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. M. N. Avadhanulu and P. G. Kshirsagar, “Text Book of Engineering Physics”, S. Chand & Company Ltd., New Delhi, 2018.

T2. David Armitage, “Introduction to Micro displays”, John Wiley & Ltd, 2006.

T3. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd, 3rd Edition, 2010

Reference Book(s):

R1. D. Halliday., R. Resnick and J. Walker, “Fundamentals of Physics”, Wiley Publications, 10th Edition, 2014.

R2. Ajoy Ghatak, “Optics”, Tata McGraw-Hill Education, New Delhi, 5th Edition, 2012.

R3. A. Marikani, “Engineering Physics”, PHI Learning, New Delhi, 2nd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ph32/preview
2. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
3. https://www.investopedia.com/terms/q/quantum-computing.asp

Course Code: 23ITT201		Course Title: Data Structures (Common to AD,AM CS,IT &SC)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The objective of the course is to impart knowledge of fundamental data structures and how they are implemented. Additionally, learn how to apply the right data structures for solving problems.

Module I **22 Hours**

Linked List: Introduction- Types of Data Structures- Abstract Data type

List ADT: Array Implementation of list - Linked List Implementation list – Doubly Linked List – Circularly Linked List-Applications: Radix sort.

Stack ADT: Stack Model – Array and Linked List Implementation of Stack - Applications: Balancing Symbols - Postfix Expressions- Infix to Postfix Conversion

Queue ADT: Queue Model – Array and Linked List Implementation of Queue-Double ended Queue- Applications of Queue

Trees: Implementation of Trees - Tree Traversals -Binary Trees: Implementation – Expression Trees – Binary Search Tree: Implementation

Module II **23 Hours**

AVL Trees: Implementation -Single Rotation – Double Rotation.

Binary Heap: Min Heap-Max Heap

Graphs: Definitions – Representation of Graphs – Graph Traversals: Breadth First Search – Depth First Search -Topological Sort

Shortest Path Algorithms: Unweighted Shortest Paths –Dijkstra's Algorithm – Critical Path

All Pairs Shortest Path: Floyds Algorithm

Minimum Spanning Tree: Prim's Algorithm – Krushkal's Algorithm.

Internal Sorting:-Insertion Short-Shell Sort-Merge Sort-Quick sort

External sorting: Simple Algorithm-Multiway Merge

Hashing: Hash Functions-Separate Chaining-Open Addressing-Rehashing-Extendible hashing

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement principles of Data Structures that efficiently manage dynamic collections of data in real-world applications.	Apply
CO2: Categorize the linear data structures list, stack and queue to various applications	Analyze
CO3: Relate the nonlinear data structures trees and graph concepts to various applications	Analyze
CO4: Interpret various internal and external sorting techniques to solve real world problems across different domain	Apply
CO5 : Analyze different hash function properties for efficient data storage and retrieval systems	Analyze
CO6: Develop solutions with ethical standards as a team to the practical problems using Data Structures Concepts	Create

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2015.

Reference Book(s):

R1. Sahni Horowitz , “Fundamentals of Data Structures in C”, 2nd Edition Tata McGraw-Hill, New Delhi, 2008.

R2. Seymour “Lipschutz, Data Structures with C”, McGraw Hill, 2014.

R3. Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, “Introduction to Algorithms” 3rd ed., The MIT Press Cambridge, 2014

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://archive.nptel.ac.in/courses/106/106/106106127/
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Code: 23EEI201		Course Title: Digital System Design (common to AD,AM,CS,IT and SC)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on basics of logic gates, number system and different types of implementation of digital circuits with its simplification methods. Also course describes the analysis of synchronous and asynchronous sequential circuit. At the end of the course the basics in design of computer system is discussed.

Module I **15 Hours**

Number System Representation and Conversion - Logic Gates, Universal Gates - Boolean Algebra and Simplification Techniques: SOP – POS and Karnaugh Map Methods for Boolean Expression Simplification. Implementation of Combinational Logic - Arithmetic Circuits: Full Adder – Full Subtraction - Magnitude Comparator – Multiplexer – De-Multiplexer – Encoder and Decoder.

Module II **15 Hours**

Flip-Flop: RS - JK – T and D – Types of Triggering. Analysis of synchronous sequential circuit - Shift Register. Analysis of asynchronous sequential circuit – Hazards – Static, Dynamic and Essential Hazards

Computer System – Computer Memory - Random Access Memory - Read Only Memory - Expanding Memory Capacity –Secondary Storage -Input / Output Devices.

List of Experiments **30 Hours**

1. Verification of Boolean theorems using digital logic gates
2. Implementation of combinational circuits using basic gates
3. Logic verification of half adder and full adder
4. Logic verification of Multiplexer / De-Multiplexer
5. Logic verification of 4 bit shift register
6. Logic verification of 3 bit binary counter

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the numbers system representation, operation of logic gates and design of computer system	Understand
CO2: Apply the fundamental concepts of Boolean algebra in simplification of digital circuits	Apply
CO3: Design and implement the arithmetic circuits using combinational logic circuits.	Create
CO4: Analyze the sequential logic circuit and infer the results.	Analyze
CO5: Analyze and interpret the digital circuits by performing hardware implementations and report the inference as a team or individual.	Evaluate

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. M. Morris Mano, “Digital Logic and Computer Design”, 1st Edition, Pearson Publication, New Delhi, 2016.

T2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, 6th Edition, McGraw-Hill, 2011.

Reference Book(s):

R1. Anil K. Maini, “Digital Electronics Principles, Devices and Applications”, John Wiley & Sons,1st Edition, 2007.

R2. Charles H.Roth, Jr. “Fundamentals of Logic Design”, 7th Edition, Jaico publishing House, New Delhi, 2014.

R3. S.Salivahanan and S. Arivazhagan, Digital Circuits and Design, Oxford University Press, 5th Edition, 2018.

R4. Leach P Donald, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications”, 7th Edition, Mcgraw Hill, 2010.

Web References:

1. http://www.nptel.ac.in/courses/ 108105132
2. https://de-iitr.vlabs.ac.in
3. https://nptel.ac.in/courses/117105080

Course Code: 23PHL001		Course Title: Physics for Information Sciences Laboratory (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P (Hours/Week) 0:0:3	Credits: 1.5	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to expose the students to various experimental skills which are very essential for an Engineering student.

List of Experiments (Any ten):

1. Determination of wavelength of the Laser using plane transmission grating.
2. Estimation of particle size of fine lycopodium powder using laser.
3. Measurement of acceptance angle and numerical aperture of an optical fiber – Laser diffraction method.
4. Determination of band gap of semiconducting materials – Thermistor (Germanium).
5. Light Illumination characteristics of Light dependent resistor (LDR).
6. Measurement of thickness of thin material – Air wedge method.
7. Determination of wavelength of the spect ral lines of mercury spectrum using grating.
8. I-V characteristics of solar cell.
9. I-V characteristics of photo diode.
10. Verification of truth tables of logic gates.
11. Design of logic gates using discrete components.
12. I-V characteristics of LED.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Elucidate the basic principles involved in the given experiments	Understand
CO2: Conduct, analyze and interpret the data and results from physics experiment	Evaluate

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Physics Laboratory Manual Prepared by Faculty of Physics, Dr. Mahalingam College of Engineering and Technology.

R2. Engineering Physics Laboratory Manual, Dr. R. Jayaraman, V. Umadevi, S. Maruthamuthu, B. Saravanakumar, Pearson India Education Services Pvt. Ltd, 2022.

R3. B.Sc., Practical Physics, C.L. Arora, S. Chand and Co, 2012.

Web References:

1. https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2. https://vlab.amrita.edu/index.php?sub=1&brch=281
3. https://vlab.amrita.edu/index.php?sub=1&brch=189

Course Code: 23ITL201	Course Title: Data Structures Laboratory (Common to AD,AM,CS,IT & SC)		
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The objective of the course is to improve student's abilities to create and analyze basic linear and nonlinear data structures. It improves students' capacity to pick and use the ideal data

List of Experiments:

1. Array based implementation of List ADT
2. Array based implementation of Stack ADT and Queue ADT
3. Linked list implementation of List ADT
4. Linked list implementation of Stack ADT and Queue ADT
5. Implementation of Binary Tree traversals
6. Implementation of Binary Search Tree
7. Implementation of Graph traversals
8. Implementation of Floyds Algorithms
9. Implementation of insertion sort
10. Implementation of Quick sort

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO1: Implement linear data structure operations using C programs	Apply
CO2: Predict the solution using non-linear data structure data structures using C programs	Evaluate
CO3 : Evaluate the efficiency of sorting algorithms using relevant data structures	Evaluate

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Reference Book(s):

R1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2015.

R2. Sahni Horowitz , “Fundamentals of Data Structures in C”, 2nd Edition Tata McGraw-Hill, New Delhi, 2008.

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://archive.nptel.ac.in/courses/106/106/106106127/

Course Code:23CSL201	Course Title: IT Practices Laboratory (common to AD,AM,CS,IT&SC)		
Course Category: SEC	Course Level: Introductory		
L:T:P (Hours/Week) 0:0:4	Credits: 2	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on developing web and mobile applications.

List of Experiments: **60 Hours**

1. Study of Peripheral Devices and PC Hardware.
2. Study of different communication protocols
   - USB
   - HDMI
   - WIFI
   - Bluetooth
3. Develop a web page with image, text, links, tables, Menus, Navigations bars, containers and Media.
4. Construct a web page to display resume.
5. Construct a web page to display the products of a company.
6. Create an application using GUI widgets, Layouts, Media and Event handlers.
7. Develop a calculator application to perform all arithmetic operations.
8. Construct an application to calculate BMI.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the components of PC hardware.	Understand
CO2: Design and develop websites, mobile applications for the given scenario using open source tools.	Apply
CO3: Optimize web application performance by considering factors such as page load times, resource usage, and caching mechanisms.	Apply
CO4: Demonstrate the developed web and mobile applications with an oral presentation.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Reference(s):
R1. Peter Abel, Niyaz Nizamuddin, “IBM PC Assembly Language and Programming”, Pearson Education, 2007.
R2. Harvey M. Deitel, Paul J. Deitel,“Internet and World Wide Web – How to Program”, 4th Edition ,Pearson Education Asia, 2009.
R3. David Wolber, Hal Abelson, Ellen Spertus, Liz Looney, “App Inventor 2: Create Your Own Android Apps”, 2nd Edition, O'Reilly Media, 2014.

Web References:

1. Open Element Tool: https://www.openelement.uk/index.htm
2. MIT App Inventor Tutorials: https://appinventor.mit.edu/explore/ai2/tutorials

Course Code: 23ESL201		Course Title: Professional Skills 1:Problem solving skills & Logical Thinking 1 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

To enhance the students' numerical, analytical and logical reasoning ability.

To make them prepare for various public and private sector exams and placement drives.

Module I Quantitative Ability 20

Number System and LCM & HCF- Percentage- Ratio and Proportion - Average- Progressions- Ages-Partnership- Mixture & Allegation - Profit and loss- Interest calculation- Data interpretation.

Module II Reasoning Ability 10

Seating Arrangement- Linear, circular and Complex – Direction Problems- Blood Relation- Puzzles- Crypt arithmetic- Venn diagrams- Statement and conclusion- Statement and argument- Causes and effects- Self-Learning.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Build the competence in numerical, analytical and logical reasoning ability	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Passed in 18th Board of Studies Meeting held on 29.12.2023
Approved in 18th Academic Council Meeting held on 23.03.2024 **BOS Chairman**

Textbook(s):

T1: Dr. R. S. Aggarwal. “Quantitative Aptitude for Competitive Examinations” Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. “A Modern Approach to Logical Reasoning”, Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013.

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020.

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்ள இயலும்.

CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்ள இயலும்.

தமிழரும் தொழில்நுட்பமும்

அலகு 1 – நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

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

அலகு 2 – வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

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

அலகு 3 – உற்பத்தித் தொழில்நுட்பம் 3

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

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 – அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization 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.

Course Code: 23VAT201		Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)	
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.
2. Understand the Scientific Tamil & Tamil Computing.

TAMILS AND TECHNOLOGY

UNIT I WEAVING AND CERAMIC TECHNOLOGY **3**

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY **3**

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

UNIT III MANUFACTURING TECHNOLOGY **3**

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY **3**

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

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

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.	Understand
CO.2 Understand the Scientific Tamil & Tamil Computing.	Understand

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization 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.

SEMESTER III

Course Code: 23MAT305		Course Title: Discrete Mathematics (Common to AM,CS,IT&SC)	
Course Category: Minor		Course Level: Intermediate	
L:T:P(Hours/Week) : 3 1 0	Credits: 4	Total Contact Hours: 60	Max Marks: 100

Course Objectives:

The objective of the course is to equip engineering students with the mathematical tools and reasoning skills needed for effective problem-solving and analytical thinking in their respective fields.

Module I **27 + 9 Hours**

Logic: Propositions- Logical operators – Logical equivalences and implications - Normal forms – Rules of inference - Consistency and inconsistency - Theory of Inference – Proofs – Predicates – Quantifiers - Universe of discourse – Validity of arguments.

Relations and Functions: Relations – Types of relations – Properties of relations - Equivalence relations – Relational matrix - Graph of relations – Partial ordering relation - Poset – Hasse Diagram. Functions - Type of functions: Injective, surjective and bijective functions – Composition of functions – Inverse functions.

Combinatorics: Mathematical induction - Basics of counting – Pigeon hole principle – Permutations with and without repetition – Circular permutation – Combinations - Recurrence relations - Solution of linear recurrence relations.

Module II **18 + 6 Hours**

Algebraic Structures: Algebraic Systems – properties – Semi groups and monoids – Groups - Sub groups- Homomorphism – Abelian group – Cyclic group – Normal subgroup and Cosets – Lagrange's theorem – Codes and Group codes.

Divisibility and Congruence: Division Algorithm – Prime and Composite Numbers – Fundamental theorem of Arithmetic - Euclidean algorithm - GCD and LCM – Congruence – Linear congruence – Chinese Remainder Theorem.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply propositional and predicate logic to solve engineering problems, demonstrating logical reasoning skills.	Apply
CO2: Apply the concepts of sets, relations and functions in discrete structures.	Apply
CO3: Solve problems using combinatorial techniques, such as counting principles, permutations, and combinations, in the context of algorithm design and analysis.	Apply
CO4: Apply the concepts of groups and its properties to algebraic structures. Also compute GCD using Euclidean algorithm and solve system of linear congruence equations using Chinese Remainder Theorem.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. J.P.Tremblay, R. Manohar, “Discrete Mathematical Structures with applications to Computer Science”, TMH International Edition, July 2017.

T2. T.Veerarajan, “Discrete Mathematical Structures with Graph Theory and Combinatorics”, Tata McGraw-Hill Education Private Limited, New Delhi, July 2017.

Reference Book(s):

R1. Kenneth H. Rosen, “Discrete Mathematics and Its Applications”, 7th Edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, July 2017.

R2. Ralph P Grimaldi, Ramana. B. V, “Discrete and Combinatorial Mathematics”, 5th Edition, Pearson Education India, 2011.

Web References:

1. NPTEL Course on Discrete Mathematical Structures: http://nptel.ac.in/courses/106106094
2. NPTEL Course on Discrete Mathematics: https://nptel.ac.in/courses/111/104/111104026/

Course Code:23CST301		Course Title: Design and Analysis of Algorithms (Common to AD & CS)	
Course Category: Major		Course Level: Intermediate	
L: T: P(Hours/Week) 3: 1: 0	Credits: 4	Total Contact Hours: 60	Max Marks: 100

Course Objective:

The objective of the course is to impart knowledge on fundamental strategies of algorithm design and how to analyze the efficiency of the algorithm.

Module I **23 + 7 Hours**

Analysis of Algorithm Efficiency: Algorithm – Fundamentals of Algorithmic Problem Solving – Problem types - Algorithm Analysis Framework - Asymptotic Notations - Basic efficiency classes – Mathematical Analysis of non-recursive algorithms - Mathematical Analysis of recursive algorithms - Empirical Analysis of algorithms.

Brute force Technique: Exhaustive Search - String matching: naïve approach – Searching: Linear Search algorithm – Sorting: Bubble sort algorithm - Matrix multiplication - Closest pair problem.

Divide and Conquer Technique: String matching: KMP approach - Searching: Binary Search – Sorting: Quick sort algorithm – Strassens Matrix multiplication – Closest pair problem.

Module II **22 + 8 Hours**

Limitations of Algorithm Power: P, NP and NP Complete problems.

Greedy Technique: Container Loading - Knapsack Problem - Job Sequencing with Deadlines - Huffman Tree.

Dynamic Programming Technique: Binomial Coefficient - Warshall's algorithm - Multistage Graph – String Edit Distance.

Backtracking Technique: n-Queens problem - Hamiltonian Circuit - Subset-sum problem - Graph colouring.

Branch and Bound Technique: Assignment problem - Knapsack problem - Travelling salesman problem.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Solve real world problems by using various algorithmic design techniques to find optimal solution	Apply
CO2: Estimate the complexity of algorithms using algorithmic analysis	Analyze
CO3: Compare and contrast the working of various design techniques and choose the suitable technique for problem solving	Evaluate
CO4: Involve in independent learning for finding solutions to real world applications by working individually or as a team.	Apply

Course Articulation Matrix:

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Anany Levitin, “Introduction to the Design & Analysis of Algorithms”, 3rd Edition, Pearson Education, 2017.

T2. Sartaj Sahni, “Data Structures, Algorithms, And Applications in Java”, 2nd Edition, Universities Press (India) Pvt. Limited, 2005.

Reference Book(s):

R1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 4th Edition, MIT Press, 2022.

R2. S.Sridhar, “Design and Analysis of Algorithms”, 2nd Edition, Oxford University Press, 2023.

Web References:

1. NPTEL course on Design and analysis of algorithms - https://archive.nptel.ac.in/courses/106/106/106106131/
2. Coursera course on Analysis of Algorithms - https://www.coursera.org/learn/analysis-of-algorithms?action=enroll
3. Udemy course on Introduction to Algorithmic Design and Analysis - Learn The Art of Computer Programming - https://www.udemy.com/course/introduction-to-algorithmic-design-and-analysis/

Course Code: 23CST302		Course Title: Computer Architecture (Common to AD & CS)	
Course Category: Minor		Course Level: Intermediate	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on memory organization, addressing modes of a processor, the organization of cache memory and pipelining techniques for the design of high speed processor.

Module I **22 Hours**

Basic Structure of Computers: Evolution of Microprocessor - Basic Processor Architecture - Operational concepts –Performance.

Instruction Set Architecture: Memory location - Memory Operations – Instructions and sequencing - Addressing modes - CISC Vs RISC.

Basic Input/Output, Processing Unit : Accessing I/O devices - Interrupts -Buses - Instruction Execution-DMA–Hardware Components – Instruction Fetch and Execution Steps – Control Signals-Hardwired Control - CISC Style Processors: Interconnect using Buses, Micro programmed Control.

Module II **23 Hours**

The Memory System: Characteristics of Memory Systems - Cache Memory Principles - Elements of Cache Design - Mapping Function - Example of Mapping Techniques - Replacement Algorithms - Performance Consideration.

Pipelining : Basic concept - Pipeline Organization and issues - Data Dependencies – Memory Delays – Branch Delays – Resource Limitations - Performance Evaluation - Superscalar operation –Pipelining in CISC Processors - Instruction Level Parallelism – Parallel Processing Challenges – Flynn’s Classification – Hardware multithreading – Multicore Processors: GPU, Multiprocessor Network Topologies.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Compare different instruction set architectures and identify their implications on system performance.	Apply
CO 2: Analyze various design elements to determine suitable memory organization for optimized performance.	Analyze
CO 3: Apply principles of pipelining and instruction-level parallelism to enhance processor performance.	Apply
CO 4: Engage in independent learning to deliver an oral presentation on emerging computer architectures and their applications.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Carl Hamacher, Zvonok Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, 6th Edition, McGraw Hill, 2012.

T2. David A. Patterson and John L. Hennessey, “Computer Organization and Design: The Hardware/Software Interface”, 5th Edition, Elsevier, 2014.

Reference Book(s):

R1. William Stallings, “Computer Organization and Architecture: Designing for Performance”, 10th Edition, Pearson Education, 2016.

R2. John L. Hennessey and David A. Patterson, “Computer Architecture: A Quantitative Approach”, 5th Edition, Elsevier, 2012.

Web References:

1. Computer Architecture –Coursera: https://www.coursera.org/lecture/comparch/course-introduction-Ouq7L
2. Computer System Architecture-MIT Open Courseware Notes: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-823-computer-system-architecture-fall-2005/index.html
3. Computer Architecture: NPTEL Course : http://www.nptel.ac.in/courses/106102062/

Course Code: 23CSI301		Course Title: Database Systems (Common to AD & CS)	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 3:0:2	Credits:4	Total Contact Hours: 75	Max Marks: 100

Course Objective:

The course is intended to impart knowledge on database fundamentals, develop skills in designing databases and apply SQL for database manipulation.

Module I **22 Hours**

Foundations of DBMS: File System versus Database approach – Database applications – View of Data – Database Languages (DDL, DCL, DML, TCL) – Database Design – Data storage and querying – Architecture –Database Users and Administrators.

Relational Model: Terminology – Structure of Relational Database – Keys – Integrity Constraints – Schema Diagrams – Relational operations.**ER Modeling:** Design Process – Entity Types – Relationship Types – Attributes – Structural Constraints – Reduction to Relational Schemas – Design Issues.

SQL Data Manipulation: Overview of Query Language – Data Types – Data Definition – SQL Queries – Aggregate functions – Nested Queries – Joins – Views – Integrity Constraints – Authorization.

Advanced SQL: SQL Programming Language – Functions and procedures – Cursors – Triggers – Accessing SQL from a Programming Language – SQL vs NoSQL.

Module II **23 Hours**

Normalization: Purpose – Data Redundancy and Update Anomalies – Functional Dependencies – Normalization Process – 1NF, 2NF, 3NF, BCNF.

Data Storage: Storage Media – RAID – Database Buffer – Indexing and Hashing.

Query Processing: Query Decomposition – Cost Estimation – Query Optimization.

Transaction and Concurrency Control: Transaction properties – Locking methods – Deadlock – Timestamp Methods – Validation Protocols – Consistency – Granularity.

Recovery System: Failure Classification – Recovery facilities – Recovery Techniques.

Introduction to Advanced Database concepts: Document database – Graph QL – Database Optimization.

List of Experiments: **30 Hours**

1. Design databases using ER modeling.
2. Create and modify database tables using DDL commands and manipulate table data using DML commands.
3. Implement Joins and nesting concept for complex queries.
4. Implement Functions and procedures using advanced SQL.
5. Create Cursors and Triggers using SQL programming.
6. Access database through JDBC connectivity

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Design ER models using various constructs to simulate the real world databases.	Apply
CO2: Formulate structured and optimized queries to manipulate databases.	Apply
CO3: Investigate the dependencies in a database and normalize to appropriate level.	Analyze
CO4: Compare and contrast the various locking facilities to perform concurrent transactions on databases.	Evaluate
CO5: Analyze the various database functionalities as an individual or team for real world applications.	Analyze

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. A Silberschatz, H Korth, S Sudarshan, “Database System Concepts”, 7th Edition, McGraw- Hill, 2019.

T2. Thomas Connolly, Carolyn Begg, “Database Systems: A Practical Approach to Design, Implementation and Management”, 6th Edition, Pearson Education, 2015.

Reference Book(s):

R1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, 7th Edition, Pearson Education, 2017.

R2. C.J. Date, A. Kannan and S. Swamynathan, “An Introduction to “Database Systems”, 8th Edition, Pearson Education, 2006.

Web References:

1. Introduction to Database Systems:
   http://www.inf.unibz.it/~nutt/IDBs1011/idbs-slides.html
2. NPTEL lecture videos and notes:
   https://onlinecourses.nptel.ac.in/noc23_cs79/
3. SQL practice exercises with solutions:

Course Code: 23CST303		Course Title: Java Programming	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 3:0:0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on the principles of Object Oriented Programming using Java. The course intends to provide in-depth knowledge on various concepts of Java programming to develop stand-alone applications.

Module I **23 Hours**

Principles of Object Oriented Programming and Java – Data types – Operators – Control flow.

Classes and Objects – Constructors – Access Specifiers – Static members – Inheritance and types – Method overloading and overriding – Nested and Inner class – Abstract classes and Abstract Methods – Final keyword.

Packages – Interfaces – Exception fundamentals and types – User defined Exceptions – Thread – Creating threads – Synchronization – Inter-thread communication.

Module II **22 Hours**

String Handling – String and String Buffer class and functions – String Tokenizer – Math and Clone functions.

Collections – Collection Interfaces: Set, Queue and List – Collection classes: LinkedList, ArrayList, HashSet and TreeSet – Java I/O classes and interfaces – Streams: DataInput/ OutputStream and Reader/ Writer – File concepts – Reading and Writing Files.

Java Swing – Layout Managers – Event Handling – Swing Components: JLabel, JButton, JTextField, JRadioButton and JTextArea.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply object oriented principles in programming to solve real world problems.	Apply
CO2: Develop lifelong learning ability to provide software solutions for societal issues.	Apply
CO3: Analyze the performance of Java programs and provide optimized solutions using advanced concepts.	Analyze
CO4: Apply appropriate user interface components for an application.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Herbert Schildt, “Java the Complete Reference”, 12th Edition, McGraw-Hill Education, December 2022.

Reference Book(s):

R1. Cay. S. Horstmann, “Core Java – Volume 1: Fundamentals”, 12th Edition, Oracle, 2021.

R2. Ken Arnold, James Gosling, David Holmes, Prakash Goteti, “The Java Programming Language”, 3rd Edition, Pearson Education, 2000.

Web References:

1. Oracle, Java tutorials, URL: https://www.oracle.com/java/technologies/
2. NPTEL, Course on Programming in Java, URL: https://archive.nptel.ac.in/courses/106/105/106105191/
3. Core Java Tutorial, URL: https://javabeginnerstutorial.com/core-java-tutorial/

Course Code: 23CSL301		Course Title: Java Programming Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0:3	Credits: 1.5	Total Contact Hours:45	Max Marks: 100

Course Objective:

The course is intended to impart knowledge on object oriented programming and solving real world problems.

List of Experiments:

1. Develop java programs using operators and control flow statements.
2. Develop java programs to implement Classes, objects and Inheritance.
3. Develop java programs to implement Abstraction and Polymorphism.
4. Develop java programs to implement Packages.
5. Develop java programs to handle Pre-defined and User-defined exceptions.
6. Implement thread synchronization and inter-thread communication.
7. Implement String handling and manipulation functions use Java.
8. Develop java program to solve real world problems using java collection framework.
9. Implement File operations using Java I/O classes and interfaces.
10. Create GUI for the given application using Java Swing components.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop object oriented solutions for solving real world problems	Apply
CO2: Create real-time applications through teamwork and demonstrate with oral presentation.	Create

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Reference Book(s):

R1. Herbert Schildt, “Java the Complete Reference”, 12th Edition, McGraw-Hill Education, December 2022

R2. Kathy Sierra, “Head First Java: A Brain-Friendly Guide”, 3rd Edition, O’ Reilly Media, June 2022.

R3. Paul J. Deitel, Harvey M. Deitel, “Java How To Program, Late Objects”, 11th Edition, Pearson, 2017.

Web References:

1. Oracle, Java tutorials, URL: https://www.oracle.com/java/technologies/
2. NPTEL, Course on Programming in Java, URL: https://onlinecourses.nptel.ac.in/noc20_cs08/preview
3. Java Online Practice: w3resource, URL: https://www.w3resource.com/java-exercises/

Course Code: 23ESL301		Course Title: Professional Skills 2: Problem solving skills & Logical Thinking 2 (Common to all B.E / B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to enhance the students' numerical, analytical and logical reasoning ability. Also course focus is to make learners prepare for various public and private sector exams and placement drives.

Module I **20 Hours**

Quantitative Ability: Time and work –Pipes and cisterns - Time Speed Distance- Problems on Trains - Boats and Streams - Permutation and Combination - Probability, Mensuration - Heights and distance – Logarithms - Clocks and Calendars – Data Sufficiency

Module II **10 Hours**

Reasoning Ability: Number & Alpha series - Odd man out-Coding and Decoding- Syllogisms - Problems on Cubes and Dices - Logical Venn diagram -Visual Reasoning- Element & logical series -Analogies

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Enhance problem solving skills & Logical thinking Skills	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning”, 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, 5th Edition, McGraw Hill Publications, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, 6th Edition, McGraw Hill Publications, 2021.

Web References:

1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT301		Course Title: Universal Human Values 2: Understanding Harmony	
Course Category: VAC		Course Level: Practice	
L:T:P (Hours/Week) 2:1: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

Unit I Introduction to Value Education 9 Hours

Need for the Value Education; Self -exploration as the process for value education; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities; Happiness and Prosperity: current scenario; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being 9 Hours

Human being as a co-existence of self (‘I’) and the material ‘Body’; needs of Self ('I') and 'Body'; The Body as an instrument of ‘I’; Harmony in the self (‘I’); Harmony of the self (‘I’) with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society 9 Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order.

Unit IV Harmony in the Nature 9 Hours

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics 9 Hours

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case study: holistic technologies, management models and production systems; Strategy for transition towards value-based life and profession.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2: Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO3: Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4: Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5: Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. R R Gaur, R Sangal, G P Bagaria, “Human Values and Professional Ethics”, Excel Books, New Delhi, 2010.

Reference Book(s):

R1. Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, “Jeevan Vidya”, Amarkantak, 1999.

R2. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.

R3. Annie Leonard, “The story of stuff”, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

SEMESTER IV

Course Code: 23MAT401		Course Title: Probability and Statistics (Common to AM,AU,CS,EC,EE,IT,ME&SC)	
Course Category: Minor		Course Level: Intermediate	
L:T:P(Hours/Week) 3:1:0	Credits: 4	Total Contact Hours:60	Max Marks:100

Course Objective:

This course aims at helping the students to gain knowledge on random variables, probability distributions and hypothesis testing for data.

Module I **27 + 9 Hours**

Probability and Random Variables :Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties.

Standard Distributions: Discrete Distributions - Binomial- Poisson- Properties, Moment generating functions.

Continuous Distributions - Uniform –Exponential- Normal Distributions and their properties.

Two Dimensional Random Variables: Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression using least square method – Transformation of random variables.

Module II **18 + 6 Hours**

Test of Hypotheses: Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means, Tests based on t, Chi-square and F distributions for mean, variance and proportion, Contingency table (test for independent), Goodness of fit.

Design of Experiments: Analysis of Variance (ANOVA) - One way Classification – Completely Randomized Design (CRD) – Two way Classification – Randomized Block Design (RBD) – Latin square.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Calculate the expected values and variances of random variables.	Apply
CO2: Use the concept of probability distributions to solve real life problems.	Apply
CO3: Compute correlation coefficient and discusses the relationship between two variables.	Apply
CO4: Apply Testing of hypothesis based on samples sizes.	Apply
CO5: Apply the principles of design of experiments and perform analysis of variance.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Veerarajan T, "Probability, Statistics and Random process", 3rd Edition, Tata McGraw-Hill,New Delhi, 2017.

T2. Dr.J.Ravichandran, "Probability and Statistics for Engineers", Wiley India Pvt. Ltd., 2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineersand Scientists", 9th Edition, Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 4th Edition, Tata McGraw Hill edition, 2012.

R3. Morris DeGroot, Mark Schervish, "Probability and Statistics", 4th Edition, Pearson Educational Ltd, 2014 India.

Web References:

1. NPTEL Course on Probability and Statistics
   https://archive.nptel.ac.in/courses/111/105/111105090/
2. NPTEL Course on Probability and Statistics

Course Code: 23CSI401		Course Title: Computer Network Technology	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3:0:2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on network fundamentals and communication protocols. The course also intends to provide exposure on Network layer design issues, routing algorithms, congestion control techniques and application layer protocols with security essentials.

Module I **22 Hours**

Introduction: Data Communications – Topologies – Network Architecture – Socket Implementation.

Link Layer: Encoding: NRZ, NRZ-I, Manchester – Framing: PPP, HDLC – Flow control – Error Control and Error Detection: Internet Checksum and CRC – Multi Access Networks: Ethernet, Wireless LAN, Wi-Fi, Bluetooth.

Network Layer: Internet Protocol – IPV4 – IP Addressing – Subnetting – IPV6 – ICMP – DHCP – Routing Protocols: RIP, OSPF and BGP.

Module II **23 Hours**

Transport Layer: UDP and TCP – TCP Connection Management – Sliding Window Protocol – Congestion Control – Congestion Avoidance Mechanisms: DECbit, RED – Quality of Services.

Application Layer: FTP – Email Protocols – DNS – SNMP – Web Services.

Security Essentials: Fundamentals of Cryptography – HTTPS – Firewalls – Network Security Standards.

List of Experiments **30 Hours**

1. Implementation of TCP/UDP Socket Programming.
2. Implementation of Error Detection Techniques.
3. Simulation of IEEE LAN Topologies.
4. Simulation of Wide area networks with Routing Protocols and Router configuration.
5. Implementation of TCP Congestion Control Algorithms.
6. Implementation of DNS using UDP sockets and SNMP.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Analyze the requirements of a given organizational structure and identify appropriate network topologies and protocols.	Analyze
CO2: Deploy network based applications for real time scenarios using socket programming.	Apply
CO3: Design wired and wireless network with suitable IP addressing and routing protocols using Cisco packet tracer simulation tool.	Create
CO4: Implement reliable application layer protocols and security aspects for real time applications through individual/Team work	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. James F Kurose, Keith W Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, 8th Edition, Pearson Education, 2022.

T2. Behrouz A Forouzan, “Data Communications and networking with TCP/IP Protocol Suite”, 6th Edition, Tata McGraw-Hill Publications, 2022.

Reference Book(s):

R1. Andrew S Tanenbaum, Nick Feamster, David J Wetherall, “Computer Networks”, 6th Edition, Pearson Education, 2022

R2. Larry L Peterson and Bruce S Davie, “Computer Networks – A Systems Approach”, 6th Edition, Morgan Kaufmann Publications, 2021.

R3. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education, 2017.

Web References:

1. NPTEL – Computer Networks and Internet Protocol: http://nptel.ac.in/courses/106105183/
2. NPTEL – Introduction on Computer Networks: http://nptel.ac.in/courses/106106091/
3. NPTEL – Computer Networks: http://nptel.ac.in/courses/106105081/

Course Code: 23CST401		Course Title: Operating Systems	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objective:

The course is intended to describe the components of operating systems, solve various process related problems, and find solutions for free space management.

Module I **23 Hours**

Introduction: Computer System Organization – Operating System Operations – Operating Systems Structures: Operating System Services, User and Operating System Interface, System calls.

Processes: Process Concepts: Process Scheduling, Operation on Process, Inter Process Communication.

CPU scheduling: First-Come, First-Served Scheduling, Shortest-Job-First Scheduling, Round-Robin Scheduling, and Priority Scheduling

Process Synchronization: The Critical Section Problem, Peterson's Solution, Hardware Support for Synchronization,

Mutex Locks, Semaphores, Monitors – Classical problems of Synchronization.

Deadlock: Deadlock Characterization – Methods for handling Deadlocks: Deadlock Prevention, Avoidance, Detection and Recovery.

Module II **22 Hours**

Main Memory: Contiguous Memory Allocation, Paging, Structure of Page Table, Swapping

Virtual Memory: Demand paging, Copy-on-write, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Mass Storage System: Overview, Disk Scheduling: FCFS, SCAN, C-SCAN scheduling

File System Interface: File Concepts, Access methods, Directory Structure, Protection

File System Implementation: File System Structure and Operations, Directory Implementation, Allocation methods, Free Space Management.

Case Study – Linux: Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Input and Output – Inter-process Communication – Network Structure – Security

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply the different concepts and functionalities of Operating System	Apply
CO2: Analyze various Operating system process strategies and techniques	Analyze
CO3: Implement memory management schemes for a system reflecting various approaches.	Apply
CO4: Demonstrate the various operating systems functionalities in Linux Environment with an oral presentation.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne “Operating System Concepts”, 10th Edition, John Wiley and Sons Inc., 2021.

Reference Book(s):

R1. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2015.

R2. William Stallings, “Operating Systems Internals and Design Principles”, 9th Edition, Pearson Education, 2018.

Web References:

1. MIT open course on Operating System Engineering: http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/
2. Bell’s Course Notes on Operating Systems Processes: https://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/3_Processes.html
3. NPTEL course on Operating System Fundamentals: https://nptel.ac.in/courses/106/105/106105214/

Course Code: 23EEI401		Course Title: Microcontrollers and IoT	
Course Category: Minor		Course Level: Intermediate	
L:T:P (Hours/Week) 3:0:2	Credits:4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course aims to teach programming the microcontroller's boards using Embedded C and connecting peripherals and sensors, building basic IoT applications across a various domains, and implementing IoT LoRaWAN protocols and architecture for IoT communication.

Module I **22 Hours**

Introduction to Microcontroller: Introduction to Microcontroller – Von Neumann and Harvard architecture -RISC vs CISC - PIC18FX Pin connection – File register – I/O ports– Serial port– Analog to digital converter- I/O programming: Data type and Time delay, Logical operations

Interfacing: Arduino Board- pin details, specification – LED and Switch interfacing- LCD interfacing – Keyboard interfacing – Relay and Opto-isolator – Sensor interfacing: Temperature sensor-LM35, DHT11- IR sensor- Ultrasonic Sensor

Module II **23 Hours**

Introduction to IoT : IoT Architecture – Application layer protocol - MQTT, HTTP - Major Components - FOG and Cloud computing

LoRaWAN: IoT wireless protocols - LoRaWAN protocol: Structure of a LoRaWAN network, LoRaWAN end device classes, Activation of LoRaWAN end devices:ABP and OTAA, Pros and cons of ABP and OTAA - LoRaWAN networks and LoRaWAN servers: types of networks, LoRaWAN network configuration - LoRa / LoRaWAN frame: LoRaWAN protocol layers, gateways and network server communication - Exporting data from LoRaWAN server: services provided by the IoT platform, exporting data with the HTTP GET protoco

List of Exercises **30 Hours**

1. Control the LED using switch
2. Control the Lamp using Relay interfacing
3. Interface ultrasonic sensor and display the distance in LCD
4. Interfacing temperature sensor with Edge node
5. Edge node connection to the LoRa Gateway using LoRa network
6. Send the data from the LoRa Gateway network server to web server.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Utilize Embedded C programming skills to implement input/output interfaces on microcontrollers.	Apply
CO2: Analyze the performance and efficiency of microcontroller-based I/O programs through testing and debugging processes.	Analyze
CO3: Analyze the functionalities and communication processes between gateway and network server of LoRaWAN protocol	Analyze
CO4: Estimate different methods of interfacing the temperature sensor with the edge node, considering factors such as sensor accuracy, communication protocols, and power consumption.	Evaluate

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Muhammad Ali Mazidi, RolinD.Mckinlay, Danny Causery,"PIC Microcontroller and Embedded systems using assembly and C PIC18", 2nd Edition, Micro Digital Ed, 2016

T2. Charalampos Doukas , "Building Internet of Things with the Arduino", volume1,Create space publishers , April 2012.

Reference Book(s):

R1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

R2. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

R3. Pedro Larrañaga, David Atienza, Javier Diaz-Rozo, Alberto Ogbechie, Carlos Esteban Puerto-Santana, Concha Bielza"Industrial Applications of Machine Learning", CRC Press, 2018.

R4.Ravindra Kumar Sharma, LoRA and IoT Networks for Applications in Industry 4.0, Nova Science Publishers Inc,2020

Web References:

1. Introduction to IoT NPTEL Videohttps://www.youtube.com/watch?v=WUYAjxnwjU4
2. https://www.univ-smb.fr/lorawan/wp-content/uploads/2022/01/Book-LoRa-LoRaWAN-and-Internet-of-Things.pdf
3. Connectivity Technologies NPTEL Video: https://www.youtube.com/watch?v=GHUR_GfQQsQ&list=PLE7VH8RC_N3bpVn-e8QzOAHziEgmjQ2qE&index=9

Course Code: 23CST402		Course Title: Data Warehousing and Mining	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives

The course is intended to describe about various preprocessing techniques, data warehousing and online analytical processing, mining frequent patterns, classification and clustering.

Module I **23 Hours**

Hours

Data Preprocessing: KDD Process – Kinds of knowledge – Applications – Data mining and society – Data types – Date Preprocessing: Cleaning – Integration – Reduction – Transformation and Discretization.

Data Warehousing and Online Analytical Processing:

Data warehouse – Data warehouse modeling: schema and measures – OLAP operations – Data cube computation – Data cube computation methods

Module II **22 Hours**

Pattern Mining: Basic concept – Frequent Itemset Mining Methods: Apriori Algorithm – FP Growth Algorithm – Vertical Data Format – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint-based Frequent Pattern Mining.

Classification: General Approach to classification – Decision Tree Induction – Bayes Classification – Lazy learners – Linear classifiers – Model Evaluation and Selection – Techniques to improve classification accuracy

Clustering: Cluster Analysis – Partitioning methods – Hierarchical methods – Types of Outliers – Outlier Detection Methods

Course Outcomes	Cognitive Level
At the end of this course – students will be able to:	
CO1: Perform data preprocessing using various techniques for any given dataset.	Apply
CO2: Demonstrate the designed data warehouse model using schemas and operations for any given multidimensional data through oral presentation.	Apply
CO3: Analyze patterns using different types of mining methods for obtaining Interesting relations.	Analyze
CO4: Evaluate the performance of classifier using various classifier evaluation metrics.	Evaluate
CO5: Analyze real-world datasets to generate cluster and detect outliers using various techniques.	Analyze

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1.Jiawei Han, Jian Pei, Hanghang Tong, “Data Mining Concepts and Techniques”, 4th Edition, Morgan Kaufman, 2022

Reference Book(s):

R1. Alex Berson and Stephen J. Smith “Data Warehousing – Data Mining & OLAP”, Tata McGraw-Hill Edition, 13th Reprint 2008

R2. K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

R3.Parteek Bhatia, “Data Mining and Data Warehousing: Principles and Practical Techniques”, Cambridge University Press, 2019

Web References:

1. Data Warehouse Concepts: https://www.udemy.com/course/master-datawarehouse-concepts-step-by-step-from-scratch/
2. Data Mining: https://onlinecourses.swayam2.ac.in/cec24_cs12/preview

Course Code: 23CSL401		Course Title: Python Programming Laboratory	
Course Category: SEC		Course Level: Intermediate	
L:T:P(Hours/Week) 1: 0:3	Credits: 2.5	Total Contact Hours: 60	Max Marks: 100

Course Objective:

The course is intended to impart knowledge on python programming constructs, files, libraries, database and GUI programming for developing real time applications.

Module I **8 Hours**

Data Types – Operators - Control statements – List - Tuples- Sets –Dictionary – Strings – Classes and Objects – Inheritance – Polymorphism - Functions – Exception Handling - File Handling

Module II **7 Hours**

Pickled objects - Shelve files - SQL Database interfaces - GUI basics - Working with pandas - numpy – matplotlib - Tkinter

List of Experiments: **45 Hours**

1. Implement data types, operators and expressions.
2. Implementation of branching statements and looping constructs.
3. Implementation of list, set, tuple, dictionary and strings.
4. Implementation of object orientation concepts using functions
5. Implementation of exception handling.
6. Implementation of file handling techniques, pickle and shelve objects.
7. Implement Database Connectivity with SQL Server.
8. Implement programs using Python Standard Libraries (pandas, numpy).
9. Implement programs using Matplotlib.
10. Develop an application using Tkinter.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply programming constructs to provide solutions for real world problems.	Apply
CO2: Analyze any given dataset using python libraries, files and exceptions.	Analyze
CO3: Develop a GUI application using python with ethical standard and Tkinter through teamwork with oral presentation.	Create

Course Articulation Matrix

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

High-3; Medium-2; Low

Reference Book(s):

R1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python”, 3rd Edition, O’Reilly, 2020.

R2. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 2021.

R3. Guttag, John, “Introduction to Computation and Programming Using Python”, MIT Press, 2016.

R4. Mark Lutz, “Learning Python, Powerful OOPs”, 5th Edition, O’Reilly, 2013.

R5. Reema Thareja, “Python Programming”, Pearson, 2017.

Web References:

1. Official documentation of python 3.10: https://docs.python.org/3/tutorial/
2. Beginner to Advanced Python developer guide: https://www.learnpython.org/
3. Python quick reference guide: https://www.pyschools.com/

Course Code: 23ESL401		Course Title: Professional Skills 3: Professional Development and Etiquette (Common to all B.E/ B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objective:

The course is intended to cultivate students' appropriate etiquette across various personal and professional contexts, fostering professionalism and effective communication.

Module I **15 Hours**

Emotional Intelligence: Intrapersonal Skill: Goal Setting- Self-management-Emotional Intelligence: Understanding & Developing EI for Effective Communication and Relationships – Enhancing Social Skills

Professional Development: Introduction to Professional Development - Career State Assessment - Set Career Goals- Stay on Industry Trends - Self & Lifelong learning – Creativity - Problem Solving Skills - Strong Fundamentals – Using/ Creating Opportunities – Work & Life Balancing - Revisiting Goals

Teamness and Interpersonal skills : Paraphrasing: Techniques for Active Listening - Paraphrasing as a Tool for Effective Understanding and Communication – Collaboration and Team Building: Building Trust and Rapport - Self-paced learning.

Module II **15 Hours**

Effective Communication: Effective Verbal Communication - Assertive Communication - Elements of Effective Communication - Barriers to Effective Communication - Persuasion Skills - Effective Presentation: Oral and visual presentation – Drafting formal reports.

Professional Etiquette: Introduction - Types of professional Etiquette- Personal Grooming: Importance of Personal Grooming in Professional Settings- Dress Codes and Professional Appearance Guidelines- Body language - Social – Email – Telephonic – Dining – Classroom - Business.

Activities:

- Emotional Intelligence: Scenario based role play, Debate
- Paraphrasing: Listening, Reading
- Effective Presentation:
    - Oral Presentation: Self-Introduction, JAM , Extempore speech
    - Visual presentation: Email Writing, Power Point Presentation, Vlog
- Professional Etiquette: Demonstrate required Professional Etiquette in all the above activities.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit Professional etiquettes in various social forums.	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	3	-	1	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Sabina Pillai, Agna Fernandez, “Soft Skills & Employability Skills”, Cambridge University Press, 2018.

T2. Peggy Post &Peter Post, “The Etiquette Advantage in Business: Personal Skills for Professional Success”, 2nd Edition, William Morrow, 2005.

Reference Book(s):

R1. Ashraf Rizvi, "Effective Technical Communication" 2nd Edition, McGraw-Hill India, 2018.

R2. Maithry Shinde, Jyotsna Sreenath, “Life Skills & Personality Development”, Cambridge University Press 2022.

Web References:

1. https://www.indeed.com/career-advice/career-development/etiquette-at-work
2. https://www.skillsyouneed.com/interpersonal-skills.html