

NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI

www.nec.edu.in



REGULATIONS – 2023

CURRICULUM & SYLLABUS

B. E. COMPUTER SCIENCE AND ENGINEERING

(Outcome Based Education & Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

I. VISION

To produce globally competent, innovative and socially responsible computing professionals

II. MISSION

- To provide world-class teaching-learning and research facilities
- To stimulate students' logical thinking, creativity, and communication skills
- To cultivate awareness about emerging trends through self-initiative
- To instill a sense of societal and ethical responsibilities
- To collaborate with industries and government organizations

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1: Achieve their professional career in industry/academia by applying the acquired knowledge of computer science and engineering.
- PEO 2: Engage in life-long learning and enhance their capabilities by embracing cutting edge technical advancements.
- PEO 3: Excel in collaboration with interdisciplinary teams and diverse stake holders for persevering successful start-ups.

IV. PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1: Build domain specific expertise by showcasing deliverables in the field of Application development, Business Intelligence, Computational Intelligence and Cyber Security
- PSO2: Build knowledge base for students to solve complex technical problems through participation in global contests and hackathons.

V. PROGRAM OUTCOMES (POs)

- PO 1 : Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2 : 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.
- PO 3 : 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.
- PO 4 : 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.
- PO 5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO 6 : 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.
- PO 7 : 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.
- PO 8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9 : Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10 : 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.
- PO 11 : 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.
- PO 12 : Lifelong 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.

REGULATIONS 2023

CURRICULUM AND SYLLABUS

SEMESTER - I

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Induction Programme – 2 weeks									0
Theory Courses									
1.	23SH11C	தமிழர் மரபு/ Heritage of Tamils	HSMC	1	0	0	0	1	1
2.	23SH12C	Mathematical Foundations for Engineers	BSC	3	1	0	0	4	4
3.	23SH13C	Introduction to Engineering	ESC	1	0	0	0	1	1
Integrated Courses									
4.	23SH14C	Technical English	HSMC	1	0	2	0	3	2
5.	23SH15C	Engineering Physics	BSC	2	0	2	0	4	3
6.	23SH16C	Engineering Chemistry	BSC	2	0	2	0	4	3
7.	23CS11C	Problem Solving Techniques	ESC	3	0	2	0	5	4
8.	23EE11C	Basic Electrical and Electronics Engineering	ESC	3	0	2	0	5	4
TOTAL				16	1	10	0	27	22

SEMESTER – II

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23SH21C	தமிழரும் தொழில்நுட்பமும் / Tamils & Technology	HSMC	1	0	0	0	1	1
2.	23GN01C	Aptitude Essentials	EEC	1	0	0	0	1	1
3.	23CS21C	Digital Principles and System Design	ESC	3	0	0	0	3	3
4.	23CS22C	Discrete Mathematics	BSC	3	1	0	0	4	4
Integrated Courses									
5.	23SH22C	Professional English	HSMC	1	0	2	0	3	2
6.	23CS23C	Semiconductor and Quantum Physics	ESC	2	0	2	0	4	3
7.	23ME11C	Engineering Graphics	ESC	2	0	4	0	6	4
8.	23CS24C	Object Oriented Programming using C++	PCC	2	0	2	2	6	4
Practical Courses									
9.	23GN02C	Innovation through Design Thinking	EEC	0	0	2	2	4	2
TOTAL				15	1	12	4	32	24

SEMESTER – III

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CS31C	Computer Organization and Architecture	PCC	3	0	0	0	3	3
2.	23CS32C	Data Structures	PCC	3	0	0	0	3	3
3.	23CS33C	Operating Systems	PCC	2	1	0	0	3	3
4.	23GN05C	Professional Ethics and Human Values	HSMC	2	0	0	0	2	2
5.	23GN04C	Aptitude Excellence	EEC	1	0	0	0	1	1
Integrated Courses									
6.	23CS34C	Probability and Statistics	BSC	3	1	0	0	4	4
7.	23CS35C	Computer Networks	PCC	3	0	2	0	5	4
Practical Courses									
8.	23CS36C	Data Structures Laboratory	PCC	0	0	4	0	4	2
9.	23CS37C	Linux System Administration	PCC	0	0	2	0	2	1
10.	23GN03C	Intellectual Property Rights Study	EEC	0	0	0	4	4	2
TOTAL				17	2	8	4	31	25

SEMESTER – IV

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CS41C	Java Programming	PCC	3	0	0	0	3	3
2.	23CS42C	Cryptography and Cyber Security	PCC	3	0	0	0	3	3
3.	23XXXXC	Embedded Systems	ESC	3	0	0	0	3	3
4.	23XXXXC	Elective – Science Stream	BSC	3	0	0	0	3	3
5.	23MC02C	Environmental Science and Engineering	MC	2	0	0	0	2	0
Integrated Courses									
6.	23CS43C	Design and Analysis of Algorithm	PCC	3	0	0	2	5	4
7.	23CS44C	Database Management Systems	PCC	3	0	2	0	5	4
Practical Courses									
8.	23CS46C	Java Programming Laboratory	PCC	0	0	2	2	4	2
9.	23CS47C	Modeling Projects	EEC	0	0	2	2	4	2
TOTAL				20	0	6	6	32	24

SEMESTER – V

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CS51C	Devops and Agile Methodologies	PCC	2	0	0	0	2	2
2.	23CS52C	Theory of Computation	PCC	3	1	0	0	4	4
3.	-	Program Elective Course – I	PEC	3	0	0	0	3	3
4.	-	Program Elective Course - II	PEC	3	0	0	0	3	3
Integrated Courses									
5.	23CS53C	Web Technology	PCC	2	0	2	2	6	4
6.	23CS54C	Artificial Intelligence	PCC	3	0	0	2	5	4
7.	-	Program Elective Course - III	PEC	2	0	2	0	4	3
Practical Courses									
8.	23CS55C	Simulation using Modern Tool	EEC	0	0	2	2	4	2
TOTAL				18	1	6	6	31	25

SEMESTER – VI

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23GN06C	Project Management and Finance	HSMC	2	0	0	0	2	2
2.	23CS61C	Business Process Management	PCC	3	0	0	0	3	3
3.	23CS62C	Object Oriented Analysis and Design	PCC	2	1	0	0	3	3
4.	23CS63C	Compiler Design	PCC	3	1	0	0	4	4
5.	23XXXXE	Program Elective Course - IV	PEC	3	0	0	0	3	3
6.	23XXXXN	Open Elective Course - I	OEC	3	0	0	0	3	3
7.	23MC01C	Constitution of India	MC	2	0	0	0	2	0
Integrated Courses									
8.	23CS64C	Data Science	PCC	2	0	2	2	6	4
Practical Courses									
9.	23CS65C	Product Development Practice	EEC	0	0	0	4	4	2
TOTAL				20	2	2	6	30	24

SEMESTER – VII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	-	Program Elective Course - V	PEC	3	0	0	0	3	3
2.	-	Program Elective Course - VI	PEC	3	0	0	0	3	3
3.	-	Open Elective Course - II	OEC	3	0	0	0	3	3
4.	-	Open Elective Course - III	OEC	3	0	0	0	3	3
Practical Courses									
5.	23CS71C	Mini Project	EEC	0	0	0	6	6	3
6.	23CS72C	Internship / In-Plant Training	EEC	-	-	-	-	-	2
TOTAL				12	0	0	6	18	17

SEMESTER – VIII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Practical Courses									
1.	23CS81C	Capstone Project / Industry Practices	EEC	0	0	0	12	12	6
TOTAL				0	0	0	12	12	6

Total No. of Credits: 167

PROGRAM ELECTIVE COURSES (VERTICALS)

S.No	Course Type	Course Code	Course Name	L	T	P	E	C
Cyber Security and Block Chain								
1.	PEC	23CS01E	Network Security	3	0	0	0	3
2.	PEC	23CS02E	Cyber Forensics	3	0	0	0	3
3.	PEC	23CS03E	Ethical Hacking	3	0	0	0	3
4.	PEC	23CS04E	Blockchain Architecture and Design	3	0	0	0	3
5.	PEC	23CS05E	Blockchain Security	2	0	0	0	2
6.	PEC	23CS06E	Security and Privacy in Cloud	2	0	0	0	2
7.	PEC	23CS07E	Digital Currencies and Crypto Assets	3	0	0	0	3
8.	PEC	23CS08E	Blockchain adoption in Metaverse	2	0	2	0	3
9.	PEC	23CS09E	Blockchain application for Cognitive	3	0	0	0	3
10.	PEC	23CS10E	Blockchain for public sector	1	0	2	2	3
11.	PEC	23CS11E	Vulnerability Analysis and Penetration testing	2	0	2	2	4

12.	PEC	23CS12E	Malware Analysis and Thread Hunting	2	0	2	2	4
13.	PEC	23CS01L	Golang Programming	0	0	2	0	1
14.	PEC	23CS02L	Kotlin Programming	0	0	2	0	1
15.	PEC	23CS03L	Solidity Programming	0	0	2	0	1
16.	PEC	23CS04L	Proof Systems in Cryptography	1	0	0	0	1
17.	PEC	23CS05L	Randomness in Cryptography	1	0	0	0	1
18.	PEC	23CS06L	Cyber Crime Investigations	1	0	0	0	1
Business Intelligence								
1.	PEC	23CS13E	Business Intelligence	3	0	0	0	3
2.	PEC	23CS14E	Advanced Database Technology	3	0	0	0	3
3.	PEC	23CS15E	Information Retrieval Techniques	3	0	0	0	3
4.	PEC	23CS16E	Marketing Management Principles	2	0	0	0	2
5.	PEC	23CS17E	IT Project Management	2	0	0	0	2
6.	PEC	23CS18E	Data Mining	2	0	2	0	3
7.	PEC	23CS19E	Business Analytics	2	0	2	2	4
8.	PEC	23CS20E	Social Computing	2	0	2	2	4
9.	PEC	23CS07L	Business Communications	1	0	0	0	1
10.	PEC	23CS08L	Business Strategy	1	0	0	0	1
11.	PEC	23CS09L	Data Analytics	0	0	2	0	1
12.	PEC	23CS10L	Data Visualization using Power BI	0	0	2	0	1
13.	PEC	23CS11L	Data Visualization using Tableau	0	0	2	0	1
14.	PEC	23CS12L	Usability Design of Application Development	0	0	2	0	1
Full Stack Development								
1.	PEC	23CS21E	Python Programming	0	0	4	0	2
2.	PEC	23CS22E	Micro Services Development	2	0	0	0	2
3.	PEC	23CS23E	Advanced Data Structures	2	0	2	0	3
4.	PEC	23CS24E	Software Testing Techniques	2	0	2	0	3
5.	PEC	23CS25E	Mobile Application Development	2	0	2	2	4
6.	PEC	23CS26E	Open Source Technology	2	0	2	0	3
7.	PEC	23CS27E	UI/UX Design	2	0	2	0	3
8.	PEC	23CS28E	Advanced Java Programming	2	0	2	2	4
9.	PEC	23CS29E	Angular and Node JS Development	2	0	2	2	4
10.	PEC	23CS13L	PostgreSQL Programming	0	0	2	0	1
11.	PEC	23CS14L	Firebase Designing	0	0	2	0	1
12.	PEC	23CS15L	Front end Development using DJANGO	0	0	2	0	1
13.	PEC	23CS16L	Application development using Flutter	0	0	2	0	1
14.	PEC	23CS17L	Design with Laravel	0	0	2	0	1
15.	PEC	23CS18L	Web Designing and Hosting	0	0	2	0	1
Computational Intelligence								
1.	PEC	23CS30E	Statistical Analysis	2	0	0	0	2
2.	PEC	23CS31E	Computer Vision and Image Processing	2	0	2	0	3
3.	PEC	23CS32E	Machine Learning Techniques	2	0	2	0	3

4.	PEC	23CS33E	Nature and Bio Inspired Computing	3	0	0	0	3
5.	PEC	23CS34E	Introduction to Computational Intelligence	3	0	0	0	3
6.	PEC	23CS35E	Reinforcement Learning	3	0	0	0	3
7.	PEC	23CS36E	Fundamentals of Deep Learning	2	0	2	0	3
8.	PEC	23CS37E	Time Series Analysis	2	0	2	0	3
9.	PEC	23CS38E	Natural Language Processing	2	0	2	0	3
10.	PEC	23CS19L	Recommender System using AI	1	0	0	0	1
11.	PEC	23CS20L	Images and Video Analytics	1	0	0	0	1
12.	PEC	23CS21L	Mathematics for Machine Learning	1	0	0	0	1
13.	PEC	23CS22L	Modeling with Deep Learning	0	0	2	0	1
14.	PEC	23CS23L	Chatbot Design	0	0	2	0	1
15.	PEC	23CS24L	Natural Language Generation	0	0	2	0	1
Augmented Reality and Virtual Reality								
1.	PEC	23CS39E	Computer Graphics	3	0	0	0	3
2.	PEC	23CS40E	Human Computer Interaction	2	0	0	0	2
3.	PEC	23CS41E	Visual Effects	2	0	0	0	2
4.	PEC	23CS04E	Blockchain Architecture and Design	3	0	0	0	3
5.	PEC	23CS42E	Augmented Reality and Virtual Reality	3	0	0	0	3
6.	PEC	23CS43E	Design of VR Systems	3	0	0	0	3
7.	PEC	23CS31E	Computer Vision and Image Processing	2	0	2	0	3
8.	PEC	23CS44E	Metaverse Development	3	0	0	0	3
9.	PEC	23CS08E	Blockchain adoption in Metaverse	2	0	2	0	3
10.	PEC	23CS45E	Mixed Reality	2	0	2	0	3
11.	PEC	23CS46E	Game Development	2	0	2	2	4
12.	PEC	23CS47E	3D Modeling and Design	2	0	2	2	4
13.	PEC	23CS27E	UI/UX Design	2	0	2	0	3
14.	PEC	23CS25L	Vuforia Development	0	0	2	0	1
15.	PEC	23CS26L	Augmented Reality for Developers	0	0	2	0	1
16.	PEC	23CS27L	AR Model for IoT	0	0	2	0	1
17.	PEC	23CS28L	Video Creation and Editing	0	0	2	0	1
18.	PEC	23CS29L	Wearable Devices for VR	1	0	0	0	1
19.	PEC	23CS30L	Web XR	0	0	2	0	1
20.	PEC	23CS31L	Programming in C#	0	0	2	0	1
Theoretical Computer Science								
1.	PEC	23CS48E	Computational Complexity Theory	3	0	0	0	3
2.	PEC	23CS49E	Algorithmic Game Theory	3	0	0	0	3
3.	PEC	23CS50E	Approximation Algorithms	3	0	0	0	3
4.	PEC	23CS51E	Parallel and Randomized Algorithms	3	0	0	0	3
5.	PEC	23CS52E	Parameterized Algorithms	2	0	0	0	2
6.	PEC	23CS53E	Model Checking and System Verification	2	0	0	0	2

7.	PEC	23CS54E	Logic for Computer Science	2	0	0	0	2
8.	PEC	23CS55E	Computational Geometry	2	0	0	0	2
9.	PEC	23CS56E	Computational Graph Theory	2	0	2	0	3
10.	PEC	23CS57E	Computational Number Theory	2	0	2	2	4
11.	PEC	23CS58E	Quantum Algorithms and Qiskit	2	0	2	2	4
12.	PEC	23CS32L	Galois Theory	1	0	0	0	1
13.	PEC	23CS33L	Spectral Algorithms	1	0	0	0	1
14.	PEC	23CS34L	Proof Systems	1	0	0	0	1
15.	PEC	23CS35L	Finite Model Theory	1	0	0	0	1
16.	PEC	23CS36L	Quantitative Automata Theory	1	0	0	0	1
17.	PEC	23CS37L	Algorithmic Algebra	0	0	2	0	1

Category	I	II	III	IV	V	VI	VII	VIII	Credits	Percentage of credits
HSMC	3	3	2			2			10	6.0%
BSC	10	4	4	3					21	12.6%
ESC	9	10		3					22	13.17%
PCC		4	16	16	14	14			64	38.32%
PEC					9	3	6		18	10.8%
OEC						3	6		9	5.4%
EEC		3	3	2	2	2	5	6	23	13.8%
Total	22	24	25	24	25	24	17	6	167	

Estd : 1984

Course Code	தமிழர் மரபு (HERITAGE OF TAMILS)	L T P E C
23SH11C	(Common to all B.E. / B.Tech. Degree Programmes)	1 0 0 0 1

COURSE OUTCOMES

இப்பாடம் முடிந்ததும் மாணவர்களிடம் வளரும் திறன்

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக் கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன்

CO2: தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன்

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

Theory Component

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக்கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன்

L:9

இந்திய மொழிக்குடும்பங்கள் - 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 - நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு - தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

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

CO2:தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன் **L:6**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி - இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிக்கல்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

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 - 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.

REFERENCES:

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

L: 15; TOTAL: 15 PERIODS

Course Code	MATHEMATICAL FOUNDATIONS FOR ENGINEERS	L	T	P	E	C
23SH12C	(Common to all B.E. / B.Tech. Degree Programmes)	3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

CO1: interpret the nature of quadratic form by orthogonal transformation.

CO2: identify the maxima and minima of functions.

CO3: solve ordinary differential equations.

CO4: find the solution of partial differential equations.

CO5: evaluate integrals of multivariate calculus.

Soft skill Component

CO6 : develop communication, problem solving and interpersonal skills

CO1: interpret the nature of quadratic form by orthogonal transformation. L:9, T:3

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors – Diagonalisation of a matrix by orthogonal transformation – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation and its nature; Cayley – Hamilton theorem (excluding proof) - Application: Stretching of a elastic membrane.

CO2: identify the maxima and minima of functions. L:9, T:3

Functions of two variables: Limit, continuity and partial derivatives; Total derivative, Jacobian, Taylor series- Application : Linearization of Non Linear systems using Taylor Series - Maxima and minima - Method of Lagrange multipliers.

CO3: solve ordinary differential equations. L:9, T:3

Solutions of first order ordinary differential equations - Equations solvable for 'p', equations solvable for 'y', equations solvable for 'x' - Solutions of higher order linear differential equations with constant coefficients – Cauchy's and Legendre's linear equations - Method of variation of parameters – Solution of simultaneous linear differential equation. Application RCL – circuit and Mass Spring System.

CO4: find the solution of partial differential equations. L:9, T:3

Formation of partial differential equations – Solutions of standard types of first order partial differential equations - Lagrange's linear equations - Solutions of homogeneous and Non homogeneous linear partial differential equations of second and higher order with constant coefficient – Application - Shallow wave equations of first order PDE.

CO5 : evaluate integrals of multivariate calculus L:9, T:3

Double integration – Cartesian and polar coordinates - Change of order of integration - Change of variables - Cartesian to polar coordinates - Area as double integral - Triple integration - Cartesian and polar coordinates – Change of Variables- Cartesian to spherical and cylindrical coordinates. Application – Moments and centers of mass.

TEXT BOOKS:

1. Grewal.B.S., Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2021.
2. James E. Gentle, Matrix Algebra, Springer International Publishing, 2nd Edition, 2017
3. Shanker Rao.G., Linear Algebra, WileyIndia, 1st Edition , 2017

REFERENCES:

1. Bali.N.P. and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications Private Limited, 10th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India, 10th Edition, 2017.
3. Kenneth B. Howell, Ordinary Differential Equations, CRC Press, 2020.
4. James Stewart, Daniel Clegg, Saleem Watson, Essential Calculus Early Transcendentals, Cengage Learning, 9th Edition, 2021.
5. Nanda Kumar A.K, P.S.Datti: Raju .K.George , Ordinary Differential Equations, Cambridge University press, 2017.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	INTRODUCTION TO ENGINEERING	L	T	P	E	C
23SH13C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES

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

Theory Component

CO1: articulate the importance of Engineering and its role in society through OBE framework

CO2: identify and describe academic pathways towards career settlement

CO1: articulate the importance of Engineering and its role in society through OBE framework

Engineering – An introduction, Classification of different Engineering Disciplines, Role of Engineers in Society. Graduate Attributes (GA), Program Specific Criteria (PSC)- Program Educational Objectives (PEO), Program Outcomes (PO), Course Outcomes (CO), Choice Based Credit System (CBCS), course categories, teaching and learning process, active and passive learning, project / problem based learning, different assessments process.

L:9

CO2: identify and describe academic pathways towards career settlement

Curriculum, cafeteria curriculum and self learning big picture of the Program and the significance of each course in the undergraduate Engineering Program, Discuss the different career paths for an engineering graduate. Career objective, competency requirement.

L:6

Case study: Each student has to interact with alumni mentors/seniors/faculty members/surf the internet and present a career path that inspires him/her at the end of the course

REFERENCES:

1. Quamrul H. Mazumder Introduction to Engineering, An Assessment and Problem Solving Approach, CRC Press, 1st Edition, 2016.
2. Saeed Moaveni, "Engineering Fundamentals an Introduction to Engineering", Cengage Learning, USA, 4th Edition, 2011.

L: 15; TOTAL: 15 PERIODS

Course Code	TECHNICAL ENGLISH	L	T	P	E	C
23SH14C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	2	0	2

COURSE OUTCOMES

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

Theory Component

CO1: apply the fundamental grammar rules in writing

CO2: utilizing phonetic transcription for pronunciation

Practical Component

CO3: apply the basic language skills in various aspects of communication

CO4: utilize technical terms and phrases in specific contexts

CO5: develop the pronunciation skill through various language components

CO6: distinguish different writing forms and interpret text through divergent thinking

CO7: develop effective reports with grammatical and language components

Soft skill Component

CO8: develop communication, team spirit, creativity and time management

CO1: apply the fundamental grammar rules in writing

**L:13,
P:26**

Parts of Speech - Word Formation using Prefix and Suffix - Sentence formation (Kinds of Sentences) - Tenses (Present, Past & Future tense) – Concord

CO3: apply the basic language skills in various aspects of communication

Diary Writing - Greeting and Self Introduction

CO4: utilize technical terms and phrases in specific contexts

Technical terms and extended definition - Essay Writing (Argumentative Essay and Analytical Essay) - Situational phrases & Conversation - Formal Letter Writing (Permission & Requisition letters)

CO6: distinguish different writing forms and interpret text through divergent thinking

Picture Description, Introduction to Reading Techniques (Skimming, scanning, inferring, predicting, Reading and Reviewing a book (Sci – Fi), E Mail Writing

CO7: develop effective reports with grammatical and language components

Listening and responding to general information (Business context) - Report Writing (Types, Structure, and Stages of report writing) - Checklist

CO2: utilizing phonetic transcription for pronunciation

L:2, P:4

Phonetics (Vowels & Consonants)

CO5: develop the pronunciation skill through various language components

Word Transformation from one form to another - Letter Writing (Informal) - Listening and responding to general information (General context)

TEXT BOOKS:

1. Paul V. Anderson, Technical Communication: A Reader - Centered Approach, Cengage Learning, 9th Edition, 2017.
2. Ravindra Nath Tiwari, Technical English-II, Shashwat Publication, 1st Edition, 2020.
3. Stephen D. Krashen, Principles and Practice in Second Language Acquisition. Pergamon, 1987.
4. Lester Kaufman and Jane Straus, The Blue Book of Grammar and Punctuation: An Easy-to Use Guide with Clear Rules, Real-World Examples, and Reproducible Quizzes, Wiley, 2021.
5. Wells H. G., The Time Machine, Penguin Classics, 2012.

REFERENCES:

1. Michael McCarthy, English Grammar: The Basics, Taylor & Francis, 2021.
2. Peter Lucantoni and Lydia Kellas, Cambridge IGCSE(TM) English as a Second Language Workbook, Cambridge University Press, 6th Edition, 2022.

L: 15; P: 30; TOTAL: 45 PERIODS

Course Code	ENGINEERING PHYSICS	L	T	P	E	C
23SH15C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	2	0	3

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

Theory Components:

CO1: identify the structural properties of crystalline materials

CO2: comprehend and apply the concepts of centre of mass and elasticity

CO3: explain thermodynamic parameters and fundamental laws and their application in various processes

CO4: illustrate the applications of different lasers and optical fibers

CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation

Practical Components:

CO6: compare the mechanical properties of the materials due to bending and torsion

CO7: analyze thermal conductivity of different bad conducting materials

CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Soft skill Component:

CO9: develop the team spirit and communication skill through group activities

CO1: identify the structural properties of crystalline materials **L:10**

Crystalline and amorphous materials - unit cell - primitive cell - crystal systems, Bravais lattices - Miller indices – interplanar distance – Characteristics of SC, BCC, FCC, HCP structures - Bragg's law - X-ray diffraction and its applications - Synthesis of crystalline materials

CO2: comprehend and apply the concepts of centre of mass and elasticity **L:6,**

CO6: compare the mechanical properties of the materials due to bending and torsion **P:10**

Multi-particle dynamics - Introduction - Center of mass (CM) – CM of continuous bodies -

Introduction to rigid bodies - translation - rotation – moment of inertia – theorems of moment of inertia – Torsional pendulum.

Elasticity – Stress - strain diagram and its applications - Moduli of elasticity and its relation - bending of beams - Bending moment – cantilever - theory and experiment - Uniform bending - theory and experiment – Non Uniform bending - I-shaped girders

CO3: explain thermodynamic parameters and fundamental laws and their application in various processes **L:6, P:8**

CO7: analyse thermal conductivity of different bad conducting materials.

Laws of thermodynamics – Thermo dynamical processes – Introduction to heat transfer – conduction - convection and radiation – thermal conductivity of good conductor –Radial flow of heat - Spherical shell method and cylindrical shell method – Thermal conductivity of poor conductor- Lee’s disc method– Applications - heat exchangers - refrigerators and ovens

CO4: illustrate the applications of different lasers and optical fibers **L:6,**

CO8: explore the light-matter interaction by the phenomenon of Interference and diffraction and photoelectric effect **P:6**

Lasers: Interaction of light with matter - Einstein coefficients and their relations – characteristics of laser - components of laser – Lasing action – Pumping methods – Types of Laser - Nd-YAG laser -semiconductor laser- Applications

Fiber optics: principle and classification of optical fibers – propagation of light in optical fiber - Numerical aperture and Acceptance angle – losses associated with optical fibers (Qualitative) – Fiber optic communication system - Applications - Displacement and pressure sensors – Endoscopy

CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation **L:6, P:2**

CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Planck’s radiation law - de-Broglie hypothesis – Matter waves - Heisenberg’s uncertainty principle – elementary proof – applications – Schrödinger’s time-dependent and time-independent wave equation – physical significance of wave function – Introduction to quantum tunneling - applications - particle in a one-dimensional box – tunneling microscope – quantum confinement in 0D, 1D, 2D systems - quantum computation

TEXT BOOKS:

1. Avadhanulu M. N., Kshirsagar P.G and Arun Murthy T.V.S, A Text book of Engineering Physics, S.Chand & Co, 11th Edition, 2018.
2. Kleppner D and Kolenkow R. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
3. Kenneth S Krane, Modern Physics, Wiley, 4th Edition, 2021.

REFERENCES:

1. Wolfson R., Essential University Physics, Volume 1 & 2, Pearson Education, 2nd Indian Edition, 2009.
2. Hitendra K. Malik, A.K.Singh, Engineering Physics, McGraw Hill Education, 2nd Edition, 2017.
3. Kyungwon An, Fundamentals of Laser Physics, World Scientific Publishing Company, 2023
4. Halliday D, Resnick R and Walker J, Principles of Physics, Wiley, 12th Edition, 2021.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	ENGINEERING CHEMISTRY	L T P E C
23SH16C	(Common to all B.E. / B.Tech. Degree Programmes)	2 0 2 0 3

COURSE OUTCOMES

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

Theory Component

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO2: apply the knowledge of corrosion to solve the industrial problems

CO3: describe the preparation, properties and their applications of smart materials in various sectors

CO4: describe the basic components and performance analysis of batteries

CO5: predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

Practical Component

CO6: estimate the amount of Ca^{2+} / Mg^{2+} , alkalinity and Chloride ion present in the water sample.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Soft skill Component

CO8: develop interpersonal, work ethics and communications skills for career settlement

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO6: estimate the amount of Ca^{2+} / Mg^{2+} , alkalinity and Chloride ion present in the water sample.

Introduction, sources and impurities in water, potable water specifications (as per WHO and BIS) - hardness-types-estimation of Ca^{2+} and Mg^{2+} ion in water by EDTA method. Alkalinity-types-determination of alkalinity of water -chronic daily intake - incremental life time risk - hazard quotient, hazard index, contamination factor - determination of chloride ion in water using Argentometric method-municipal water treatment- physical methods and chemical methods. Disinfection-internal conditioning - calgon and carbonate conditioning. Desalination-types-Reverse Osmosis (RO) process- Forward osmosis (FO) - electro dialysis - demineralization.

L:6, P:12

CO2: apply the knowledge of corrosion to solve the industrial problems.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Corrosion – mechanism of dry and wet corrosion-forms of corrosion– galvanic corrosion and differential aeration corrosion, crevice corrosion, pitting corrosion, microbial corrosion-stress corrosion, intergranular corrosion - determination of rate of corrosion by weight loss method.

L:6, P:6

Protection: cathodic protection, surface coatings, corrosion inhibitors. Corrosion of industrial components: corrosion and its control in power industries, automotive industries, chemical processing industries and marine industries.

CO3: describe the preparation, properties and their applications of smart materials in various sectors

Polymers: introduction - classification - functional polymers: electroluminescence polymer, biodegradable polymers, fire retardant polymer, thermo responsive polymer - piezo, ferro and pyroelectric polymer - nanocomposites: introduction, synthesis,

L:6

properties & applications- synthesis of nanocomposites using sol -gel process

CO4: describe the basic components and performance analysis of batteries

Introduction - components - operation principle - Lead acid – Nickel metal hydride batteries- Lithium ions batteries: Lithium polymer battery, Lithium sulphur battery - fabrication and performance evaluation- safety issues - battery management system - recycling of lithium batteries.

L:6

CO5:predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques.

Spectroscopy methods: Beer-Lambert’s law and its limitations– UV-visible spectroscopy and IR spectroscopy – principle - instrumentation– applications. Estimation of copper. Electro analytical methods: potentiometric titration - Estimation of Fe^{2+} ion by potentiometric method. Conductometric method- estimation of HCl by conductometric titration- pH metric method-Estimation of HCl by pH metric titration- applications. Thermal analytical methods: Thermal Gravimetric Analysis (TGA) and Differential Thermal Analysis (DTA)- Thermo Mechanical Analysis (TMA) –principle - instrumentation - Thermo gravimetric analysis of $CuSO_4 \cdot 5H_2O$ - applications.

L:6, P:12

TEXT BOOKS:

1. Jain P.C. and Jain M, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2021.
2. Dara S.S and Umare S.S, A Text Book of Engineering Chemistry, S.Chand & Company Limited, 20th Edition, 2018.
3. Agarwal S, Engineering Chemistry, Cambridge Publishing Company, 2nd Edition, 2019

REFERENCES:

1. Benjamin M. M, Water Chemistry, Waveland Press, 2nd Edition, 2019.
2. Cicek V, Corrosion Engineering, Springer Publishing, 1st Edition, 2021.
3. Shahinpoor. M, Fundamentals of Smart Materials, Publisher: Royal Society of Chemistry, 1st Edition, 2020.
4. Berg H, Bernhardsson S, and Johansson P, Electric Vehicle Batteries: Moving from Research towards Innovation, Publisher: Springer, 1st Edition, 2019.
5. Crouch S, Skoog D, Holler F, Principles of Instrumental Analysis, 2017.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	PROBLEM SOLVING TECHNIQUES	L	T	P	E	C
23CS11C	(Common to all B.E. / B.Tech. Degree Programmes)	3	0	2	0	4

COURSE OUTCOMES

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

Theroy Component

CO1: apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems

CO2:apply fundamental, sequential, conditional logic statements and arrays for solving basic problems

CO3: implement modular programming concept using user defined functions

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions

CO5: develop file processing application programs

Practical Component

CO6: develop programs for simple algorithms using sequential and Control structures

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

CO8: develop application programs using structures and files concept.

CO1: apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems L:6

Overview of programming: Problem Solving in Everyday Life, Types of Problem, Computer-based problem solving, Algorithms - Building blocks of algorithms (statements, control flow, functions) - Notation (pseudo code, flow chart) – Problem solving aspect – Top down design – Implementation of algorithms – Program Verification – Efficiency of algorithms – Analysis of algorithm.

CO2: apply fundamental, sequential, conditional logic statements and arrays for solving basic problems L:12, P:10

Data Types - Constants – Variables - Keywords – Operators– Problem Solving using fundamental algorithms. Control Statements: Branching and Looping - Algorithms Using Selection and Repetition - Summation of a set of numbers, Reversing Digits of an Integer - Implementation of fundamental algorithms and factoring methods - Array Techniques - Array order reversal, Array Counting, Finding maximum and the minimum value in a set

CO6: develop programs for simple algorithms using sequential and Control structures

Solve problems using control statements (Decision making and Looping)

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Problem solving based on Array Handling(1D and 2D, Multi-dimensional arrays, traversal, rotation) - Solve problems to handle strings

CO3: implement modular programming concept using user defined functions L:10, P:8

Modular Programming approach: Modularization and recursion - Bubble Sort, Selection Sort, Linear Search, Binary Search, Implementation of sorting and searching

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Solve problems by using modular approach (Functions and Recursion)

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions L:12, P:10

Pointer Concept – add numbers using call by reference – finding maximum number from list of numbers - permutations of a given string using pointers – Implementation of function returns a pointer;

Structures & Union - finding the largest element of an array using Dynamic Memory Allocation – Implementation of Student database in structure using Dynamic Memory

Allocation;

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Build efficient solutions to manage memory efficiently through Pointers.

CO8: develop application programs using structures and files concept.

Develop applications using Structures

CO5: Develop file processing application programs

L:5, P:2

File Handling: Files - Introduction, Types of file processing: Sequential access, Random access – Implementation of word count, copy file, Voter's age validation, Marks range validation

CO8: Develop application programs using structures and files concept.

Develop applications using Files

TEXT BOOKS:

1. Maureen Sprankle and Jim Hubbard, Problem Solving and Programming Concepts, Prentice Hall, 9th Edition, 2012.
2. R.G Dromey, How to solve it by Compute, Pearson education, Delhi, 2nd Edition, 2021.

REFERENCES:

1. Behrouz A. Forouzan, Richard F.Gilberg, P.Golda Jeyasheeli, G.Priyanka, S.T.Veena , Problem solving Using C A Structured Programming Approach, Volume I & II, 1st Edition, Cengage Publication, 2022
2. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, BCS Learning & Development Limited, 1st Edition, 2017.
3. Byron S. Gottfried, Jitendar Kumar Chhabra, Programming with C, Tata McGraw Hill Publishing Company, New Delhi, 4th Edition, 2018.
4. Kernighan B.W., Ritchie D.M., C Programming Language (ANSI C), Prentice Hall of India Private Limited., New Delhi, 2nd Edition, 2010.
5. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, New Delhi, 2018.
6. Yashavant P. Kanetkar, Let Us C, BPB Publications, 16th Edition, 2020
7. H. M.Deitel, P. J. Deitel, C How to Program, Pearson Education., New Delhi, 7th Edition, 2016.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	BASIC ELECTRICAL AND ELECTRONICS	L	T	P	E	C
23EE11C	ENGINEERING	3	0	2	0	4

COURSE OUTCOMES:

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

Theory Component

CO1: Demonstrate and explain the characteristic parameters of DC and AC circuits.

CO2: Explain the working of AC and DC machines.

CO3: Describe analog and digital instruments for monitoring and control.

CO4: Demonstrate the operation of electronic devices for applications.

CO5: Describe the purpose of safety standards and equipment.

Practical Component

CO6: Analyze the basic electric circuits and characteristics of electrical machines.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

CO8: Perform residential wiring and measure earth resistance.

CO1: Demonstrate and explain the characteristic parameters of DC and AC circuits L:9, P:6

Sources - Passive Elements – Electrical Quantities: Voltage, Current, Power and Energy. DC circuits: Ohms Law – Kirchhoff's Laws – Mesh analysis. AC Circuits: Waveforms, RMS, Peak, real power, reactive power and apparent power, power factor.

CO6: Analyze the basic electric circuits and characteristics of electrical machines

1. Verification of Ohms law & Kirchhoff law.
2. Measurement of power and power factor for R, L load

CO2: Explain the working of AC and DC machines

L:9, P:6

Machines: Construction, Types of DC motors – Working Principles – Need for Starters - AC Motors: Construction and Working of Single Phase and Three Phase Induction Motor– Servomotor -Stepper motor.

CO6: Analyze the basic electric circuits and characteristics of electrical machines

1. Analyze the characteristics of DC Shunt Motor and DC series motor
2. Distinguish the operation of single phase and three phase induction motor

CO3: Describe analog and digital instruments for monitoring and control

L:9, P:6

Analog instruments: Functional Elements, Principles: PMMC, MI, Electrodynamometer wattmeter – Digital voltmeter - multimeter – DSO – Digital Energy meter - Multifunction meter.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

1. Calibration of single phase energy meter using wattmeter
2. Measurement of AC signal parameter (Peak-Peak, RMS, Period and Frequency) using DSO

CO4: Demonstrate the operation of electronic devices for applications

L:9, P:6

Characteristics and applications: Diode – Rectifiers, Zener Diode – Regulators, BJT - Configuration, Amplifier – LEDs – Photo Diodes, Opto-Isolators.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

1. Experimental Verification of PN Junction diode as rectifier.
2. Experimental Verification of Zener Diode as Voltage Regulators.
3. Input and Output Characteristics of BJT in CE Configuration.

CO5: Describe the purpose of safety standards and equipment

L:9, P:6

Electric shock -Protection: PPE, Switches, Plug and Socket, Fuse, MCB, ELCB, MCCB and Earthing - Types of wires and cables - Energy storage devices - Inverters – UPS - Energy Consumptions and Battery Charging system – Electrical safety standards in IT industry – Schematic Electrical Layout of Computer Lab with battery backup.

CO8: Perform residential wiring and measure earth resistance

1. Measurement of Earth Resistance using Electrical Equipment.
2. Harness residential house wiring, staircase wiring and fuse connections

TEXT BOOKS:

1. D.P. Kothari and I J Nagrath, “Basic Electrical and Electronics Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. R.K.Rajput, “Basic Electrical and Electronics Engineering”, University Science Press, 2017.

REFERENCES:

1. Lionel Warnes, “Electrical and electronics engineering: Principles and practice, Palgrave Macmillan publication, 3rd Edition, 2003.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, Revision 1st Edition, 2011.
3. David Bell, “Electronic Devices and Circuits”, Oxford University Press, 5th Edition, 2008.
4. Mohamed A. El-Sharkawi, “Electric Safety Practice and Standards”, Taylor & Francis, 2013.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	தமிழரும் தொழில்நுட்பமும் (TAMILS AND TECHNOLOGY)	L	T	P	E	C
23SH21C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES

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

- CO1:** தமிழர்களின் நெசவு மற்றும் பாணைத் தொழில் நுட்பம், வடிவமைப்பு மற்றும் தொழில் நுட்பம், உற்பத்தித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.
- CO2:** தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.

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

- CO1:** Know and explain about Tamils weaving and Pottery technology, Design and construction Technology and Manufacturing Technology.
- CO2:** Know and explain about Tamils Agriculture and irrigation technology, Scientific Tamil and Tamil computing

CO1:தமிழர்களின் நெசவு மற்றும் பாணைத் தொழில் நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் L:9

தொழில் நுட்பம் மற்றும் உற்பத்தித் தொழில் நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன் சங்ககாலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிகப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்- சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக்கலை- கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத்தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடிமணிகள் - சுடுமண்மணிகள் - சங்குமணிகள் - எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

CO1:KNOW AND EXPLAIN ABOUT WEAVING AND CERAMIC TECHNOLOGY, DESIGN AND CONSTRUCTION TECHNOLOGY, MANUFACTURING TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW)– Graffiti on Potteries- 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- 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 – Gemstone types described in Silappathikaram.

CO2: தமிழர்களின் வேளாண்மை, நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் கணிணித் தமிழ் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.

L:6

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்குழுதித்தும் பின் முக்கியத்துவம் -கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்- அறிவியல் தமிழின் வளர்ச்சி - கணிணித் தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக்கல்விக்கழகம் - தமிழ் மின்நூலகம் - இணையத்தில் தமிழ்அகராதிகள் - சொற்குவைத் திட்டம்.

CO2: KNOW AND EXPLAIN ABOUT AGRICULTURE TECHNOLOGY, IRRIGATION TECHNOLOGY, SCIENTIFIC TAMIL & TAMIL COMPUTING

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thooppu 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- 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.

REFERENCE BOOKS:

1. தமிழகவரலாறு-மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணிணித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி-வைகைநதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநடை-ஆற்றுங்கரைநாகரிகம் (தொல்லியல் துறைவெளியீடு)
5. Social Life of Tamils(Dr.K.K.Pillay)A joint publication of TNTB & ESC and RMRL
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 InstituteofTamilStudies.)
9. Keeladi-Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology &Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Published by: The Author)

L: 15; TOTAL: 15 PERIODS

Course Code	APTITUDE ESSENTIALS	L	T	P	E	C
23GN01C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES:

Upon the completion of the course the students will be able to

CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly

CO2: Develop problem solving skills on Numbers and enhance arithmetic ability

CO3: Infer appropriate comparison and distribution methods using ratio and to form equations

CO4: Improve quantitative skills and solve problems on percentages and profit loss

CO5: Calculate data interpretation and data sufficiency in quantitative aptitude

CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly **L : 3**

Numeric series – Finding missing numbers – Odd number out series - Letter series – Symbol series - Alphanumeric series

CO2: Develop problem solving skills on Numbers and enhance arithmetic ability **L : 3**

Number Types - HCF & LCM – Square root- Cubic root - divisibility criteria- Unit digit calculation- Prime factors

CO3: Infer appropriate comparison and distribution methods using ratio and to form equations **L : 3**

Ratio & Proportion: Comparison of Ratios - Variations: Direct and indirect proportion
Ages: Present Age, Past Age & Future calculation

CO4: Improve quantitative skills and solve problems on percentage and profit loss **L : 3**

Concept of Percentage – Percentage calculation - Calculation of Percentage on Population Results on Depreciation .Profit and Loss –Percentage of Profit and Loss – Discount

CO5: Calculate data interpretation and data sufficiency in quantitative aptitude **L : 3**

Data Interpretation – Pie Chart – Bar Chart – Table Chart .Data Sufficiency in Logical Reasoning : Numbers, Ratio, Ages, Percentage and Profit Loss

REFERENCES:

1. Dr.R.Aggarwal, “ Quantitative Aptitude”, S Chand Publishing, Revised Edition 2017
2. R.V.Praveen, “Quantitative Aptitude and Reasoning” , 3rd Edition , Eastern Economy Edition, PHI Learning 2016

Video Materials

Profit Loss

<https://youtu.be/PpVO7I8dx6U>

https://youtu.be/cW7_BUDYcw

Number series

<https://youtu.be/4ZJfKFE2XU>

<https://youtu.be/83nJmniFmNk>

Numbers

<https://youtu.be/81pwuMJ8OIU>

https://youtu.be/VT_N9cacgl4

Square root and Cube root

<https://youtu.be/nJSqsaT0AgU>

<https://youtu.be/HyhW8P9KY>

Problems on Ages

<https://youtu.be/6PCTRVmu-ek>

https://youtu.be/eAl3BvO_Ipw

Data Interpretation

<https://youtu.be/s99rda8e0vc>

Course Code	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	E	C
23CS21C		3	0	0	0	3

COURSE OUTCOMES

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

Theory Component

CO1: apply the principles of number systems and logic gates to design digital circuits

CO2: design of combinational and sequential logic circuits for basic processing units

CO3: analyze the design of Asynchronous Sequential circuits

CO4: apply the concept of Programmable Logic Devices for the design of digital circuits

CO5: implement the Digital Logic circuits using VHDL and functions

CO1: apply the principles of number systems and logic gates to design digital circuits L:9

Number Systems and Codes - Binary Number system - Binary to decimal - decimal to binary – hexadecimal - ASCII code - Excess-3 Code - Gray code - Digital Logic - Basic Gates-Universal Logic Gates - Combinatorial Logic Circuits - Boolean Laws and Theorems-Sum of Products method - Truth table to Karnaugh Map - Don't Care Conditions

CO2: design of combinational and sequential logic circuits for basic processing units L:9

Arithmetic Circuits - Binary Addition and Subtraction - 2's Complement Representation– Data Processing Circuits - Multiplexers - Demultiplexers - Decoders - Encoders - Sequential Circuits - Flip-Flops -operation and excitation tables - Triggering of FF - Analysis and design of clocked sequential circuits - Moore/Mealy models - state minimization and state assignment- Design and analysis of sequential circuits

CO3:analyze the design of Asynchronous Sequential circuits L:9

Asynchronous sequential logic circuits - Stable and Unstable states - output specifications - cycles and races - state reduction - race free assignments - Hazards - Design and analysis of asynchronous sequential circuits

CO4:apply the concept of Programmable Logic Devices for the design of digital circuits L:9

Classification of memories - ROM organization – PROM – EPROM – EEPROM - RAM organization - Write operation - Read operation - Static RAM - Programmable Logic Devices - Programmable Logic Array (PLA) - Programmable Array Logic

CO5:implement the Digital Logic circuits using VHDL and functions L:9

Introduction to HDLs Library – Entity – Architecture - Modeling styles -Data flow modeling –Behavioral modeling - Structural modeling - Data objects - Concurrent and sequential statements - Design examples using VHDL for basic combinational and sequential circuits

TEXT BOOKS

1. M. Morris Mano, “Digital Logic and Computer Design”, 6th Edition, Pearson Education, 2018.
2. M. Morris Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2018.

REFERENCES

1. Thomas Floyd, "Digital fundamentals", 11th Edition, Pearson Education, 2021.
2. Stephen Brown, "Fundamentals of Digital Logic with Verilog", 2nd Edition, McGraw Hill, 2017.
3. John F.Wakerly, "Digital Design Principles and Practices", 5th Edition, Pearson Education, 2017.
4. James W. Bignel, Digital Electronics, 5th Edition, Cengage learning, 2013.
5. G. K. Kharate, "Digital Electronics", 2nd Edition, Oxford University Press, 2010.
6. R.P. Jain, "Modern digital electronics", 3rd Edition, 12th reprint TMH Publication, 2007.
7. Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2003

L: 45; TOTAL: 45 PERIODS

Course Code	DISCRETE MATHEMATICS	L	T	P	E	C
23CS22C		3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

- CO1: illustrate the validity of the arguments.
 CO2: analyze the concepts of Sets, Relations and Functions.
 CO3: perform the principles of counting and solve recurrence relations.
 CO4: interpret the basic concepts of graphs.
 CO5: compute minimum Spanning trees and shortest route for the graph.

CO1: illustrate the validity of the arguments.

Propositional Logic – Equivalences and Implications – Normal forms –Predicate Calculus and Quantifiers - Rules of inference – Proof methods and Strategies - Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

L:9,T:3

CO2: analyze the concepts of Sets, Relations and Functions

Basic Definitions - Set operations – Laws of set theory – Relations – Properties of relations - Partial Ordering Relation - Equivalence Relation - Matrices of relations - Closure of relations – Functions – Bijective functions - Inverse and Compositions of functions.

L:9,T:3

CO3: perform the principles of counting and solve recurrence relations.

Mathematical induction - Strong induction and well ordering -The basics of counting – The pigeonhole principle - Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions - Inclusion and exclusion principle.

L:9,T:3

CO4:interpret the basic concepts of graphs

Graphs and their properties - Special types of graphs – Matrix representation of graphs and graph isomorphism- connectivity, Cut vertex and cut edge - Euler and Hamiltonian graphs.

L:9,T:3

CO5: compute minimum Spanning Trees and shortest route for the graph

L:9,T:3

Trees – Some properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree – Rooted and Binary Trees - Spanning Trees- minimum spanning tree–Prim’s algorithm- shortest route - Dijkstra’s algorithm

TEXT BOOKS:

1. Kenneth H.Rosen, Discrete Mathematics and its Applications (with Combinatory and Graph Theory), Special Indian Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 7th Edition, 2017.
2. Tremblay J.P and Manohar.R. Discrete Mathematical Structures with Applications to Computer Science, 1st Edition, Tata McGraw-Hill Pub. Company Limited, New Delhi, 2017.
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, 1st Edition, Dover Publications Inc., 2016.

REFERENCES:

1. Ralph .P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition, Pearson Education Asia, Delhi, 2019.
2. Bondy,J.A., Murty.U.S.R., Graph Theory with applications, North Holland publication, 2008.
3. V.K.Balakrishnan, Schaum's Outline of Graph Theory, Tata Mc Graw-Hill Pub, 2020.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	PROFESSIONAL ENGLISH	L	T	P	E	C
23SH22C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	2	0	2

COURSE OUTCOMES

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

Theory Component

CO1: extend the primary language skills to develop critical thinking

CO2: build the secondary language skillsfor professional competence

Practical Component

CO3: apply the vital sub-functions of listening in particular context

CO4: take part in propagating ideas through effective oral communication

CO5: inferring information using various reading techniques

CO6: construct professional content via distinct methods of writing

Soft skill Component

CO7: develop interpersonal, communicational and behavioral attributes

CO1:extend the primary language skills to develop critical thinking

CO3: apply the vital sub-functions of listening in particular context

L:6,P:16

CO4: take part in propagating ideas through effective oral communication

If Conditionals – Standard Abbreviations – Types of Listening (Comprehensive, Informational, Critical Listening) – One Word Substitution, Components of Speaking
Listening for Specific Information – Listening to Speech (Oxford Union Society) –
Listening to Science Talks or Theories
Product Description – Chart Description – Process Description – Group Discussion
(Uses – Structure – Strategies – Team Work – Positive & Negative Body Languages –
Samples – Demo)

CO2: build the secondary language skills for professional competence

L:5,P:18

CO5: inferring information using various reading techniques

CO6: construct professional content via distinct methods of writing

Synonyms – Intensive and Extensive Reading – Error Spotting (Based on Concord, Pronoun, Articles & Adverb Placement) – Writing Style (Persuasive, Expository & Descriptive)

Newspaper Reading – Reading Comprehension (Fiction & NonFiction)

Business Letters for Quotations and Clarification, Placing Orders and Making Complaints – Proposal Writing – Job Application Letter & Resume Preparation – Paragraph Writing – Content Writing

TEXT BOOKS:

1. Lucantoni, Peter & Lydia Kellas. “English as a Second Language Workbook”, 6th Edition, Cambridge University Press, 2022.
2. Twain, Mark. “The Adventures of Tom Sawyer”, 1st Edition, Pegasus, 2012.
3. Clear, James. “Atomic Habits”, 1st Edition, Dreamliners, 2022.
4. Garcia, Hector & Francesc Miralles. Ikigai: The Japanese Secret to a long and Happy Life. 1st Edition, Tuttle Publishing, 2021.
5. Elbow, Peter, “Writing with Power” 2nd Edition, Oxford University Press, 1998.

REFERENCES:

1. Butterfield, Jeff. “Soft Skills for Everyone”. 2nd Edition, Cengage, 2020
2. Raman, Meenashi & Sangeetha Sharma. Professional English. 1st Edition, Oxford University Press, 2018

L: 11; P: 34; TOTAL: 45 PERIODS

Course Code	SEMICONDUCTOR AND QUANTUM PHYSICS	L	T	P	E	C
23CS23C		2	0	2	0	3

COURSE OUTCOMES:

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

Theory Component

CO1: explain the conductivity in metals using free electron theories

CO2: describe the fundamental properties of semiconductors

CO3: illustrate the optical properties and their applications to optical devices

CO4: apply the basics of sensing and imaging techniques in engineering and medical applications

CO5: apply the concepts of quantum mechanics in quantum computing

Practical Component:

CO6:determine the bandgap and hall coefficient of semiconductors

CO7: demonstrate the I-V characteristics of PN junction diodes

CO8: analyze the characteristics of light sensor

CO9: demonstrate the basic quantum computing using simulation

Soft skill Component:

CO10: develop a sense of teamwork and enhance communication abilities through collaborative group activities

CO1: explain the conductivity in metals using free electron theories

Conduction in metals - Classical free electron theory of metals – Mobility and electrical conductivity - Thermal conductivity of metals – Wiedemann-Franz law – Quantum free electron theory - Merits and limitations of free electron theory - Fermi-Dirac Statistics - Density of States.

L:6

CO2: describe the fundamental properties of semiconductors

CO6: determine the bandgap and hall coefficient of semiconductors

Energy band diagram - Direct and indirect band gap - Intrinsic semiconductors - Carrier concentration and Fermi level in an intrinsic semiconductor- Extrinsic semiconductors - Carrier concentration and Fermi level in N-type and P-type semiconductors - Hall effect – Determination of band gap and hall coefficient

L:6

P:8

CO3: illustrate the optical properties and their applications to optical devices

CO7: demonstrate the I-V characteristics of PN junction diodes

Classification of optical materials – Absorption emission and scattering of light in metals, insulators and semiconductors (quantitative) – Carrier generation and recombination - photocurrent in a P-N diode – Principle and working of solar cell - LED – Organic LED – Laser diodes - Photo diode – Determination of V-I Characteristics -Photoconductors - Optical data storage techniques.

L:6

P:12

CO4: apply the basics of sensing and imaging techniques in engineering and medical applications

CO8: analyze the characteristics of light sensor

Sensors - principle – working – bio sensors -LDR– Determination of V-I-Characteristics-wearable sensors in health care- Medical imaging techniques – ultrasound- Non destructive testing (NDT) - X ray –CT scan – MRI scan-FMRI Scan

L:6

P:4

CO5: apply the concepts of quantum mechanics in quantum computing

CO9: demonstrate the basic quantum computing using simulation

Introduction - Quantum confinement - Band gap of nanomaterials – Quantum tunneling – Quantum cellular automata - Quantum system for information processing - Quantum states – Classical bits – Quantum bits –CNOT gate - Multiple qubits – quantum gates – Fundamental quantum computing experiment using simulation software-Advantage of quantum computing

L:6

P:6

TEXTBOOKS:

1. S.O Pillai, Solid State Physics, 10th edition, NEW AGE International Publishers, 2022
2. Progress in Nanoscale and Low-Dimensional Materials and Devices, Hilmi Unlu and Norman

J M.Horing, Springer Link, 2022.

3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

REFERENCES:

1. Principles of Electronic Materials and Devices, S.O.Kasap, McGraw Hill Education, 2017.
2. Physics for Computer Science Students, N.Garcia, A.Damask and S.Schwarz, Springer-Verlag, 2012
3. Fundamentals of Nanoelectronics, G.W. Hanson, Pearson Education, 2009.
4. Optoelectronics. Pearson Education, J. Wilson and J.F.B. Hawkes, 2018.

L : 30; P : 30; TOTAL : 60 PERIODS

Course Code	ENGINEERING GRAPHICS	L	T	P	E	C
23ME11C	(Common to MECH, CIVIL, AIDS, EEE, IT)	2	0	4	0	4

COURSE OUTCOMES:

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

CO1: Construct the Engineering Curves and Perform Freehand Sketching.

CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina

CO3: Draw the Projections of Simple Solids in Different Positions.

CO4: Visualize the Sectional Views and Surface of Various Solids.

CO5: Draw the Isometric and Perspective Projections of Various Solids.

CO1: Construct the Engineering Curves and Perform Freehand Sketching.

L:6, P:12

Principles of Engineering Graphics – significance. Usage of Drawing Instruments. Lettering and dimensioning exercise Construction of ellipse, parabola and hyperbola using eccentricity method– Construction of cycloids, Epi and Hypo-cycloids. Orthographic views of simple components by Free hand drawing - Transferring measurement from the given object to the free hand sketches.

CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina

L:6, P:12

Principle of orthographic projections – Conventions - First angle and third angle projections. Projections of points placed in all quadrants – projections of straight lines – inclined to both reference planes - determination of true length and inclinations. Projections of regular polygonal surfaces and circular lamina inclined to both reference planes.

CO3: Draw the Projections of Simple Solids in Different Positions.

L:6, P:12

Projections of simple solids like prisms, pyramids, cylinder and cone - axis inclined to one reference plane - change of position method.

CO4: Visualize the Sectional Views and Surface of Various Solids.

L:6, P:12

Sectioning of simple solids – Axis perpendicular to horizontal plane- Drawing sectional views with true shape of the section. Development of lateral surfaces of truncated solids – Prisms, pyramids, cylinder and cone.

CO5: Draw the Isometric and Perspective Projections of Various Solids.

L:6, P:12

Principles of isometric projection – Isometric scale – Isometric projections of simple solids like prism, pyramid, cone and cylinder – Combination of solids. Perspective projections of simple solids by visual-ray method

TEXT BOOKS:

1. Bhatt N.D, “Engineering Drawing”, 54th Edition, Charotar Publishing House, 2023.
2. Shah M.B and Rana B.C, “Engineering Drawing”, Pearson Education, 2nd Edition, 2009.

REFERENCES:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Agrawal B. & Agrawal C.M., “Engineering Graphics”, TMH Publication, 2nd Edition, 2013
3. Narayana K.L. & Kannaiah P, “Text book on Engineering Drawing”, Scitech Publishers, 2011.
4. Gopalakrishna K.R, “Engineering Drawing”, Subhas Publications, 32nd Edition, 2017.

L: 30; P: 60; TOTAL: 90 PERIODS

Course Code	OBJECT ORIENTED PROGRAMMING IN C++	L	T	P	E	C
23CS24C	(Common to CSE, IT & ECE)	2	0	2	2	4

COURSE OUTCOMES

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

Theory Component

- CO1: apply the object oriented programming constructs to solve known applications
 CO2: design effective application with inheritance, compile time and run time polymorphism
 CO3: develop real-world applications by using files, streams, and exceptions
 CO4: construct well-defined, efficient data handling strategies using templates and STL

Practical Component

- CO5: demonstrate the basic OO principles such as class, objects, and constructors
 CO6: implement code reusability through overloading, inheritance and polymorphism
 CO7: solve problems using files and exception handling
 CO8: employ problem solving skill using templates and STL

Experiential Component

- CO9: create efficient solutions for solving real-world OOP applications

Soft Skill Component

- CO10: demonstrate diversity and inclusive attitude while practicing project component as a team

CO1: apply the object oriented programming constructs to solve known applications L:8;

CO5: demonstrate the basic OO principles such as class, objects, and constructors P:8;

Introduction- Comparison between procedural programming paradigm and object-oriented programming paradigm. Features of object-oriented programming. Functions - Inline functions- Friend functions. Arrays -Array of objects. Pointer - Function pointer. Memory management: New and Delete. Classes and Objects - Access specifiers, Types of classes-

Constructor and destructor - Types of constructor - Static members

CO2:design effective application with inheritance, compile time and run time polymorphism L:8;
P:8;

CO6:implement code reusability through overloading, inheritance and polymorphism E:10

Function Overloading, Overloading Constructors, Ambiguity in Overloading. Operator overloading - Overloading Using Friend Function- Overloading New and Delete- Overloading Special Operators. Inheritance – Types of Inheritance - Typing Conversions and Visibility – Code Reuse- Aggregation. Polymorphism- Virtual Functions – Pure Virtual Functions – Early vs. Late Binding. Run-Time Type ID and Casting Operators: RTTI – Casting Operators – Dynamic Cast.

CO3: develop real-world applications by using files, streams, and exceptions L:7;

CO7: solve problems using files and exception handling P:6;

Streams and Files: Streams classes - Sequential Input and Output operations – Random E:4

Access - File pointers - Error handling in file I/O with member function - command line arguments. Exception handling – expected and unexpected exceptions - uncaught exception - resource captures and release. Case study with real time applications.

CO4: construct well-defined, efficient data handling strategies using templates and STL L:7;
P:8;

CO8: employ problem solving skill using templates and STL E:8

Templates- Generic programming - variadic templates – template compilation model – Generic Classes. Standard Template Library: Iterators – Auxiliary Iterator function – Algorithms – Non-modifying sequence operations – mutating sequence operations – Containers: Sequence and associative containers - Algorithms, string class – explicit, mutable and operator keywords. Namespaces: user defined namespaces, namespaces provided by library

TEXT BOOKS:

1. Bjarne Stroustrup, “A Tour of C++”, 3rd Edition, Pearson Education, April 2023.
2. Herbert Schildt, “C++: The Complete Reference”, 4th Edition, Tata Mc-Graw Hill Publishers, 2017.

REFERENCES:

1. Reema Thareja, “Object oriented programming with C++”, Revised 1st Edition, Oxford University Press, 2018.
2. E.Balagurusamy, “Object oriented programming with C++”, 8th Edition, McGraw Hill Education (India) Private Limited, September 2020.
3. Ivor Horton, Peter van, “Beginning C++ 20 from novice to professional”, 6th Edition, APRESS media, 2020.
4. Bjin Andrist, Viktor Sehr, “C++ High Performance: Master the art of optimizing the functioning of your C++ code”, 2nd Edition, Packt Publishing Limited, December 2020.
5. Nicolai M.Josuttis and Doug Gregor, “C++Templates: The complete guide”, 1st Edition, Addison Wesley, 2020

ONLINE COURSES:

1. https://onlinecourses.nptel.ac.in/noc23_cs78/preview
2. <https://www.udemy.com/course/oops-and-c-from-basic-to-advanced>
3. <https://www.udemy.com/course/crash-course-on-cpp-stl/>

4. <https://www.coursera.org/lecture/c-plus-plus-b/1-3-standard-template-library-o3v9K>
5. <https://www.coursera.org/learn/object-oriented-cpp>

L:30; P:30; E:30; TOTAL: 90 PERIODS

Course Code	INNOVATION THROUGH DESIGN THINKING	L	T	P	E	C
23GN02C	(Common to all B.E. / B.Tech. Degree Programmes)	0	0	0	4	2

COURSE OUTCOMES

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

Experiential Component

CO1: Analyse the impact of design thinking process.

CO2: Practice design thinking process through real world problems.

Soft skill Component

CO3: Present survey conclusions on selected real-world problems.

CO1: Analyse the impact of design thinking process 30

Design thinking process: history and phases -Ideation tools: brainstorming, mind mapping, scrambler method, six thinking hats -case studies.

CO2: Practice design thinking process through real world problems 30

Real world problem selection-Practicing the preliminary stages of design thinking process - work presentation.

TEXT BOOKS:

1. Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, "Design Thinking: The Handbook", WS Professional, 2020
2. PavanSoni, "Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem solving", Penguin Random House, 2020

REFERENCES:

1. Michael Lewrick, "The Design Thinking Playbook", Wiley, 2019
2. Kathryn Christopher, "Design Thinking in Engineering", Kendall Hunt Publishing Company, 2019
3. Robert Curedale, "Design Thinking Process & Methods" Design Community College Inc, 5th Edition, 2019
4. David Lee, "Design Thinking in the Classroom", Ulysses Press, 2018
5. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
6. Monika Hestad Silvia Rigoni Anders Grnli, "The Little Booklet on Design Thinking: An Introduction", Zaccheus Entertainment, 2nd Edition, 2017
7. Scott Swan, Michael G.Luchs and Abbie Griffin, "Design Thinking: New Product Development Essentials", Wiley-Blackwell, 2016
8. D.M. Arvind Mallik, "Design Thinking for Educators", Notion Press, 2019

E:60; TOTAL:60 PERIODS

Course Code	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	E	C
23CS31C	(Common to CSE, IT and AI&DS)	3	0	0	0	3

COURSE OUTCOMES

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

Theory Component

CO1: apply the fundamental design techniques of a digital computer to execute simple arithmetic operations

CO2: relate the execution sequence of an instruction to design the datapath and control unit for a processor

CO3: analyze the hierarchical structure of various memory systems and assess the performance

CO4: relate various types of I/O interfaces and their functionalities

CO5: analyze the impact of hazards in pipeline performance by utilizing the different stages of instruction execution in a pipelined processor

CO1: apply the fundamental design techniques of a digital computer to execute simple arithmetic operations L:10

Functional units – Basic operational concepts – Bus Structures – Performance – Memory locations and addresses – Instructions and instruction sequencing – Addressing modes. Arithmetic: Addition and Subtraction of Signed Numbers – Design of fast adders – Multiplication of unsigned and signed numbers – Fast Multiplication – Integer division.

CO2: relate the execution sequence of an instruction to design the datapath and control unit for a processor L:8

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Instruction Fetch and Execution Steps – Control Signals – Hardwired control – Micro programmed control.

CO3: analyze the hierarchical structure of various memory systems and assess the performance L:8

Basic concepts – RAM – ROM – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Secondary storage devices.

CO4: relate various types of I/O interfaces and their functionalities L:8

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces – PCI, SCSI, SATA, USB – Advanced IO interfaces.

CO5: analyze the impact of hazards in pipeline performance by utilizing the different stages of instruction execution in a pipelined processor L:11

Basic concepts – Parallel processing – Instruction pipeline – Data hazards – Instruction hazards – Influence on instruction sets – datapath and control consideration – Super scalar operation – RISC vs CISC processors – Instruction Level Parallelism – Parallel IO Organization – IO in Multicore Computers.

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian, “Computer Organization and Embedded Systems”, McGraw Hill Higher Education, 6th Edition, 2022.
2. William Stallings, “Computer Organization and Architecture - Designing for Performance”, Pearson Education, 6th Edition, 2021.

REFERENCES:

1. David A. Patterson, John L.Hennessy, “Computer Organization and Design, The Hardware / Software Interface”, 6th Edition, Morgan Kaufmann/Elsevier, 2020.
2. M. Morris Mano, “Computer System Architecture”, 3rd Edition, Pearson Education, 2017.
3. John P. Hayes, “Computer Architecture and Organization”, 3rd Edition, Tata Mc-GrawHill, 2017.
4. Yan Solihin, “Fundamentals of Parallel Multicore Architecture”, CRC Press, 2015.
5. V.P. Heuring, H.F. Jordan, T.G.Venkatesh, “Computer Systems Design and Architecture”, 2nd Edition, Pearson Education, 2008.

ONLINE SOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_cs64/preview
2. <https://www.udemy.com/course/computer-organization-and-architecture-j/>

L: 45; TOTAL: 45 PERIODS

Course Code	DATA STRUCTURES	L	T	P	E	C
23CS32C	(Common to CSE & IT)	3	0	0	0	3

COURSE OUTCOMES

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

Theory Component

CO1: apply appropriate sorting and searching algorithms using list for solving real world problems.

CO2: apply appropriate linear data structures for different applications.

CO3: implement various tree operations that handle non linear data organization.

CO4: employ suitable indexing and hashing techniques for optimal data accessing.

CO5: implement various graph and its traversal techniques for solving network problems.

CO1: apply appropriate sorting and searching algorithms using list for solving real world problems. L:8

List ADT – Array based Implementation - Linked List Implementation – Singly linked list - Doubly linked list - Circular linked list – Applications of lists - Sorting –Insertion Sort – Merge Sort – Quick Sort – Searching – Linear Search – Binary Search – Fibonacci Search.

CO2: apply appropriate linear data structures for different applications. L:8

Stack ADT – Operations (using Array and Linked List) – Applications of Stack – Balancing symbols – Infix to postfix conversion – Evaluating postfix expression.

Queue ADT – Operations (using Array and Linked List) – Circular Queue – De-Queue – Application of Queues.

CO3: implement various tree operations that handle nonlinear data organization. L:10

Tree ADT – Basic Tree Terminologies – Types of Trees – Binary tree ADT – Operations – Tree Traversals – Expression Trees - Binary search Tree ADT – Threaded Binary Tree - AVL Trees - Splay Tree – Priority Queue (Heaps) - case study on parser.

CO4: employ suitable indexing and hashing techniques for optimal data accessing. L:10

Indexing: B Tree and B+ Tree: Definitions – algorithms - Hashing: Hash Function – Separate chaining – Open Addressing – Rehashing – Extendible hashing - Dictionary: Dictionary ADT - Implementation – Tries - Applications.

Disjoint Sets– Equivalence Relations - Dynamic Equivalence Problem – Smart union algorithms – Path compression – Applications of set

Case study on data structures in social media.

CO5: implement various graph and its traversal techniques for solving network problems. L:9

Graphs: Basic Terminologies and Representation – Types of graphs – Breadth first search – Depth first search – Bi-connectivity – Topological sort – Dijkstra’s algorithm – Network flow problem – Minimum Spanning Tree – Prim’s algorithm – Kruskal’s algorithm – LAN network – Travelling Salesman problem - case study on network protocols and social network analysis.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 4th Edition, Pearson Education, 2017.
2. R.G. Dromey, “How to Solve it by Computer”, 1st Edition, Prentice Hall International, 2011.

REFERENCES:

1. Langsam, Augenstein and Tanenbaum, “Data Structures Using C and C++”, 2nd Edition, Pearson Education, 2015.
2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, “Data Structures and Algorithms”, 5th Edition, Pearson, 2008.
3. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd Edition, Universities Press, 2022.
4. Kamthane, “Introduction to Data Structures in C”, First Edition, Pearson Education, 2007.
5. Kruse, “Data Structures and Program Design in C”, 2nd Edition, Pearson Education, 2006.

ONLINE SOURCES:

1. <https://people.ok.ubc.ca/ylucet/DS/Algorithms.html> - Data Structure Visualization tool
2. <https://nptel.ac.in/courses/106/102/106102064/> - NPTEL Lecture series

L: 45; TOTAL: 45 PERIODS

Course Code	OPERATING SYSTEMS	L	T	P	E	C
23CS33C	(Common to CSE, IT and AI&DS)	2	1	0	0	3

COURSE OUTCOMES

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

Theory Component

CO1: conceive the basic components and working principles of operating systems.

CO2: analyze CPU scheduling mechanisms for diverse scheduling criteria

CO3: devise the solutions for process synchronization issues.

CO4: relate various techniques for handling memory management.

CO5: apply file management and I/O management techniques.

CO1: conceive the basic components and working principles of operating systems. L:6;

Introduction to operating systems - Types of operating system - structure of OS – system calls and its types – system programs – Processes : Concept – Process scheduling – operations on processes – Threads : concept – multithreading models – Inter process communication – Processes and threads in Linux os-Free and Open source-**Overview: Windows, Linux, Mobile, Real-Time, and Robotic Operating Systems.** T:1

CO2: analyze CPU scheduling mechanisms for diverse scheduling criteria L:6;

CPU Scheduling – basic concepts – scheduling criteria – Preemptive and non preemptive scheduling algorithms: FCFS, SJF, Priority, Round Robin – scheduling in Real Time Operating System (RTOS) – Rate Monotonic (RM) scheduling algorithm – Least Laxity First (LLF) scheduling algorithm – **Simulation of process scheduling.** T:3

CO3: devise the solutions for process synchronization issues. L:6;

Process Synchronization – The Critical – Section problem – Peterson’s solution – Mutex locks – concurrency - Semaphores – Classic problems of synchronization – monitors. Deadlock: System model – deadlock characterization – Methods for handling deadlock – deadlock prevention – deadlock avoidance – banker’s algorithm – deadlock detection – recovery from deadlock. T:3

CO4: relate various techniques for handling memory management. L:6,

Memory management – Background – Swapping – Contiguous memory allocation – Segmentation – Paging – Segmentation with paging – Intel 32 and 64 bit Architectures-Virtual memory: Background – Demand paging – page replacement – algorithms: FIFO, LRU, Optimal-allocation of frames – thrashing-**Case Study on Redis page replacement approach.** T:4

CO5: apply file management and I/O management techniques. L:6,

File concept – Access methods – directory and disk structure – file system mounting – protection – File system implementation: Directory implementation – Allocation methods – Free space management. Disk scheduling – Algorithms: FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK – disk management. T:4

TEXT BOOK:

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, “Operating System Concepts”, Enhanced eText, 10th Edition , Wiley Asia Student Edition, 2018.

REFERENCES:

1. William Stallings, “Operating Systems: Internals and Design Principles”, 9th Edition, Prentice Hall of India, 2018.
2. Andrew S. Tanenbaum, Modern Operating Systems, Pearson, 4th Edition (2016).
3. Anderson, Thomas, and Dahlin, Michael. Operating Systems: Principles and Practice”, 2nd Edition, United Kingdom, Recursive Books, 2014.

https://onlinecourses.nptel.ac.in/noc22_cs104/preview

L: 30; T: 15; TOTAL: 45 PERIODS

Course Code	PROFESSIONAL ETHICS AND HUMAN VALUES	L	T	P	E	C
23GN05C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	0	0	2

COURSE OUTCOMES

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

CO1: Recognize and practice the core human values and theories related to ethical behavior.

CO2: Analyze the engineering ethical breach from past study.

CO3: Distinguish and apply safety, responsibility and rights in workplaces.

CO1: Recognize and practice the core human values and theories related to ethical behavior **L: 10**

Moral dilemmas and moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy –Case studies: Vigil mechanism, Whistle blowing - Protected disclosures - Personal ethics, work ethics and human values - Governing Regulation.

CO2 : Analyze the engineering ethical breach from past study **L: 10**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - Case study: The challenger disaster

CO3 : Distinguish and apply safety, responsibility and rights in workplaces **L: 10**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Collegiality and loyalty - respect for authority – confidentiality; Collective bargaining, Conflicts of interest - Case study; Occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination. Case studies: The Three mile island and Chernobyl disaster

TEXT BOOK

1. Mike W Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York, 5th Edition, 2022

REFERENCES

1. BehnamTaebi, “Ethics and Engineering: An Introduction”, Cambridge University Press, 2021
2. Ajesh Faizal, Aswathy S U, Roy V I, “Professional Ethics in Engineering: an Industry Perspective”, Noor Publishing, 2021
3. R.S.Naagarazan, “A Textbook on Professional Ethics and Human Values”, New age International Pvt. Ltd; 3rd Edition, 2022
4. Dr. P. Elamurugan, “Professional Ethics in Engineering”, Notion Press, 2021

L:30; TOTAL:30 PERIODS

Course Code	APTITUDE EXCELLENCE	L	T	P	E	C
23GN04C		1	0	0	0	1

COURSE OUTCOMES

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

CO1: Infer appropriate methods to simplify computation

CO2: Develop problem solving skills on Time and Work

CO3: Interpret fundamentals in quantitative techniques and solve problems quickly

CO4: Improve quantitative skills and solve problems on permutation and Combination

CO5: Acquire the knowledge of Cognitive ability and solve puzzles effectively

CO1: Infer appropriate methods to simplify computation

Simplification: BODMAS rule –Simplification algebraic expressions, techniques for mental calculation, approximation methods and quick estimation strategies **3**

CO2: Develop problem solving skills on Time and Work

Time and Work: Chain rule- Units method – efficiency ratio technique-work and wages – pipes and cisterns **3**

CO3: Interpret fundamentals in quantitative techniques and solve problems quickly

Time Speed Distance: Relation between speed and time –Speed ratio-Average speed-Effective speed - Data Sufficiency **3**

CO4: Improve quantitative skills and solve problems on permutation and Combination

Probability Permutation Combination: Fundamental Counting Principle – Computing Permutation – Circular Permutation – Computing Combinations - Data Sufficiency-Percentile **3**

CO5: Acquire the knowledge of Cognitive ability and solve puzzles effectively

Abstract reasoning: Mirror and water image – Figure Matrix –Pattern Completion-Graphing of Data - Logical puzzles – Dot situation - Ranking ordering. **Cognitive ability:** Blood Relation - Direction Sense Test-Data Sufficiency **3**

REFERENCES:

1. R.V.Praveen, “Quantitative Aptitude and Reasoning”, 3rd Edition, Eastern Economy Edition, PHI Learning 2016
2. Arun Sharma,” Quantitative Aptitude for CAT”, McGraw Hill Edge, 10th Edition 2022
3. Dr.R.Aggarwal, “ Quantitative Aptitude”, S Chand Publishing, Revised Edition 2017

L:15; TOTAL : 15 PERIODS

Course Code	PROBABILITY AND STATISTICS	L	T	P	E	C
23CS34C		3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

CO1: perform basic probability concepts and standard distributions.

CO2: find the correlation and regression of two dimensional random variables.

CO3: calculate the various measures of dispersion.

CO4: apply the concept of testing of hypothesis for small and large samples.

CO5: apply the basic concepts of classifications of design of experiments.

CO1:perform basic probability concepts and standard distributions

Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, and Normal distributions. **L:9,T:3**

CO2: find the correlation and regression of two dimensional random variables

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression - Transformation of random variables – Central Limit Theorem. **L:9,T:3**

CO3: calculate the various measures of dispersion

Central tendencies - Mean, median, mode - Measures of Dispersion–Mean deviation, and Quartile deviation - Carry out performance study on measures of central tendencies – Case Study through software –Moments – Skewness –Kurtosis - Correlation and Regression. **L:9,T:3**

CO4: apply the concept of testing of hypothesis for small and large samples

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on Chi-square distribution - Contingency table for independent of attributes – Goodness of fit. **L:9,T:3**

CO5: apply the basic concepts of classifications of design of experiments

Tests based on t and F distributions for mean, variance and proportion- One way and two way classifications - Completely randomized design – Randomized block design– Latin square design – 2^2 factorial design - Predict and validate the variances for design of experiments –Activity through software. **L:9,T:3**

TEXT BOOKS:

1. Richard A. Johnson, Irwin Miller, John Freund, Miller & Freund's, Probability and Statistics for Engineers, 9th Edition, Pearson Education Limited, Global Edition, 2017.
2. Grewal.B.S., Higher Engineering Mathematics, 44th Edition, Khanna Publications, Delhi, 2017.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2017.

REFERENCES:

1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia, 9th Edition, 2016.
2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, Schaum Outlines, Probability and Statistics, Tata McGraw Hill Edition, 2017.
3. Chapra, S.C and Canale, R. P. Numerical Methods for Engineers, 7th Edition, Tata McGraw Hill, New Delhi, 2016.
4. Jain R.K. and Iyengar S.R.K.,Advanced Engineering Mathematics, 5th Edition, Narosa Publishing House Private Limited, 2016.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	COMPUTER NETWORKS	L	T	P	E	C
23CS35C	(Common to CSE, IT)	3	0	2	0	4

COURSE OUTCOMES

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

Theory Component

- CO1: analyze the functionalities of various layers and network components
CO2: evaluate various access control mechanisms for error free data communication.
CO3: apply various flow, congestion control and routing algorithms for optimal path detection
CO4: analyze the performance of various application layer protocols

Practical Component

- CO5: design different network topologies using network simulation tool.
CO6: implement the various services of the data link and network layer.
CO7: demonstrate the protocols in application layer

CO1: analyze the functionalities of various layers and network components L:9;

Introduction– Networks Types – connection-transfer modes-Network Components: **P:6**
Devices and medium - Topology – Protocol Layering – TCP/IP protocol suite – OSI Model - Switching Networks – Network operating system: modes of operation

CO5: design different network topologies using network simulation tool

Representing a network- configure a network switch – Network troubleshooting
Commands- implement basic connectivity

CO2: evaluate various access control mechanisms for error free data communication. L:12; P:8

Data Link Layer – Framing – Flow control – Error control – Data Link Layer Protocols and standards – HDLC –PPP - Ethernet Basics-Media Access Control: Addresses-CSMA/CA-CSMA/CD – Virtual LAN – Wireless LAN (IEEE802.11).

CO6: implement the various services of the data link and network layer.

Implementation of Error Detection Techniques and framing methods-simulation of VLAN

CO3: apply various flow, congestion control and routing algorithms for optimal path detection L:15; P:10

Introduction - IPV4 Addresses –CIDR - Address Mapping - ARP, RARP, and DHCP- ICMP-NAT- IPv6 Addresses -Transition from IPV4 to IPV6 - Distance Vector Routing: RIP - Link State Routing: OSPF-TCP- Congestion control - Congestion avoidance-UDP-Datagram -Services- Applications.

CO6: implement the various services of the data link and network layer

Configuration of router interfaces -Demonstrate the ARP & RARP process in local and remote network-Implement routing protocols

CO4: analyze the performance of various application layer protocols L:9;

Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols **P:6**
(SMTP - POP3 - MIME) – DNS – SNMP

CO7: demonstrate the protocols in application layer

analyze the network traffic - Implement Chat application

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communication and Networking with TCP/IP suite, 6th Edition, McGraw Hill, 2022.
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, 6th Edition, Morgan Kaufmann Publishers Inc., 2021.

REFERENCES

1. Andrew S. Tenenbaum, Nick feamster, David J. wetherall, Computer Networks, 6th Edition, Pearson Education, New Delhi, 2022
2. James F. Kurose, Keith W.Ross, Computer Networking A Top-down Approach, 8th Edition, Pearson Education., New Delhi, 2022
3. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education, 2017.

ONLINE SOURCES

1. <https://nptel.ac.in/courses/106/105/106105081/www.nptel.ac.in>
<https://www.udemy.com/course/computer-networks-for-beginners-it-networking-fundamentals/>

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	DATA STRUCTURES LABORATORY	L	T	P	E	C
23CS36C	(Common to CSE & IT)	0	0	4	0	2

COURSE OUTCOMES

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

Practical Component

CO1: develop suitable sorting, searching, linear and nonlinear data structures for efficient data handling.

CO2: perform hierarchical searching problems using hash, heaps and graph algorithms.

CO1: develop suitable sorting, searching, linear and nonlinear data structures for efficient data handling. P:40

1. Implementation of Sorting and searching for various applications.
2. Implementation of Stack and Queue using Array and Linked List.
3. Applications of stack, Queue and Linked List.
4. Construction of Expression Tree.
5. Implementation of Binary Search Tree.
6. Implementation of Dictionary operations using AVL Tree.

Mini project

CO2: perform hierarchical searching problems using hash, heaps and graph algorithms. P:20

1. Implementation of Priority Queue using Heap structures.
2. Applications of Hashing techniques.
3. Applications of Graph algorithms.

Mini project

Software Requirements

- GNU C/C++ Compiler
- OS - Linux

P: 60; TOTAL: 60 PERIODS

Course Code	LINUX SYSTEM ADMINISTRATION	L	T	P	E	C
23CS37C	(Common to CSE, IT and AI&DS)	0	0	2	0	1

COURSE OUTCOMES

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

CO1:demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment

CO2:implement Shell Scripting

LIST OF EXPERIMENTS

Explore the LINUX Commands

P:6

- Directory
- File Manipulation
- General-purpose
- Network utilities
- Disk utilities
- Backup utilities and Filters

Shell Programming - Develop Shell script programs for the following:

P:10

- Interactive shell script
- Positional parameters
- Arithmetic
- If-then-fi, if-then-else-fi, & nested if-else
- Logical operators
- Else + if equals elif, case structure
- While & for loop
- Meta characters

Shell scripting for - Real world problem solving

P:14

- File Backup
- Text File Search
- Password Generator
- Disk Cleanup
- Memory Leak Detection
- Cache Management
- Swap Space Optimization

SOFTWARE REQUIREMENTS

Operating System: Linux (Ubuntu).

REFERENCES

- Venkateshmurthy, "Introduction To Unix And Shell Programming", 1st Edition, Pearson Publisher India, 2016.
- Behrouz A. Forouzan, Richard F. Gilberg, Unix and shell Programming, 1st Edition Thomson Publisher, 2013.
- Andrew S. Tanenbaum, Modern Operating Systems, 4th Edition, Pearson Education, 2014.
- Robert Love, Linux System Programming - Talking Directly to the Kernel and C Library, O'Reilly Media, 2013.

P: 30 TOTAL: 30 PERIODS

23GN03C	INTELLECTUAL PROPERTY RIGHTS STUDY	L	T	P	E	C
	(Common to all B.E. / B.Tech. Degree Programmes)	0	0	0	4	2

COURSE OUTCOMES

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

Experiential Component

CO1: Survey and practice the basic elements of existing patents.

CO2: Investigate and present the state of art technologies through effectual IP search.

Soft Skill Component

CO3: Present patent survey conclusions

CO1 Survey and practice basic elements of existing patents 30

Basic elements of IPR – claims – infringements – Patent examination and Report - Case studies: patent survey.

CO2 Investigate and present the state of art technologies through effectual IP search 30

Importance of IP search-factors to be considered for effective IP search-Hands-on Practice

REFERENCES

1. D.P. Mittal, “Indian Patents Law and Procedure”, Taxman Publication, 2002
2. B.L. Wadera, “Patents, trademarks, copyright, Designs and Geographical Judications”, 2010
3. P. Narayanan, “Intellectual Property Law”, Eastern Law House, 2022
4. N.S.Gopalakrishnan & T.G.Agitha, “Principles of Intellectual Property”, Eastern Book Company, Lucknow, 2009.

E:60 TOTAL:60 PERIODS