B.Tech. INFORMATION TECHNOLOGY

REGULATIONS – 2023

CHOICE BASED CREDIT SYSTEM

I to V SEMESTER

CURRICULA AND SYLLABI

COIMBATORE INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

B. TECH INFORMATION TECHNOLOGY

Regulation 2023

(Students admitted from 2023 - 2024 onwards)

CHOICE BASED CREDIT SYSTEM

VISION AND MISSION OF THE DEPARTMENT

Vision

Our Vision is to develop the department as a Centre of excellence in Information Technology by providing Quality Education, Successful Graduation, Employability skills and confident outlook towards Research and Development.

Mission

M1 Equip students with technical skills to meet the demands of modern technology and ability to solve real – world problems.

M2 Providing strong industry – institute interactions through industrial training, industry visits, internships and industry run courses.

M3 Nurture students to develop their career, life skills, and leadership skills.

Programme Outcomes (POs):

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

PO2 Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3 Design and development of solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

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PO4 Conduct investigations of complex problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5 Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6 The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7 Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8 Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9 Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10 Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11 Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

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Programme Educational Objectives (PEOs)

The following Programme Educational Objectives are designed based on the department Mission

PE01 Graduates of the IT program will be able to integrate the fundamental concepts and software engineering practices to develop practical solutions to complex technological problems

PE02 Graduates will possess excellent communications skills, team-based multi-disciplinary skills, problem solving and have an aptitude for understanding and solving societal real-world problem.

PE03 Graduates will be successful in advancing their careers, pursing graduate studies becoming an entrepreneur with the attributes of leadership skills, integrity, and awareness towards environment.

Program specific outcomes (PSOs)

PSO1 Design, develop, and implement software and IT solutions by applying programming skills, software engineering principles, and modern tools to meet industry and societal needs.

PSO2 Develop intelligent, data-driven, and context-aware IT solutions by using concepts from artificial intelligence, machine learning, big data technologies.

PSO3 Integrate emerging technologies like IoT, cloud computing, and embedded systems to innovate and contribute effectively in multidisciplinary teams or independent ventures.

Mapping PEOs, POs & PSOs

PEOs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
PEO1	3	3	3	3	3	2	1	2	2	2	2	3	2	2
PEO2	2	2	2	1	2	3	2	3	3	2	2	2	2	3
PEO3	2	1	2	1	2	2	3	3	2	3	3	2	2	3

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SEMESTER I							
S.No.	Course Code	Course Title	Contact Periods / week			Credits	Category
			L	T	P		
	Theory						
1	U23EGT01	Communicative English	3	0	0	3	HS
2	U23MAT01	Linear Algebra and Calculus	3	1	0	4	BS
3	U23CYT01	Engineering Chemistry	3	0	0	3	BS
4	U23CST01	Problem Solving and Programming in C	3	0	0	3	ES
5	U23ECT01	Basics of Electronics	3	0	0	3	ES
6	U23TAT01	Heritage of Tamils	1	0	0	1	HS
	Practical						
7	U23CYP01	Chemistry Laboratory	0	0	2	1	BS
8	U23CSP01	Problem Solving and Programming in C Laboratory	0	0	2	1	ES
9	U23CSO01	Professional Development	0	0	2	1	EEC
	Mandatory						
10	U23MTA01	Induction Programme	0	0	0	**0**	MC
		Total Periods:23	**16**	**1**	**6**	**20**	

SEMESTER II							
S.No.	Course Code	Course Title	Contact Periods / week			Credits	Category
			L	T	P		
	Theory						
1	U23MAT03	Discrete Mathematics	3	0	0	4	BS
2	U23PYT01	Engineering Physics	3	0	0	3	BS
3	U23CST02	Python Programming	3	0	0	3	ES
4	U23ECT02	Digital Principles and Computer Organization	3	0	0	3	ES
5	U23TAT02	Tamils and Technology	1	0	0	1	HS
6	U23EGT02	Professional English	3	1	0	3	HS
	Practical						
7	U23PYP01	Physics Laboratory	0	0	2	1	BS
8	U23CSP02	Python Programming Laboratory	0	0	2	1	ES
9	U23ECP01	Devices and Digital Circuits Laboratory	0	0	2	1	ES
10	U23MEP02	Engineering Drawing	0	0	4	2	ES
		Total Periods:27	**16**	**1**	**10**	**22**	

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SEMESTER III							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
	Theory						
1	U23MAT05	Probability and Statistics	3	1	0	4	BS
2	U23CST03	Data Structures	3	0	0	3	PC
3	U23ITT01	Object Oriented Programming with Java	3	0	0	3	PC
4	U23ITT02	Software Engineering Design	3	0	0	3	PC
5	U23ITT03	Web Essentials	3	0	0	3	PC
	Practical						
6	U23CSP03	Data Structures Laboratory	0	0	4	2	PC
7	U23ITP01	Object Oriented Programming with Java Laboratory	0	0	4	2	PC
8	U23ITP02	Software Engineering Design Laboratory	0	0	2	1	PC
9	U23ITP03	Web Essentials Laboratory	0	0	4	2	PC
	Mandatory Course						
10	U23MTA03	Wellness through Yoga and Ayurveda	2	0	0	0	MC
Total Periods: 32			**17**	**1**	**14**	**23**	

SEMESTER IV							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
	Theory						
1	U23CST10	Design and Analysis of Algorithms	3	1	0	4	PC
2	U23ITT04	Database Management System	3	0	0	3	PC
3	U23ITT05	Principles of Operating System	3	0	0	3	PC
4	U23ITT06	Data Communication and Networking	3	0	0	3	PC
5	U23OE---	Open Elective-I	3	0	0	3	OE
	Practical						
6	U23ITP04	Database Management System Laboratory	0	0	4	2	PC
7	U23ITP05	Principles of Operating System Laboratory	0	0	2	1	PC
8	U23ITP06	Data Communication and Networking Laboratory	0	0	2	1	PC
	Mandatory Course						
9	U23MTA__	Mandatory Course – II	2	0	0	0	MC
	Employability Enhancement Course						
10	U23EGS01	English Expertise and Career Moxie	0	0	2	1	EEC

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Total Periods: 28	**17**	**1**	**10**	**21**	

SEMESTER V								
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
	Theory						
1	U23ITT07	Foundations of Artificial Intelligence	3	0	0	3	PC
2	U23ITT08	Data Mining and Analytics	3	0	0	3	PC
3	U23ITT09	Web Frameworks	3	0	0	3	PC
4	U23ITV01	Data Science using Python	3	0	0	3	PE
5	U23OE151	Foundation of Electrical and Electronics for Computer Applications	3	0	0	3	OE
	Practical						
6	U23ITP07	Artificial Intelligence Laboratory	0	0	4	2	PC
7	U23ITP08	Data Mining and Analytics Laboratory	0	0	2	1	PC
8	U23ITP09	Web Frameworks Laboratory	0	0	4	2	PC
	Employability Enhancement Course						
9	U23ITO01	Summer Internship	0	0	0	1	EEC
10	U23ITO--	Industry Oriented Course – I	0	0	2	1	EEC
Total Periods: 27			**15**	**0**	**12**	**22**	

SEMESTER VI							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
	Theory						
1	U23MGT02	Principles of Management	3	0	0	3	HS
2	U23ITT10	Foundations of Machine Learning	3	0	0	3	PC
3	U23ITT11	Mobile Communication	3	0	0	3	PC
4	U23ITT12	Mobile and Web Application Development	3	0	0	3	PC
5	U23ITV---	Professional Elective – II	3	0	0	3	PE
6	U23ITV---	Professional Elective – III	3	0	0	3	PE
	Practical						
7	U23ITP10	Machine Learning Laboratory	0	0	4	2	PC
8	U23ITP11	Mobile and Web Application Development Laboratory	0	0	4	2	PC
	Employability Enhancement Course						

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9	U23ITJ01	Mini Project	0	0	4	2	EEC
10	U23ITO---	Industry Oriented Course – II	0	0	2	1	EEC
		Total Periods: 30	**18**	**0**	**14**	**25**	

SEMESTER VII							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
	Theory						
1	U23MGT03	Entrepreneurship Development	3	0	0	3	HS
2	U23ITT13	Network and communication Security	3	0	0	3	PC
3	U23ITT14	Distributed and Cloud Computing	3	0	0	3	PC
4	U23ITV---	Professional Elective – IV	3	0	0	3	PE
5	U2ITV---	Professional Elective – V	3	0	0	3	PE
6	U23ITV---	Professional Elective – VI	3	0	0	3	PE
	Practical						
7	U23ITP12	Network and communication Security Laboratory	0	0	2	1	PC
8	U23ITP13	Distributed and Cloud Computing Laboratory	0	0	2	1	PC
	Employability Enhancement Course						
9	U23ITJ02	Project Work Phase – I	0	0	6	3	EEC
		Total Periods: 28	**18**	**0**	**10**	**23**	

CAT - Category; BS - Basic Science; HS - Humanities and Social Science; ES - Engineering Science; PC - Professional Core; PE - Professional Electives; OE - Open Electives;
EEC - Employability Enhancement Course; MC – Mandatory Course

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SEMESTER VIII							
S.No.	Course Code	Course Title	Contact Periods / week			Credits	Category
			L	T	P		
	Employability Enhancement Course						
1	U23ITJ03	Project Work Phase – II	0	0	20	10	EEC
Total Periods: 20			0	0	20	10	

SUMMARY OF CREDIT DISTRIBUTION										
CAT	Credits /Semester								Total Credits	Percentage of total credits
	I	II	III	IV	V	VI	VII	VIII		
HS	4	4	0	0	0	3	3	0	14	8.48
BS	8	8	4	0	0	0	0	0	20	12.12
ES	7	10	0	0	0	0	0	0	17	10.30
PC	0	0	19	17	14	12	8	0	70	42.42
PE	0	0	0	0	3	6	9	0	18	10.91
OE	0	0	0	3	3	0	0	0	6	3.64
EEC	1	0	0	1	2	3	3	10	20	12.12
MC	0	0	0	0	0	0	0	0	0	0.00
Total	20	22	23	21	22	24	23	10	165	100.00

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PROFESSIONAL ELECTIVE COURSES – VERTICALS

VERTICAL-1	VERTICAL-2	VERTICAL-3	VERTICAL-4	VERTICAL-5	VERTICAL-6	VERTICAL-7
Data Science and Big Data Analytics	**Multimedia Technologies**	**IoT and Embedded Systems**	**Artificial Intelligence and Machine Learning**	**Network Management and Security**	**Full Stack Software Development**	**Cloud Computing and Data Center Technologies**
Data Science using Python	Computer Graphics	Introduction to Embedded Systems	Optimization Techniques in ML	Software Defined Network	UI/UIX Design	Virtualization Techniques
R Programming	Multimedia Programming	Embedded C and Microcontroller	Soft computing	Mobile Ad-hoc Network	Design Patterns and Dev ops	Storage Technologies
Data visualization	Multimedia Data Compression and Storage	Sensors and Actuators in IoT	Deep Learning	Next Generation Wireless Networks	Crafting Applications with .Net Frame work	Cloud Service Management
Big Data Technologies	Video Creation and Editing	IoT Communication Technologies	Natural Language Processing	Ethical Hacking	Advanced Java Programming	Cloud Automation
Exploratory Data Analysis	Visual effects (VFX)	IoT and its Application	Large Language Model	Cyber Forensics and Malware Analysis	Enterprise Application Development	Security and Privacy in Cloud
Health care Analytics	Game Design and Development	Real Time Operating Systems RTOS	Social Network Analysis	Privacy and Security in Social Media	Low-Code and No-Code Application Development	Serverless computing
Recommender systems	Augmented Reality and Virtual Reality with meta verse	Robotic process Automation	Computer vision	Block chain and cryptocurrency	Version Control Systems	Stream Processing

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PROFESSIONAL ELECTIVE COURSES

VERTICAL -1 DATA SCIENCE AND BIG DATA ANALYTICS							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV01	Data Science using Python	3	0	0	3	PE
2	U23ITV02	R Programming	3	0	0	3	PE
3	U23ITV03	Data visualization	3	0	0	3	PE
4	U23ITV04	Big Data Technologies	3	0	0	3	PE
5	U23ITV05	Exploratory Data Analysis	3	0	0	3	PE
6	U23ITV06	Health care Analytics	3	0	0	3	PE
7	U23ITV07	Recommender systems	3	0	0	3	PE

VERTICAL -2 MULTIMEDIA TECHNOLOGIES							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV08	Computer Graphics	3	0	0	3	PE
2	U23ITV09	Multimedia Programming	3	0	0	3	PE
3	U23ITV10	Multimedia Data Compression and Storage	3	0	0	3	PE
4	U23ITV11	Video Creation and Editing	3	0	0	3	PE
5	U23ITV12	Visual effects (VFX)	3	0	0	3	PE
6	U23ITV13	Game Design and Development	3	0	0	3	PE
7	U23ITV14	Augmented Reality and Virtual Reality with meta verse	3	0	0	3	PE

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VERTICAL -3 IOT AND EMBEDDED SYSTEMS							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV15	Introduction to Embedded Systems	3	0	0	3	PE
2	U23ITV16	Embedded C and Microcontroller	3	0	0	3	PE
3	U23ITV17	Sensors and Actuators in IoT	3	0	0	3	PE
4	U23ITV18	IoT Communication Technologies	3	0	0	3	PE
5	U23ITV19	IoT and its Application	3	0	0	3	PE
6	U23ITV20	Real Time Operating Systems RTOS	3	0	0	3	PE
7	U23ITV21	Robotic process Automation	3	0	0	3	PE

VERTICAL -4 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV22	Optimization Techniques in ML	3	0	0	3	PE
2	U23ITV23	Soft computing	3	0	0	3	PE
3	U23ITV24	Deep Learning	3	0	0	3	PE
4	U23ITV25	Natural Language Processing	3	0	0	3	PE
5	U23ITV26	Large Language Model	3	0	0	3	PE
6	U23ITV27	Social Network Analysis	3	0	0	3	PE
7	U23ITV28	Computer vision	3	0	0	3	PE

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VERTICAL -5 **NETWORK MANAGEMENT AND SECURITY**							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV29	Software Defined Network	3	0	0	3	PE
2	U23ITV30	Mobile Ad-hoc Network	3	0	0	3	PE
3	U23ITV31	Next Generation Wireless Networks	3	0	0	3	PE
4	U23ITV32	Ethical Hacking	3	0	0	3	PE
5	U23ITV33	Cyber Forensics and Malware Analysis	3	0	0	3	PE
6	U23ITV34	Privacy and Security in Social Media	3	0	0	3	PE
7	U23ITV35	Block chain and cryptocurrency	3	0	0	3	PE

VERTICAL-6 **FULL STACK SOFTWARE DEVELOPMENT**							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV36	UI/UIX Design	3	0	0	3	PE
2	U23ITV37	Design Patterns and Dev ops	3	0	0	3	PE
3	U23ITV38	Crafting Applications with .Net Frame work	3	0	0	3	PE
4	U23ITV39	Advanced Java Programming	3	0	0	3	PE
5	U23ITV40	Enterprise Application Development	3	0	0	3	PE
6	U23ITV41	Low-Code and No-Code Application Development	3	0	0	3	PE
7	U23ITV42	Version Control Systems	3	0	0	3	PE

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VERTICAL-7 CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23ITV43	Virtualization Techniques	3	0	0	3	PE
2	U23ITV44	Storage Technologies	3	0	0	3	PE
3	U23ITV45	Cloud Service Management	3	0	0	3	PE
4	U23ITV46	Cloud Automation	3	0	0	3	PE
5	U23ITV47	Security and Privacy in Cloud	3	0	0	3	PE
6	U23ITV48	Serverless computing	3	0	0	3	PE
7	U23ITV49	Stream Processing	3	0	0	3	PE

MANDATORY COURSES							
S.No.	**Course Code**	**Course Title**	**Contact Periods / Week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23MTA02	Essence of Indian Traditional Knowledge	2	0	0	0	IKS
2	U23MTA03	Wellness Through Yoga and Ayurveda	2	0	0	0	IKS
3	U23MTA04	Universal Human Values and Professional Ethics	2	0	0	0	UHV
4	U23MTA05	Gender, Culture and Development	2	0	0	0	Gender Sensitization
5	U23MTA06	Environmental Science	2	0	0	0	EVS
6	U23MTA07	Sustainable Development	2	0	0	0	SDG
7	U23MTA08	Disaster Risk Reduction and Management	2	0	0	0	SDG
8	U23MTA09	Vision for Humane Society	2	0	0	0	IKS

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OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENT							
S.No.	**Course Code**	**Course Title**	**Contact Periods / week**			**Credits**	**Category**
			L	**T**	**P**		
1	U23OE301	Introduction to Computer Networks	3	0	0	3	OE
2	U23OE302	Java architecture and Design	3	0	0	3	OE
3	U23OE303	Cloud Computing Technologies	3	0	0	3	OE
4	U23OE304	Health Informatics	3	0	0	3	OE
5	U23OE305	Information technology Essentials	3	0	0	3	OE

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Mapping of Course Outcome and Programme Outcome

Year	Sem	Course Title	Programme Outcomes (POs)											PSOs		
			1	2	3	4	5	6	7	8	9	10	11	1	2	3
I	I	Communicative English	✓	✓	✓	-	✓	-	-	-	-	✓	-	✓	✓	✓
		Linear Algebra and Calculus	✓	✓	✓	✓	-	-	-	-	✓	-	✓	✓	✓	✓
		Engineering Chemistry	✓	✓	✓	✓	-	✓	✓	-	-	-	-	✓	✓	✓
		Problem Solving and Programming in C	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
		Basics of Electronics	✓	✓	✓	-	-	-	-	-	-	-	-	✓	✓	✓
		Heritage of Tamils	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	✓
		Chemistry Laboratory	✓	✓	✓	✓	✓	✓	✓	-	✓	-	-	✓	✓	✓
		Problem Solving and Programming in C Laboratory	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
		Engineering Practices Laboratory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	II	Discrete Mathematics	✓	✓	✓	✓	-	-	-	-	-	✓	-	✓	✓	✓
		Engineering Physics	✓	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	-
		Python Programming	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
		Digital Principles and Computer Organization	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Tamils and Technology	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
		Professional English	✓	✓	✓	-	✓	-	-	-	✓	✓	-	✓	✓	✓

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		Physics Laboratory	✓	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓
		Python Programming Laboratory	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓	✓
		Devices and Digital Circuits Laboratory	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
		Engineering Drawing	✓	✓	✓	-	✓	-	-	-	-	✓	-	✓	✓	✓
II	**III**	Probability and Statistics	✓	✓	✓	✓	✓	-	-	-	✓	-	✓	-	-	-
		Data Structures	✓	✓	✓	✓	-	-	-	✓	✓	✓	-	✓	✓	✓
		Object Oriented Programming with Java	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
		Software Engineering Design	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
		Web Essentials	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
		Data Structures Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
		Object Oriented Programming with Java Laboratory	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
		Software Engineering Design Laboratory	✓	✓	✓	✓	✓	-	✓	-	✓	✓	✓	✓	✓	✓
		Web Essentials Laboratory	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
	IV	Design and Analysis of Algorithms	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
		Database Management System	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓

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		Principles of Operating System	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
		Data Communication and Networking	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
		Open Elective-I														
		Database Management Systems Laboratory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	✓
		Operating Systems Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
		Data Communication and Networking Laboratory	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
		English Expertise and Career Moxie	✓	✓	✓	-	✓	-	-	-	-	✓	-	✓	-	✓
III	**V**	Foundations of Artificial Intelligence	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	
		Data Mining and Analytics	✓	✓			✓						✓	✓	✓	
		Web Frameworks	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓
		Professional Elective – I (Data Science using Python)	✓	✓									✓	✓	✓	
		Open Elective – II (Foundations of Electrical and Electronics for Computer Applications)	✓	✓									✓	✓		✓
		Artificial Intelligence Laboratory	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓

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		Data Mining and Analytics Laboratory	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓
		Web Frameworks Laboratory	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓

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Semester I

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		L	T	P	C
U23EGT01	**COMMUNICATIVE ENGLISH (Common to ALL branches)**	**3**	**0**	**0**	**3**

Pre-Requisites : None

Objectives:

- To enhance learners' English Language Acquisition skills
- To facilitate learners to acquire effective technical writing skills
- To prepare learners for placement and competitive exams
- To facilitate effective English language skills for academic purposes and real-life situations

Course Outcomes: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
CO1	Analyze comprehension skills on technological contexts	**K4**
CO2	Summarize appropriate, paragraphs, essays effectively in personal and professional situation	**K5**
CO3	Examine technical writings skills such as grammar instructions, reports, data interpretation, professional letters	**K3**
CO4	Formulate effective speaking skills in various situations	**K6**
CO5	Experiment with variety of vocabulary by analyzing the meaning and language	**K4**

Course Contents

Unit I COMMUNICATIVE ENGLISH **9**

Introduction to Communicative English, **Reading**: Skimming and Scanning; Comprehensive questions (Multiple choice questions/ short questions/open - ended questions) **Speaking:** Self- introduction **Writing**: Formal and informal letters (Requisition, Complaint / Invitation /Accepting/ Declining/ Personal) Grammar: Parts of speech, Present Tense, **Vocabulary**: Synonyms/Antonyms, word formation, Prefixes /suffixes.

Unit II WORDS AND SENTENCES **9**

Reading: Reading biographies on famous scientists and personalities/ newspaper articles/ movie reviews **Speaking:** Travelog with pictorial video /PPT **Writing:** Single line and extended definitions, Data interpretation (Pie chart, Bar chart, Table, Flow chart) **Grammar:** Modal verbs, Voices, Past Tense **Vocabulary**: Compound words, One-word substitutions.

Unit III TECHNICAL COMMUNICATION **9**

Reading: Review on technology/gadgets, reading user manual, **Writing:** Writing Instructions; Recommendations **Speaking:** Pride activity (About hometown) **Grammar:** Cause and Effect, Prepositions, Future Tense **Vocabulary**: Phrasal Verbs, Collocations

Unit IV BUSINESS COMMUNICATIONS **9**

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Reading: Reading and understanding general and technical articles **Writing:** Report writing (Industrial visit report, Feasibility report), Checklist **Speaking:** Cultural and heritage of hometown, Dialogue writing and Telephonic conversation Grammar**:** WH questions, If conditionals **Vocabulary**: Abbreviation and Acronyms, Misspelt words.

Unit V PROFESSIONAL ENGLISH 9

Reading: Brochures, Scientific Blogs. **Writing:** Jumbled Sentences, Note-making **Speaking:** team task (role play) **Grammar:** Types of sentences, Possessive case **Vocabulary**: Homonyms/ Homophones.

Total Hours 45

Text Books:

1. "English for Engineers & Technologists", 2020, Orient Blackswan Private Ltd., Department of English, Anna University.
2. Dr. B. Vinoth & Prof.J. Oormila Heleena, "A workbook of Communicative English", 1st edition, 2023, Sri Krishna Hitech publishing company pvt., Coimbatore.
3. Ramalingam N, "Grammar for all", 2nd edition, 2013, Himalaya Publishing House.

Reference Books:

1. Norman Whitby, Business Benchmark Pre-intermediate to intermediate Personal Study Book BEC and BULATS Edition, 2006, Cambridge University Press,.
2. Anne Laws, Writing Skills, Summertown Publishing Oxford - U.K., 2011.
3. Sinha DK "Specimen of English Prose", 2012, Orient Black Swan., Hyderabad.
4. Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", 2009, Oxford University Press.
5. Raymond Murphy. "English Grammar and Use", 4th edition, 2004, Cambridge University Press.

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1. https://www.science.org/blogs
2. https://www.liveworksheets.com/worksheets/en
3. https://www.upsconline.nic.in/

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U23MAT01	LINEAR ALGEBRA AND CALCULUS (Common to ALL branches)	L	T	P	C
		3	1	0	4

Pre-Requisites : Concepts of basic matrices, differentiation and integration

Objectives:

To make the students

- Acquaint with the knowledge of vector space and its applications.
- Develop the use of matrix techniques for practical problems.
- Familiarize with functions of several variables.
- Understand the concepts of Gradient, Divergence and Curl through vector differentiation and integration.
- Interpret with mathematical tools needed in evaluating multiple integrals and their applications

Course Outcomes:
Upon completion of the course, students would be able to

		BT Level (highest level)
CO1	Understand the concepts of vectors to find the bases and dimensions.	**K2**
CO2	Apply the knowledge of matrices to solve the problems for respective areas of specialization.	**K3**
CO3	Analyze and model there all time problems using differentiation techniques	**K4**
CO4	Compute gradient, curl and divergence using vector differentiation and evaluate line integral, area and volume using vector integration.	**K3**
CO5	Evaluate the function to get the surface area and volume using multiple integrals.	**K3**

Course Contents

Unit I LINEAR ALGEBRA **9+3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

Unit II MATRICES **9+3**

Determinant- Cramer's rule-Eigen values and Eigen vectors of a real matrix-Properties-Cayley–Hamilton theorem(statement only)-Application-Elastic Membrane.

Unit III FUNCTIONSOFSEVERALVARIABLES **9+3**

Limits and Continuity (Geometrical interpretations) – Properties of continuous function – Partial derivatives-Totalderivatives-Jacobians-Taylor's series for two variables.

Unit IV VECTOR CALCULUS **9+3**

Gradient and directional derivative – Divergence and curl - Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Volume integral - Green's and Stoke's theorems.

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Unit V MULTIPLE INTEGRALS **9+3**

Double integration (Cartesian coordinates)-Region of integration-Triple integration in Cartesian coordinates- application of triple integrals.

Total Hours 60

Text Books:

1. James Stewart, "Calculus: Early transcendentals", 7th Edition, 2015, Cengage Learning, New Delhi.
2. Kreyszig. E, "Advanced EngineeringMathematics", 10th Edition, 2016, John Wiley and Sons (Asia) Ltd, Delhi.

Reference Books:

1. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", 5th Edition,2017, Narosa Publications, New Delhi.
2. Srimantha Pal and Bhunia. S.C., "Engineering Mathematics", 2015, Oxford University Press, India
3. Lay.D.C., "Linear Algebra and Its Applications", 5th Edition, 2015, Pearson Education, New Delhi

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		L	T	P	C
U23CYT01	**ENGINEERING CHEMISTRY (Common to CSE, CSE (CS), EEE, ECE, AI&DS and IT)**	**3**	**0**	**0**	**3**

Pre-Requisites : None

Objectives:

- Understand the requirements of Boiler feed water, its problems and water treatment methods.
- Conversant with the principles of Electrochemistry, corrosion and its prevention.
- Learn the principles and generation of energy in solar cells, fuel cells and batteries.
- Familiar with the preparation, properties and uses of polymers.
- Develop an understanding about nano materials and its applications.

Course Outcomes:
Upon completion of the course, students would be able to

		BT Level (highest level)
CO1	Adapt various water treatment process, which make it fit for industrial and domestic purpose.	**K3**
CO2	Choose suitable corrosion prevention techniques that can be adopted in their field of work.	**K3**
CO3	Examine various sources of energy and its storage in different batteries, which find its application in society including engineering fields.	**K3**
CO4	Identify polymers for various engineering applications and their characterization.	**K3**
CO5	Explain different methods involved in the synthesis of nanomaterials.	**K2**

Course Contents

Unit I WATER TECHNOLOGY 9

Hardness of water-types -expression-units-estimation of hardness of water by EDTA-numerical problems-boiler feed water-disadvantages of hard water in boilers-boiler troubles (scale & sludge, boiler corrosion)-water treatment-zeolite process, Ion exchange process-desalination-reverse osmosis-instrumental methods for water analysis-AAS, flame emission spectroscopy and photocolorimetry.

Unit II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell-reversible and irreversible cell-electrode potential-electrochemical series-Nernst equation (derivation and problems)-reference electrode-calomel electrode, ion selective electrode-glass electrode-emf -measurement of emf of a cell- Electrochemical sensors. Corrosion-types-chemical, electrochemical corrosion (galvanic, differential aeration)-corrosion control-sacrificial anodic method and impressed current cathodic protection method. Protective coatings -electroplating of gold and electroless plating of nickel-paints-constituents and functions.

Unit III ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources-types-nuclear energy-nuclear fission-controlled nuclear fission-nuclear fusion-nuclear reactor power generator-breeder reactor-solar energy-solar energy conversion-wind energy-Batteries - primary (alkaline battery) - Secondary (lead storage battery, NICAD battery and lithium ion battery) - Electric vehicles – working principles -Fuel cells (H_2-O_2 , direct methanol and solid oxide)-super capacitors.

Unit IV POLYMERS **9**

Polymers: functionality, degree of polymerisation, molecular weight M_n and M_w-classification-types of polymerisation-glass transition temperature-factors affecting Tg- industrially important polymers-preparation, properties and uses of PE, PET, PU, Nylon, epoxy resin-Printed circuit board-Flexible electronics – conducting polymers (intrinsic and extrinsic). Organic electronic materials (introduction only)-applications.

Unit V NANO MATERIALS **9**

Nano Chemistry: Basics-distinction between molecules, nanoparticles and bulk materials-preparation of nanoparticles by sol-gel-preparation of nanowires by electro spinning-preparation of carbon nanotube by chemical vapour deposition-quantum dots-synthesis by colloidal process- Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Total Hours 45

Text Books:

1. Jain P.C. and Monica Jain, “Engineering Chemistry”, 17th Edition, 2018, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
2. Palanna O.G, “Engineering Chemistry”, 2nd edition, 2017, McGraw Hill Education (India) Pvt. Ltd., Chennai.
3. Dara S.S, and Umare S.S, “Engineering Chemistry”, 2013, S. Chand & Company Ltd., New Delhi

Reference Books:

1. Murty B. S, Shankar P, Baldev Raj, Rath B.B and James Murday, 2018, “Text book of nanoscience and nanotechnology”, Universities Press-IIM Series in Metallurgy and Materials Science.
2. Sivasankar B, “Engineering Chemistry-Fundamentals and Applications”, 2008, Tata McGraw-Hill Publishing Company, Ltd., New Delhi.
3. Shikha Agarwal, “Engineering Chemistry” Second Edition, 2019, Cambridge University Press, New Delhi.

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1. https://archive.nptel.ac.in/courses/104/106/104106137/
2. https://archive.nptel.ac.in/courses /104/105/104105039/
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		L	T	P	C
U23CST01	**PROBLEM SOLVING AND PROGRAMMING IN C (Common to all branches)**	**3**	**0**	**0**	**3**

Pre requisites : None

Objectives:

- To understand problem solving methodologies.
- To provide an overview of concepts in C language.
- To develop C programs using Arrays and Strings
- To develop modular applications in C using Functions.
- To develop skills in using Pointers. Structures, Unions and File handling.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
C01	Apply problem solving techniques and basic C programming constructs.	**K3**
C02	Identify the appropriate conditional and looping statements for developing applications.	**K3**
C03	Use arrays and Strings to organize and process data effectively in applications	**K3**
C04	Apply Functions and Pointers to solve computational problems.	**K3**
C05	Develop applications in C using Structures, Unions and File processing.	**K3**

Course Contents

UNIT-I PROBLEM SOLVING FUNDAMENTALS 9

Fundamentals of Computing – Identification of Computational Problems -Problem solving- Flow Chart, Algorithm, Pseudo code – Introduction to C – Structure of a C program- Keyword- Identifiers - Data Types – Variables - Constants – Input/output statements Operators – Type Conversion and Type casting.

UNIT-II CONDITIONAL STATEMENTS AND LOOPING CONSTRUCTS 9

Conditional Branching Statements: if, if-else, else-if ladder, nested-if, switch constructs - Looping constructs: for, while, do-while constructs – Nested loops - Usage of break continue, return and go to statements.

UNIT-III ARRAYS AND STRINGS 9

1D Array –Declaration, Initialization, 2D Array - Declaration, Initialization – Operations on Arrays- Multi-dimensional Arrays, Strings: Declaration and Initialization - String operations: length, compare, concatenate, copy.

UNIT-IV FUNCTIONS AND POINTERS 9

Functions: Built-in Functions, User defined functions – Function Prototypes–Command Line Arguments -Arrays and Functions – Strings and Functions- Scope of Variables – Storage classes – Recursion- Pointers: Declaration – Pointer operators – Pointer expressions -Passing Pointers to a Function – Pointers and one-dimensional arrays – Pointers and Strings - Dynamic Memory Allocation.

UNIT-V STRUCTURES, UNIONS AND FILE HANDLING 9

Structure: Creating a Structure-Member initialization - Accessing Structure Members - Nested structures – Pointer and Structures – Array of structures - Self Referential Structures – typedef –Unions – Bit fields – Enumerated data types - Files- Opening and Closing a Data File, Reading and writing a data file- Pre-processor Directives

Total Hours 45

Text Books:

1. David Riley and Kenny hunt, "Computational Thinking for the Modern problem solver", 2014, Chapman & Hall, CRC.
2. SparnkleM, "Problem solving and programming concepts", 9th edition, 2011, Pearson Education, New Delhi.
3. ReemaThareja, "Programming in C", Second Edition, 2016, Oxford University Press.
4. Herbert Schildt, "C – The Complete Reference", 2017, Tata McGraw Hill Publishing Company, New Delhi.
5. Kernighan B. W. and Ritchie D. M., "C Programming Language (ANSI C)", 2015, Prentice Hall of India Private Limited, New Delhi.

Reference Books:

1. Deitel and Deitel, "C How to Program", 2011, Pearson Education, New Delhi.
2. Byron S. Gottfried and Jitendar Kumar Chhabra, "Programming with C", 2011, Tata McGraw Hill Publishing Company, New Delhi.
3. PradipDey and ManasGhosh, "Programming in C", 2009, Oxford University Press, New Delhi.

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2. https://www.udemy.com/topic/c-programming/
3. https://www.coursera.org/courses?query=c%20programming
4. https://alison.com/tag/c-programming
5. https://nptel.ac.in/courses/106105171

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U23ECT01	**BASICS OF ELECTRONICS** **[Common to CSE, IT, AIDS, CSE(CS)]**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-Requisites **:** High school Education & Physics.

Objectives:

- To understand diode and it's applications in clipping and clamping circuits, rectifiers.
- To be able to plot the current voltage characteristics of Transistors.
- To learn the use of semiconductor devices in designing the circuits.
- To provide the basic knowledge of special function diodes.
- To understand the concepts of operation amplifier.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Extract the semiconductor devices with the help of VI characteristics	**K2**
CO2	Relate biasing circuits for BJT analyze BJT circuits and oscillator.	**K3**
CO3	Relate the characteristics of amplifier circuits employing FET devices.	**K3**
CO4	Apply the concepts of basics Electronic devices to design various circuits.	**K3**
CO5	Use Operation amplifier circuits for various application.	**K3**

Course Contents

Unit I **PN-JUNCTION DIODE AND ITS APPLICATIONS** **9**

PN junction, Unbiased PN junction, Forward and Reversed biased condition, VI-characteristics of PN junction diode. Half and full wave rectifiers, Bridge rectifier (qualitative treatment only), Regulated power supply, Basic Clipper and Clamper circuits using diodes.

Unit II **BIPOLAR JUNCTION TRANSISTORS AND OSCILLATOR** **9**

Introduction, Transistor construction, operation and characteristics of CE, CB and CC configuration, DC load line and bias point, Induction to oscillators, RC phase shift oscillator, Wein bridge oscillator, Hartley oscillator, Colpitts oscillator using BJT and its Application.

Unit III **FIELD EFFECT TRANSISTORS** **9**

Junction field effect transistors (JFET), Comparison of BJT and FET, Characteristics of JFET- drain and transfer characteristics, MOSFETs - Depletion type MOSFET and Enhancement type MOSFET, Characteristics of MOSFET and Introduction to CMOS.

Unit IV **SPECIAL PURPOSE DIODES AND TRANSISTORS** **9**

Zener Diode, Light emitting diode (LED), Photo diode, Photo transistor, PIN diode, Varactor diode, Photo voltaic, Liquid crystal Displays, Opto-coupler.

Unit V **OPERATIONAL AMPLIFIER** **9**

Introduction to Integrated Circuits, Advantages and Disadvantages, Characteristics of an Ideal op-amp, Introduction of IC741, Inverting and Non-inverting op-amp circuits, Adder amplifier, Difference Amplifier, Voltage follower, Integrator and Differentiator.

Total Hours 45

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Text Books:

1. Kothari D.P and Nagrath I. J, “Basic Electronics”, 2014, McGraw Hill Education.
2. Boylestad R. L. and Nashelsky L, “Electronic Devices and Circuit Theory”, 2013, Pearson Education.

Reference Books:

1. David A. Bell, “Electronic Devices and Circuits”, 2008, 5th Edition, Oxford University Press.
2. Albert Malvino & David, “Electronic Principles”, 2007, Seventh edition Tata McGraw-Hill.
3. Boylestad R. L. and Nashelsky L, “Electronic Devices and Circuit Theory”, 2013, Pearson Education.

Web URL(s):

1. https://www.electronics-circuits.com
2. https://www.discovercircuits.com
3. https://www.projectcircuits.com
4. https://www.dmoz.org
5. https://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/rectifier-circuits/

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U23TAT01	HERITAGE OF TAMILS (Common to all branches)	L	T	P	C
		1	0	0	1

Pre-Requisites : None

Objectives:

To make the students to:

- Understand and appreciate the secular nature and ethical concepts of Sangam literature and the evolution of Tamil literature through different periods.
- Explore and analyze the traditional and modern art forms, including sculpture and folk arts, and their significance in Tamil culture and society.
- Evaluate the historical and cultural impact of Tamil heritage, including traditional sports, Agam and Puram theories, and the role of Tamil contributions in the Indian national movement and knowledge dissemination.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Understand the secular nature of Sangam literature and its ethical concepts.	**K2**
CO2	Apply knowledge of ancient and modern sculpture techniques to analyze various art forms.	**K3**
CO3	Evaluate the role of traditional sports in Tamil society and their impact on community life.	**K3**
CO4	Recognize the Agam and Puram theories from ancient Tamil texts.	**K2**
CO5	Assess the historical significance of Tamil printing and its role in the dissemination of knowledge.	**K3**

Course Contents

Unit I LANGUAGE AND LITERATURE **3**

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

Unit II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

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

Unit III FOLK AND MARTIAL ARTS **3**

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

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Unit IV THINAI CONCEPT OF TAMILS **3**

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

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

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

Total Hours 15

Text cum Reference Books:

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

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		L	T	P	C
U23CYP01	**CHEMISTRY LABORATORY (Common to ALL branches)**	**0**	**0**	**2**	**1**

Pre-Requisites : None

Objectives:

- To make the student to acquire practical skills in the determination of water quality parameters through Volumetric and instrumental analysis.
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, hardness, DO.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.
- To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Examine the water quality parameters for domestic and industrial purposes.	**K3**
CO2	Quantitatively analyse the amount of metal ions by spectroscopic techniques.	**K3**
CO3	Practice electroanalytical technique to determine the ions in solution.	**K3**

List of Experiments

1. Estimation of Total, Temporary and Permanent Hardness of Water Sample by EDTA method.
2. Determination of DO content in Water by Winkler's method.
3. Determination of strength of acids in a mixture using conductivity meter.
4. Determination of strength of acid in a base using conductivity meter.
5. Determination of strength of an acid using pH meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Determination of molecular weight and degree of polymerisation of a polymer (PVA) by viscometric method.
8. Estimation of Iron in a given sample by photo colorimetry.

Total Hours 30

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U23CSP01	**PROBLEM SOLVING AND PROGRAMMING IN C LABORATORY (Common to ALL branches)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Pre-Requisites : None

Objectives:

This Course aims to develop comprehensive competence in C programming by practising problem solving skills.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Utilize C programming constructs to develop efficient programs.	**K3**
CO2	Develop robust programs incorporating arrays, strings, functions and pointers.	**K3**
CO3	Design and implement structured, efficient and error-free C programs.	**K6**

LIST OF EXPERIMENTS:

1. I/O statements, operators, expressions.
2. Decision-making constructs: if-else, go to, switch-case, break-continue.
3. Loops: for, while, do-while.
4. Arrays: 1D and 2D, multi-dimensional arrays.
5. Strings: Operations.
6. Functions: call, return, passing arrays to function, Passing string to functions, Recursion.
7. Pointers: Pointers to Functions, Arrays and Strings, Passing parameters to functions.
8. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
9. Files: reading and writing, File pointers, File operations, Preprocessor directives.
10. Mini project.

Total Hours 30

Reference Books:

1. ReemaThareja, “Programming in C”, 2nd Edition, 2016, Oxford University Press.
2. Herbert Schildt, “C – The Complete Reference”, 2017, Tata McGraw Hill Publishing Company, New Delhi.
3. Kernighan B. W. and Ritchie D. M., “C Programming Language (ANSI C)”, 2015, Prentice Hall of India Private Limited, New Delhi.
4. Deitel and Deitel, “C How to Program”, 2011, Pearson Education, New Delhi.
5. Byron S. Gottfried and Jitendar Kumar Chhabra, “Programming with C”, 2011, Tata McGraw Hill Publishing Company, New Delhi.
6. PradipDey and ManasGhosh, “Programming in C”, 2009, Oxford University Press, New Delhi.

Web URL(s):

1. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

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		L	T	P	C
U23EEP01	**ENGINEERING PRACTICES LABORATORY (Common to EEE, MCT, MECH, CIVIL branches)**	**0**	**0**	**4**	**2**

Pre-Requisites : None

Objectives: To make the students to

- Gain the basic knowledge of measuring the components and to know about the usage of appropriate tools and equipment used in welding, plumbing and carpentry
- Impart knowledge about different types joints in welding, carpentry and plumbing.
- Understand working methodologies of lathe machine and sheet metal processes.
- Impart knowledge in electrical wiring concepts for house hold and calculations of power and energy.
- Familiarize with various electronic components and equipment.
- Learn the basic skills of soldering electronic components and wires.

Course Outcomes:

	Upon completion of this course, students will be able to	**BT Level (highest level)**
CO1	Demonstrate the ability to measure basic dimensions of mechanical components and join metals using arc welding.	**K3**
CO2	Construct models in sheet metal and perform basic machining operations on a lathe, utilizing proper tools for plumbing and carpentry.	**K3**
CO3	Assemble joints related to carpentry and plumbing work.	**K3**
CO4	Perform basic home electrical works and measure electrical quantities.	**K3**
CO5	Utilize knowledge of various electronics components and equipment.	**K3**
CO6	Demonstrate soldering practices.	**K3**

List of Experiments:

MECHANICAL AND CIVIL ENGINEERING PRACTICES

1. Measurement of mechanical components using Vernier Caliper and Vernier Height Gauge.
2. Measurement of diameter of mechanical components using Micrometer.
3. Sheet Metal Works: Model making – like Rectangular Tray.
4. Hands-on-exercise on Lathe machine: Facing, Simple Turning and Step Turning
5. Hands-on-exercise on Drilling Machine: Drilling of holes in a component.
6. Preparation of butt joint, lap joint and T- joint by metal arc welding.
7. Study of plumbing tools and equipment
8. Hands-on-exercises in Plumbing: Basic pipe connection using different types of joints and components required for residential and industrial buildings.
9. Hands-on-exercises in Carpentry: Wood work joints using conventional and power tools.
10. Assembling and dismantling of simple mechanical products.

Total Hours 30

ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

1. Basic switch board wiring with switch to connect three pin socket, Two Lights and Indicator Lamp.
2. Staircase wiring.
3. Measurement of Voltage, Current, Power and calibration of Single-phase Energy meter.
4. Fluorescent Lamp wiring with introduction to CFL and LED types.
5. Measurement of AC Signal parameters using CRO and Function Generator.

6. (i) Measurement of DC & AC Voltage, Continuity using Digital Multimeter.
   (ii) Measurement of Inductor and Capacitor using LCR Meter.
7. Soldering of Electronic components in PCB.
8. Study of Megger, Circuit Breakers, DC Regulated power supply and DSO.

Total Hours 30

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Semester II

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U23MAT03	DISCRETE MATHEMATICS (Common to CSE, CSE(CS), IT and AI&DS)	L	T	P	C
		3	1	0	4

Pre-Requisites : Concepts of Logic and group theory

Objectives:

To make the students

- Equip with logical and mathematical maturity to solve the problems.
- Understand the concepts of permutation and combination for scenario-based problems.
- Familiarize the applications of algebraic structures.
- Represent the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering.
- Interpret the basic concepts of graph theory in the field of computer science.

Course Outcomes:
Upon completion of the course, students would be able to

		BT Level (highest level)
CO1	Interpret simple mathematical proofs and have substantial experience to comprehend formal logical arguments.	**K3**
CO2	Apply basic counting techniques to solve Combinatorial problems.	**K3**
CO3	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.	**K3**
CO4	Distinguish the homomorphism between the Lattice and Boolean Algebra and application of switching circuits.	**K3**
CO5	Apply the concepts and properties of graph theory.	**K3**

Course Contents

Unit I LOGIC AND PROOFS **9+3**

Statements- Truth Tables-connectives- Normal forms- predicate Calculus- Inference theory for statement calculus and Predicate Calculus.

Unit II COMBINATORICS **9+3**

Review of Permutation and combination- Mathematical Induction- Pigeon hole principle- Principle of inclusion and exclusion- generating function- Recurrence relations.

Unit III ALGEBRAIC SYSTEMS **9+3**

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

Unit IV LATTICES AND BOOLEAN ALGEBRA **9+3**

Partial ordering- Posets- Hasse diagram- Lattices- properties of Lattices- Sub Lattices- Special Lattices- Boolean Algebra- Application with simple logic circuits**.**

Unit V GRAPHS **9+3**

Introduction to Graphs, Graph terminology, Directed and Undirected Graphs, Matrix representation

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of graphs, Graph Isomorphism, connectivity – Euler and Hamilton Paths- application-Dijkstra's shortest path algorithm.

Total Hours 60

Text Books:

1. Kenneth H.Rosen., "Discrete Mathematics and its applications", 7th Edition ,2017, , Tata Mcgraw Hill Pub . Co,Ltd ,New Delhi.
2. Tremblay. J.P. and Manohar. R., "Discrete Mathematical Structures with Applications to Computer Science", 30th Edition ,2011, Tata McGraw Hill Pub. Co. Ltd, New Delhi.

Reference Books:

1. Thomas Koshy., "Discrete Mathematics with applications",7th edition, 2011, Tata Mcgraw Hill Pub . Co,Ltd., New Delhi.
2. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", 3rd Edition, 2010, Schaum's Outlines, McGraw Hill Education Pvt. Ltd, New Delhi.
3. Grimaldi. R.P.., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition 2013, Pearson Education, New Delhi.

Web URL(s):

1. https://archive.nptel.ac.in/courses/106/108/106108227/
2. https://archive.nptel.ac.in/courses/111/107/111107058/
3. https://archive.nptel.ac.in/courses/106/103/106103205/

U23PYT01	ENGINEERING PHYSICS (Common to CSE, CSE (CS), EEE, ECE, IT and AI&DS)	L	T	P	C
		3	0	0	3

Pre-Requisites : None

Objectives:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves.
- Gain the knowledge on magnetic and super conducting properties of materials.
- Know about the quantum mechanics and its applications.
- Learn the principles of Laser and optical communication.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Apply the important concept of mechanics.	**K3**
CO2	Use their knowledge in electromagnetic waves.	**K3**
CO3	Complete knowledge on magnetic properties of materials, superconducting properties of materials and their applications.	**K3**
CO4	Understand about basic quantum physics and apply the concept of quantum physics in electron microscope.	**K3**
CO5	Explain the types of laser, optical fiber and apply them in optical communication.	**K3**

Course Contents

Unit I MECHANICS **9**

Basic definitions – Multi–particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Types of motion– Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy – moment of inertia– torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule – torsional pendulum.

Unit II ELECTROMAGNETIC WAVES **9**

Basic definitions: Gauss law for electric field, Faraday's law and Ampere's circuit law – Maxwell's equations – Derivation of Maxwell's Equations – wave equation: Plane electromagnetic waves in vacuum – properties of electromagnetic waves in vacuum: speed, amplitude, phase, orientation and waves in matter – Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure.

Unit III MAGNETIC MATERIALS AND SUPERCONDUCTIVITY **9**

Introduction – Types of magnetic materials: Dia, Para and Ferromagnetism–domain theory of Ferromagnetism –hysteresis – Ferrites and application of Ferrites.

Superconductivity: Properties of Superconductor – Type I& Type II Superconductor. Application of Superconductor: Josephson junction – SQUID – Magnetic levitated Train.

Unit IV QUANTUM PHYSICS **9**

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Black body radiation(quantitative) – Compton effect: theory and experimental verification– matter waves – properties of matter waves –concept of wave function and its physical significance – Schrodinger's wave equation – time independent and time dependent equations –particle in a one–dimensional rigid box. Electron microscope– Scanning electron microscope.

Unit V LASER AND FIBER OPTICS 9

Lasers principles – Properties of Laser – Einstein's A and B coefficients derivation – Population inversion – resonant cavity– Types of Laser: He–Ne Laser – Semiconductor lasers – homo junction and hetero junction.

Fiber optics: principle, numerical aperture and acceptance angle – types of optical fibers (material, refractive index, and mode). Fiber optic communication.

Total Hours 45

Text Books:

1. Kleppner D and Kolenkow R, "An Introduction to Mechanics",2017, McGraw Hill Education (Indian Edition),New Delhi.
2. Purcell E M and Morin D J, "Electricity and Magnetism",2013, Cambridge Univ.Press.United Kingdom.
3. Bhattacharya DK and Poonam Tandon, "Engineering Physics", 2015, Oxford University Press,New Delhi.

Reference Books:

1. Wolfson R, "Essential University Physics". Volume 1 & 2, 2009, Pearson Education (Indian Edition), New Delhi.
2. Halliday D, Resnick R and Walker J, "Principles of Physics",2015, Wiley (Indian Edition),New Delhi.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S,"Concepts of Modern Physics",2017, McGrawHill (Indian Edition), New Delhi.

Web URL(s):

1. http://nitttrc.edu.in/nptel/courses/video/115104094/115104094.html
2. http://nitttrc.edu.in/nptel/courses/video/115101005/115101005.html
3. https://archive.nptel.ac.in/courses/115/105/115105131/
4. https://archive.nptel.ac.in/courses/115/102/115102124/

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U23CST02	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

Pre requisites : None

Objectives:

- To understand and apply fundamental Python programming concepts.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To know the basics of object-oriented programming concepts.
- To do input/output with files in Python.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
C01	Develop python programs using appropriate data types and control structures.	**K3**
C02	Utilize and manipulate Python data structures like lists, tuples, sets, and dictionaries.	**K3**
C03	Design and implement functions, modules, and packages for structured Python programming.	**K3**
C04	Articulate the Object oriented programming concepts used in Python.	**K3**
C05	Develop Python applications with file handling, command-line programming, and exception handling.	**K3**

Course Contents

UNIT I BASICS OF PYTHON PROGRAMMING **9**

Introduction to Python - Python Interpreter – Data types - variables - expressions -statements- Operators and Expressions – Strings – Decision control statements.

UNIT II PYTHON DATA STRUCTURES **9**

Sequence - Lists - Functional Programming – Tuples – Sets- Dictionaries.

UNIT III FUNCTIONS, MODULES AND PACKAGES **9**

Functions – Definition – Call - Variable scope and Life time – Return- Lamda Functions- Recursive functions- Modules – Packages.

UNIT IV OBJECT ORIENTED PROGRAMMING **9**

Object-Oriented Concepts and Terminology - Classes and objects - Attributes and Methods - Inheritance – Method overriding – Data encapsulation – Data hiding.

UNIT V FILES AND EXCEPTION HANDLING **9**

File Handling - Read - Write – Command Line Programming – Exception Handling.

Total Hours 45

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, 2016, Updated for Python 3, Shroff O'Reilly Publishers.
2. Reema Thareja, "Problem solving and Programming with Python", 2018, Oxford University.
3. Liang Y. Daniel, "Programming Using Python", 1st Edition, 2017, Pearson Education.
4. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python", 2011, Revised and updated for Python 3.2, Network Theory Ltd.

Reference Books:

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", 2012, CENGAGE Learning.
2. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", 2013, Wiley India Edition.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach", 2016, Pearson India Education Services Pvt. Ltd.
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, 2019, No Starch Press.

Web URL(s):

1. https://nptel.ac.in/courses/106106145
2. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview
3. https://nptel.ac.in/courses/106106182
4. https://www.udemy.com/course/python-for-complete-beginners-1/

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U23ECT02	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION (Common to CSE, IT CSE(CS), AIDS)	L	T	P	C
		3	0	0	3

Pre requisites : Mathematics

Objectives:

- Classify boolean expression by different method and implementation using Logic gates.
- Analyze the combinational circuits using K map
- Design the sequential circuits using Integrated Circuits.
- Articulate the basic structure and operation of a digital computer.
- Summarize the concept of various memories and I/O interfacing.

Course Outcome

Upon completion of the course, students would be able to		**BT Level (highest level)**
C01	Classify Boolean expression by different method and implementation using Logic gates.	**K3**
C02	Analyze the combinational circuits using K map.	**K3**
C03	Design the sequential circuits using Integrated Circuits.	**K3**
C04	Articulate the basic structure and operation of a digital computer.	**K3**
C05	Summarize the concept of various memories and I/O interfacing.	**K2**

Course Contents

Unit I BOOLEAN ALGEBRA 9

Introduction to Boolean law- -basic theorem of Boolean algebra-canonical forms for Boolean functions-logic gates -karnaugh map method-quine-mc-cluskey method.

Unit II COMBINATIONAL CIRCUITS 9

Combinational Circuits – Adder – Subtractor – Decoder- Encoder- Code Converter- Magnitude Comparator – Multiplexers –Demultiplexers.

Unit III SEQUENTIAL CIRCUITS 9

Sequential Circuits-Latches-Flip Flops- Counters-Synchronous counter-Asynchronous Counter, Shift Registers- SISO,SIPO, PIPO, PISO.

Unit IV COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High-Level Language.

Unit V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

Total Hours 45

Text Books

1. Morris Mano M, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL,VHDL, and System Verilog", 6th Edition, 2018, Pearson Education.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", 6th Edition, 2020, Morgan Kaufmann/Elsevier.

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Reference Books

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, 2012, Tata McGraw-Hill.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance",10th Edition, 2016, Pearson Education.
3. M. Morris Mano, "Digital Logic and Computer Design", 2016, Pearson Education,.

Web URL(s):

1. https://onlinecourses.nptel.ac.in/noc22_ee55/preview
2. https://onlinecourses.swayam2.ac.in/nou23_ec05/preview

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U23TAT02	**TAMILS AND TECHNOLOGY**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

Pre-Requisites : None

Objectives:

To make the students to:

- Understand the key technologies and techniques in weaving and ceramics during the Sangam Age, including pottery styles and decorations.
- Explore ancient design and construction methods by studying buildings and architectural styles from different historical periods in Tamil Nadu.
- Learn about manufacturing technologies like shipbuilding and metalworking, and their importance in ancient Tamil society through archaeological findings.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Understand the significance of weaving and ceramic technology during the Sangam Age, including Black and Red Ware Potteries and graffiti on potteries.	**K2**
CO2	Apply knowledge of ancient design and construction techniques to analyze structural elements and materials used during the Sangam Age.	**K3**
CO3	Evaluate the technological advancements in manufacturing, including shipbuilding, metallurgy, and bead making during ancient Tamil periods.	**K3**
CO4	Recognize the agricultural and irrigation practices, including dam and pond construction, and animal husbandry methods used during the Chola period.	**K2**
CO5	Assess the development of scientific Tamil and Tamil computing, including digitalization efforts and the establishment of Tamil virtual resources.	**K3**

Course Contents

Unit I WEAVING AND CERAMIC TECHNOLOGY 3

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

Unit II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

Unit III MANUFACTURING TECHNOLOGY 3

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

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Unit IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

Unit V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

Total Hours 15

Text-cum-Reference Books:

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

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U23EGT02	**PROFESSIONAL ENGLISH (Common to ALL branches)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-Requisites : None

Objectives:

- To enhance learners' English language acquisition skills
- To facilitate learners to acquire effective technical writing skills
- To prepare learners for placement and competitive exams
- To facilitate effective English language skills for academic purposes and real-life situations

Course Outcomes: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
CO1	Analyze various reading comprehension skills in TOFEL/IELTS.	**K4**
CO2	Compose grammatically correct instructions, paragraphs, and essays proficiently for personal and professional context.	**K6**
CO3	Use technical writing skills to produce reports, interpret data, craft professional letters and group discussion.	**K3**
CO4	The process of completing forms in a professional manner, as well as acquiring knowledge about creating travel itineraries.	**K6**
CO5	Choose a diverse range of vocabulary through thorough analysis of meaning and language.	**K5**

Course Contents

Unit I CREATIVE THINKING **9**

Articles – Conjunctions – subject verb agreement - Sentence completions- online worksheets on matching, paragraph writing on Comparison and contrast.

Unit II PROFESSIONAL VOCABULARY **9**

Compound nouns-Process description, product description, Job application and resume writing-Online worksheets for hints development

Unit III TECHNICAL SKILL **9**

Discourse Markers -Gerunds and infinitive– Relative Pronouns – Definitions of Technical Terms – Digital Transcoding – Group discussion (Do's and Don't)-online worksheet on transcoding

Unit IV PROFESSIONAL COMMUNICATIONS **9**

Concord – Clauses – Phrases – Numerical Adjectives – Complaint letter-Filling up forms(Opening bank a/c and ticket booking) – Virtual Communication: E-Mail Writing – Essay Writing: Types of essays Opinion Essay, Discussion Essay, Direct Questions Essay, Advantage/Disadvantage Essay, Problem/Solution Essay.

Unit V ENGLISH FOR COMPETITIVE EXAMS **9**

TOFEL / IELTS- (LSRW) Synonyms; Vocabulary; reading comprehension of IELTS; writing-verbal: Verbal Ability- Commonly misspelt words, travel itinerary.

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Total Hours 45

Text Books:

1. "English for Engineers & Technologists", 2020, Orient Blackswan Private Ltd., Department of English, Anna University.
2. Dr. B. Vinoth & Prof.J. Oormila Heleena, "A workbook of Communicative English", 1st edition, 2023, Sri Krishna Hitech publishing company pvt., Coimbatore.
3. Ramalingam N, "Grammar for all", 2nd edition, 2013, Himalaya Publishing House.

Reference Books:

1 Norman Whitby, Business Benchmark Pre-intermediate to intermediate Personal Study Book BEC and BULATS Edition, Cambridge University Press, 2006.
2 Anne Laws, Writing Skills, Summertown Publishing Oxford - U.K., 2011.
3 Sinha DK "Specimen of English Prose", Orient Black Swan., Hyderabad, 2012.
4 Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press. 2009.
5 Raymond Murphy. "English Grammar and Use" - 4th edition, Cambridge University Press. 2004.

Web URL(s):

1 https://www.liveworksheets.com/worksheets/en
2 https://www.ets.org/toefl.html (TOEFL Test Takers (ets.org)
3 https://englishonline.britishcouncil.org/ielts-coach/

U23PYP01	PHYSICS LABORATORY (Common to ALL branches)	L	T	P	C
		0	0	2	1

Pre-Requisites : None

Objectives:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Use the different components and equipment's in physics practical.	**K3**
CO2	Solve problems individually and summarize the experimental results effectively.	**K3**
CO3	Use graphical models to analyze laboratory data and develop skills to impart practical knowledge in real time solution.	**K3**

List of Experiments

1. Determination of Wavelength of Laser.
2. Determination of Particle Size and Acceptance angle of the fibre using laser.
3. Determination of young's modulus by Uniform bending.
4. Determination of thickness of a thin wire by Air wedge method.
5. Determination of thermal conductivity of bad conductor.
6. Determination of Rigidity modulus by Torsion pendulum.
7. Determination of wavelength of mercury spectrum – Spectrometer grating.
8. Determination of bandgap of a semiconductor.
9. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

Total Hours 30

		L	T	P	C
U23CSP02	**PYTHON PROGRAMMING LABORATORY (Common to ALL branches)**	**0**	**0**	**2**	**1**

Pre requisites : None

Objectives:

This course helps to develop and implement Python programs using fundamental constructs, data structures, and advanced features like OOP and file handling.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
C01	Apply Python programming fundamentals to create programs with simple statements, expressions and control structures.	**K3**
C02	Design and implement complex programs integrating data structures, modules and exception handling for technical solutions.	**K4**
C03	Develop real-time applications using advanced Python features such as functions, OOP, and file handling.	**K6**

List of Experiments

1.Python programming using simple statements and expressions.
2. Conditionals and Iterative loops.
3. Implementing programs using Functions.
4. Implementing programs using Strings.
5. Implementing real-time/technical applications using Lists, Tuples, and Dictionaries.
6. Implementing programs using written modules and Python Standard Libraries.
7. Implementing real-time/technical applications using File handling.
8. Implementing real-time/technical applications using Exception handling.
9. Python programming using OOPs concepts.
10. Mini project.

Total hours 30

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, 2016, Updated for Python 3, Shroff O'Reilly Publishers.
2. ReemaThareja, "Problem solving and programming with python", 2018, Oxford University.
3. Liang Y. Daniel, "Programming Using Python",1st Edition, 2017, Pearson Education.
4. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python ", 2011, Revised and updated for Python 3.2, Network Theory Ltd.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs",2012, CENGAGE Learning.
6. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", 2013,Wiley India Edition.
7. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach"., 2016, Pearson India Education Services Pvt. Ltd.

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Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition,2019, No Starch Press.

Web URL(s):

1. https://python-iitk.vlabs.ac.in/

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U23ECP01	Devices and Digital Circuits Laboratory [Common to CSE, IT, AIDS, CSE (CS)]	L	T	P	C
		0	0	2	1

Pre-Requisites : Mathematics

Objectives:

- Understand the semiconductor devices with the help of VI characteristics.
- Analyze the characteristics of biasing circuits for BJT.
- Apply concepts of basics logic gates.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Design the semiconductor devices with the help of VI characteristics.	**K3**
CO2	Analyze the characteristics of biasing circuits for BJT.	**K3**
CO3	Apply concepts of basics logic gates.	**K3**

LIST OF EXPERIMENTS

1. Characteristics of PN Junction diode.
2. Characteristics of Zener diode.
3. Design of Clipper and Clamper.
4. Characteristics of BJT using common configuration.
5. Realization of Logic gates.
6. Implementation of Adder and Subtractor.
7. Implementation of Multiplexer and Demultiplexer.
8. Implementation of Encoder and Decoder.

Total Hours 30

Reference Books:

1. Kothari D.P and Nagrath I. J., “Baic Electronics”, (2014) McGraw Hill Education.
2. Boylestad R. L. and Nashelsky, L. “Electronic Devices and Circuit Theory”, (2013) Pearson Education.
3. Jacob Millmann & Halkias, “Integrated Electronics”, (2010) McGraw Hill Education (India) Private Limited.
4. David A. Bell, “Electronic Devices and Circuits”, (2008), 5th Edition Oxford University Press.
5. Albert Malvino & David, “Electronic Principles”, (2007) Tata McGraw-Hill, Seventh edition.

Web URL(s):

1. https://books.google.co.in
2. https://onlinecourses.nptel.ac.in/noc22_ee55/preview
3. https://onlinecourses.swayam2.ac.in/nou23_ec05/preview

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		L	T	P	C
U23MEP02	**ENGINEERING DRAWING (Common to ECE, EEE, CSE, CSE(CS), IT and AIDS)**	**0**	**0**	**4**	**2**

Pre-Requisites : None

Objectives:

- To develop graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national BIS standards related to technical drawings.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Prepare orthographic projection of simple solids inclined to principal plane.	**K3**
CO2	Sketch lateral surfaces of sectioned solids and 2D multi view drawings from 3D models	**K3**
CO3	Draw isometric views of 3D models.	**K3**

List of Exercises:

1. Construction of Ellipse, Parabola and Hyperbola using Eccentricity method. To draw tangent and normal to the above curves at any point.
2. Construction of Cycloid and Involute curves with tangent and normal at any point on the curve.
3. Projection of simple solids (Prism, Pyramid, Cylinder and Cone) when the axis is inclined to one of the principal planes by rotating object method.
4. Sectioning of solids (Prism, Pyramid, Cylinder and Cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other.
5. Development of lateral surfaces of simple solids – Prisms, pyramids, cylinders and cones.
6. Free Hand sketching: Sketching of multiple views from pictorial views of objects.
7. Isometric projections of simple solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.
8. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
9. Drawing of curves like parabola, spiral, involute using B-spline or cubic spline.
10. Drawing of front view and top view of simple solids like prism, pyramid, cylinder and cone including dimensioning.
11. Drawing front view, top view and side view of objects from the given pictorial views
12. Drawing isometric projection of simple objects.

Total Hours: 60

Reference Books:

1. Venugopal K. and Prabhu Raja V, “Engineering Graphics”, 2019, New Age International (P) Limited, New Delhi.

2. Natarajan K.V., “A text book of Engineering Graphics”, 2018, Dhanalakshmi Publishers, Chennai.

3. Bhatt N.D. and Panchal V.M, “Engineering Drawing”, 53rd Edition, 2019, Charotar Publishing House, Ahemedabad.

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U23MAT05	PROBABILITY AND STATISTICS	L	T	P	C
	(Common to CSE, CSE(CS),CSE(AI&ML) IT and AI&DS)	3	1	0	4

Pre-Requisites : Nil

Objectives:

To make the students

- Introduce the basic concepts of probability and random variables.
- Introduce the conceptions of two-dimensional random variables.
- Acquaint the knowledge of testing of hypothesis for small and large samples this plays an important role in real life problems.
- Introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture.
- Provide the required skill to apply the statistical tools in engineering problems.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Use the fundamental knowledge of the concepts of probability in standard distributions.	**K3**
CO2	Apply the concepts of two-dimensional random variables in Engineering applications.	**K3**
CO3	Apply the concept of testing of hypothesis for small and large samples.	**K3**
CO4	Apply the basic concepts of classifications of design of experiments in the field of agriculture	**K3**
CO5	Apply the statistical techniques used in engineering and management problems based on statistical quality control.	**K3**

Course Contents

Unit I PROBABILITY AND RANDOM VARIABLES **9+3**

Probability – Axioms of probability – Conditional probability –Baye's theorem- Discrete and continuous random variables – Moments – Moment generating functions- Binomial, Poisson and Normal distributions.

Unit II TWO – DIMENSIONAL RANDOM VARIABLES **9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.

Unit III TESTING OF HYPOTHESIS **9+3**

Large sample test based on Normal distribution for single mean and difference of means – Tests based on t,chi-square and F distributions for testing means and variances –Contingency table (Test for Independency) – Goodness of fit.

Unit IV DESIGN OF EXPERIMENTS **9+3**

Completely randomized design – Randomized block design – Latin square design.

Unit V STATISTICAL QUALITY CONTROL **9+3**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.

Total Hours 60

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Text Books:

1. Johnson. R.A, Miller. I and Freund. J, "Miller and Freund's Probability and Statistics for Engineers", 8th Edition 2015, Pearson Education, Asia.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", 4th Edition 2007, Tata McGraw Hill.

Reference Books:

1. Ramana. B.V., "Higher Engineering Mathematics",2018, McGraw Hill Education (India) Pvt. Ltd
2. Gupta S.C. and Kapoor.V.K., "Fundamentals of Mathematical Statistics",12th Edition, 2020, Sultan Chand & Sons, New Delhi.
3. Devore. J.L, "Probability and Statistics for Engineering and the Sciences", 10th Edition, 2014, Cengage Learning, New Delhi.

Web URL(s):

1. https://archive.nptel.ac.in/content/syllabus_pdf/111106112
2. https://archive.nptel.ac.in/content/syllabus_pdf/111105090
3. https://archive.nptel.ac.in/courses/109/104/109104182/

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U23CST03	**DATA STRUCTURES**	**L**	**T**	**P**	**C**
	(Common to CSE, CSE(CS), AI&DS, IT)	**3**	**0**	**0**	**3**

Pre-Requisites : **U23CST01/U23CST02**

Objectives:

- To understand the concept of Abstract Data Types (ADTs).
- To understand the concepts and applications of Linear and Non-Linear Data Structures.
- To identify the right Data Structure for solving problems.

Course Outcomes: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
CO1	Apply arrays and linked lists to manage data in real-time scenarios.	**K3**
CO2	Implement stacks and queues to solve algorithmic problems.	**K3**
CO3	Demonstrate the use of trees for efficient data organization and retrieval.	**K3**
CO4	Apply graph traversal algorithms to solve computational problems.	**K3**
CO5	Perform sorting, searching, and hashing operations in practical scenarios.	**K3**

Course Contents

Unit I FUNDAMENTALS OF DATA STUCTURES **9**

Introduction- Abstract Data Type (ADT) - Need for Data structures - Types - Arrays - Lists- Operations -Multi Dimensional Arrays- Linked List- Types - Singly Linked List, Doubly Linked List, Circularly Linked List – Operations and Implementation- Reversing a Linked List-Cloning a Linked List-Sorting a Linked List- Applications of Linked Lists-Polynomial Addition-Sparse Matrices.

Unit II STACKS AND QUEUES **9**

Stack ADT - Representation and Operations- Implementation - Applications- Balancing Parenthesis and String Traversal - Queue ADT- Representation and Operations - Implementation - Types of Queue-Circular Queue –Deque- Priority Queue – Applications – Reversing the Queue using Stack.

Unit III TREES **9**

Terminologies - Binary Trees- Tree Traversal - Expression Trees - Binary Heap - Heap Sort- Binary Search Tree -M-way Search Tree - AVL Tree - Operations - Rotations - Insertion –Deletion- Applications.

Unit IV GRAPHS **9**

Graph: Terminologies - Representation of Graph - Graph Traversal - Topological Sort-Applications of DFS – Bi connectivity - Euler Circuits - Finding Strongly Connected Components - Applications of BFS - Bipartite Graph-Graph Colouring.

Unit V SEARCHING, SORTING AND HASHING 9

Searching-Linear Search-Binary Search – Sorting - Internal Sorting-Insertion Sort - Shell Sort - Bubble Sort- Radix Sort - External Sorting-Simple Algorithm-Multiway Merge-Hashing - Hash Table - Hash Functions -Collision Resolution Techniques-Rehashing.

Total Hours 45

Text Books:

1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2015, Pearson
2 A.K. Sharma, "Data Structure Using C", 2011, Pearson Education.
3 Reema Thareja, "Data Structures Using C 2E", 2014, Oxford University Press.

Reference Books:

1 R.Venkatesan, S. Lovelyn Rose, "Data Structures" , 2015, Wiely India pvt ltd.
2 Ahmad Talha Siddiqui, Shoeb Ahad Siddiqui, "Data Structure Using C", 2023, CRC Press.

Web URL(s):

1 https://nptel.ac.in/courses/106102064/
2 https://archive.nptel.ac.in/courses/106/106/106106130/
3 https://archive.nptel.ac.in/courses/106/106/106106127/

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U23ITT01	**OBJECT ORIENTED PROGRAMMING WITH JAVA**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre requisites :None

Objectives:

- To understand the fundamentals of object-oriented programming.
- To introduce Packages, Interfaces and Multithreading in Java.
- To Understand Input and Output Operations, GUI Programming and Database Connectivity.
- To understand Exception Handling and Multithreading.
- To impart Knowledge on the concepts of Server-Side Programs.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Develop applications using Java object-oriented concepts	**K3**
C02	Design programs using inheritance, packages and interfaces.	**K4**
C03	Build Software using the concepts of files and collection Framework	**K3**
C04	Analyze the concepts of Exception Handling and Multi-threading	**K4**
C05	Implement GUI using Java FX and web applications using Servlet and JSP	**K2**

Course Contents:

UNIT I INTRODUCTION **9**

Introduction to OOP: OOP Concepts-Procedure Oriented Programming Vs OOP-Features of OOP-Structure of Java Program-Data types- Variables- Operators-Control Statement and Looping- Array.

UNIT II CLASSES, OBJECTS AND INHERITANCE **9**

Fundamentals of objects and classes in java- Packages-Constructors-Polymorphism-method overloading and method overriding, Inheritance - Inheritance types - abstract classes and methods, final classes and methods- Interfaces (Defining Interface, Implementing an Interface).

UNIT III I/O BASICS, GENERICS AND STRING HANDLING **9**

Byte Streams and Character Streams-Reading Console Input and Writing Console Output- File Class, File Reader and File Writer-Generic programming - Generic Class and Method-String Handling - Collection Framework: List - Set -Queue -Array List - Map.

UNIT IV EXCEPTION HANDLING AND MULTITHREADING **9**

Exception Handling Fundamentals-Try and Catch-Multiple catch Clauses-Nested Try Statements - Java's Built-in Exceptions-creating own Exception. Multithreaded Programming: Java Thread Model-Creating a Thread and Multiple Threads-Priorities- Synchronization- Inter Thread Communication - Type Wrappers.

UNIT V GUI PROGRAMMING AND SERVLETS **9**

Basics of Applet- Life Cycle of Applet- Introducing Swing: Swing Features, MVC Connection, Components and Containers-Exploring Swing-JAVAFX: Exploring JavaFX Controls-Accessing Database using JDBC- Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets - JSP TAGS-Expressions-Applications using Servlet and JSP.

Total Hours 45

Text Books:

1. Herbert Schildt, "Java The complete reference", 2021, McGraw Hill Education (India) Pvt. Ltd.
2. Kishori Sharan and Peter Spath "Learn JavaFX: Building User Experience and Interfaces with Java" 2nd Edition, 2022, Apress.

Reference Books:

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition,2020, Pearson.
2. Deitel P and Deitel H," Java: How to Program", 11th Edition", 2018, Prentice Hall.
3. Matt Weisfeld," The Object-Oriented Thought Process", 5th Edition, 2019, Addison-Wesley Professional.
4. Herbert Schildt, "Introducing JavaFX 8 Programming", 2015, McGraw Hill Education.
5. Jeffrey C. Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.

Web URL(s):

1. https://archive.nptel.ac.in/courses/106/105/106105191/
2. https://www.w3resource.com/java-tutorial/
3. https://jenkov.com/tutorials/javafx/index.html
4. https://www.udemy.com/course/jsp-tutorial/?couponCode=LETSLEARNNOWPP

U23ITT02	SOFTWARE ENGINEERING DESIGN	L	T	P	C
		3	0	0	3

Pre requisites : None

Objectives:

- To understand the process and its models.
- To understand fundamental concepts of Requirements Engineering and Analysis Modelling.
- To understand the design principles.
- To learn various testing and maintenance measures.
- To predict the risk associated in the project

Course Outcome:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Understand the key phases of software development life cycle and compare different process models.	K2
C02	Apply the concepts of Requirements Engineering and Analysis modelling.	K3
C03	Apply a systematic procedure for software design and deployment.	K3
C04	Understand the different testing strategies for the software developed.	K2
C05	Apply umbrella activities from inception till maintenance.	K3

Course Contents

UNIT I SOFTWARE LIFE CYCLE MODELS 9

Process: Definition, Benefits of well-defined process, Generic phases, Verify and validate – Software life cycle models: Waterfall model, Prototyping model, RAD model, Spiral model, Agile methodologies: Adaptive Software Development (ASD), Scrum, Dynamic Systems Development Method (DSDM), Crystal, Feature Drive Development (FDD)-Extreme Programming (XP).

UNIT II REQUIREMENT ENGINEERING 9

Functional and Non-Functional requirements-–Modelling requirements: Data Flow Diagram, Entity Relation Diagram, Data Dictionary, State Transition Diagram-Conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams. –Requirement Engineering Process -Requirements Elicitation - Software Requirements Document -Requirements Validation-Requirements Change.

UNIT III SOFTWARE DESIGN 9

Design process and concepts – Popular design methods: Modular Decomposition, Event- oriented, Object-oriented design – Transition from Analysis to Design – Architectural Styles: Pipes & filters, Object-oriented systems, Layered Systems, Data Centered systems – Structured Design: principles, strategies for converting DFD into Structure chart – How to measure the goodness of the design: coupling, cohesion, types.

UNIT IV TESTING 9

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Software testing fundamentals – Testing approaches – Black Box Testing: Equivalence partitioning, Boundary Value Analysis – White box testing: basis path testing – Test coverage criteria based on Data flow mechanisms – Regression Testing –Validation Testing - Levels of Testing: Unit Testing, Integration Testing, System Testing, Acceptance Testing.

UNIT V UMBRELLA ACTIVITIES 9

Project Management: Risk Management-Managing People-Quality Management: software quality-software standards-Reviews and inspections-software measurement and metrics: configuration Management: change management -version management-system building-Release Management-Process Improvement-Process measurement.

Total Hours 45

Text Books:

1. Roger S. Pressman, "Software Engineering – A practitioner's Approach", 9th Edition, 2023, Mc Graw Hill International.
2. Ian Sommerville, "Software Engineering", 10th Edition, 2017, Pearson Education Asia.

Reference Books:

1. Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, 2009, PHI Learning Private Limited.
2. Kelkar S. A., "Software Engineering", 2007, Prentice Hall of India Pvt Ltd.
3. Pankaj Jalote, "Software Engineering – A Precise Approach", 2010, Wiley India.
4. Ghezzi, "Fundamentals of Software Engineering", 2nd Edition, 2015, Pearson Education India.

Web URL(s):

1. https://archive.nptel.ac.in/courses/106/105/106105182/
2. https://nptel.ac.in/courses/106101061
3. https://learn-xpro.mit.edu/systems-engineering?utm_medium=ppc&utm_source=google&utm_campaign=SysEngx&utm_term

		L	T	P	C
U23ITT03	**WEB ESSENTIALS**	**3**	**0**	**0**	**3**

Pre requisites : None

Objectives:

- To understand the fundamentals of the Internet, web browsers, web servers, and working principles of websites.
- To learn how to design web pages using HTML, CSS, and XML
- To use JavaScript for adding interactivity and validation to web pages
- To develop dynamic web applications using PHP and database connections
- To build modern web applications using React JS.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Understand and build dynamic and interactive websites	**K2**
C02	*Develop* web pages using HTML tags, CSS styles, and basic XML features	**K3**
C03	Implement JavaScript programming techniques for web page validation, event handling, and simple AJAX-based applications	**K3**
C04	Develop applications using PHP and MySQL	**K3**
C05	Analyze and build a dynamic web page using React JS components.	**K4**

Course Contents:

UNIT I BASICS OF WWW **7**

The Internet Overview— Basic Internet protocols - HTTP Request Message –HTTP Response Message - Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-side scripting.

UNIT II WEB DESIGNING **11**

HTML Basic Tags – Links – Lists – Tables – Images – Frames - Forms – HTML5 Form Input Types and autocomplete attribute -Audio -Video Controls – CSS – Syntax- Selectors – Types - Basic XML- Document Type Definition- XML Schema, XML Parsers, XPATH and XSLT Transformation.

UNIT III JAVASCRIPT **9**

An introduction to JavaScript–Variables-Operators – Literals - Functions -Loops-Conditional Statements – Arrays - Built-in objects - Validation- Event Handling. - Exception Handling – Introduction to AJAX–XML Http Request (XHR)–Create Object–Request–Response–Ready State-Simple AJAX applications.

UNIT IV PHP **9**

Introduction to PHP: Basic Syntax – Variables and constants – Operators -Expressions, Conditional and Looping - Functions- Arrays – Strings - File Handling- Cookies -Sessions Connecting to database (My SQL as reference)- PHP and HTML.

UNIT V REACT JS 9

React Introduction – Installation - React Render HTML - React JSX – Class – Props – Events – Lists –Forms - Styling React Using CSS - Styling React Using Sass - NPM Basics - Nested Components and Tools - React Hooks.

Total Hours 45

Text Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web – How to Program", 6th Edition, 2017, Pearson Education.
2. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", 2011, Pearson Education.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML" 3rd Edition, 2014, O'Reilly publishers.
4. Greg Sidelnikov, "React.js Book: Learning React JavaScript Library from Scratch", 2017.

Reference Books:

1. Uttam K Roy, "Web Technologies", Oxford University Press.
2. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, 2017 McGraw Hill Publishers.
3. Steven Holzener, "PHP – The Complete Reference", 1st Edition, 2017, Mc-Graw Hill.
4. Chris Minnick, John Wiley & Sons, "Beginning ReactJS Foundations Building User Interfaces with ReactJS", 2022.

Web URL(s):

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/php
3. https://www.udemy.com/topic/react/free/

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U23ITP01	OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	L	T	P	C
		0	0	4	2

Pre requisites : None

Objectives:

- To give students the ability to construct software using Java programming for practical applications.
- The ideas of classes, packages, interfaces, inheritance, exception handling, and file processing will be understood and applied by the students.
- Students are also capable of creating applications using event handling and general programming.
- Implement Exception Handling and Multithreaded Programming.
- To design and build simple Graphical User Interfaces.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Apply Object-Oriented Programming concepts on simple Java programs using packages, Constructor, Inheritance and Interface.	**K3**
C02	Implement File operation and String handling, Exception Handling and Multithreaded Programming.	**K4**
C03	Design and develop event driven programming applications for real world problems.	**K4**

List of Experiments

1. Implementation of Operators, Arrays and Control Structures.
2. Implementation of Packages, constructors and method overloading.
3. Implementation of Inheritance and Interface.
4. Implementation of File Operations.
5. Implementation of String Handling.
6. Implementation of Exception Handling.
7. Implementation of Multithreading.
8. Implementation of Swing and Java FX.
9. Implementation of Server-side program using Servlet and JSP.
10. Mini Project.

Total hours 60

Reference Books:

1. Herbert Schildt, “Java The complete reference, McGraw Hill Education (India) Pvt. Ltd. 2021.
2. Kishori Sharan and Peter Spath “Learn JavaFX 17: Building User Experience and Interfaces with Java” second Edition, Apress, 2022.
3. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11th Edition Pearson, 2020.
4. Deitel P and Deitel H,” Java: How to Program, 11th Edition”, Prentice Hall, 2018.
5. Matt Weisfeld,” The Object-Oriented Thought Process”, Fifth Edition Addison-Wesley Professional, 2019.
6. Herbert Schildt,” Introducing JavaFX 8 Programming”, McGraw Hill Education, 2015.

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7. Jeffrey C. Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

Web URL(s):

1. https://archive.nptel.ac.in/courses/106/105/106105191/
2. https://www.w3resource.com/java-tutorial/
3. https://jenkov.com/tutorials/javafx/index.html
4. https://www.udemy.com/course/jsp-tutorial/?couponCode=LETSLEARNNOWPP

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U23ITP02	**SOFTWARE ENGINEERING DESIGN LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Pre requisites : None

Objectives:

- Understand software engineering principles and apply them to real-world problems.
- Develop skills in requirement analysis, design, and testing using industry-standard tools and technique
- Gain hands-on experience in developing software prototypes and performing various types of testing
- Learn to estimate effort and plan software projects using established methodologies.
- Develop problem-solving skills and collaborate effectively in a team-based software development environment.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Design software systems using various diagrams (DFD, Use Case, Class, State-Chart, etc.) with the aid of a CASE tool by evaluating software requirements.	**K3**
C02	Analyze prototypes and conduct unit and integration testing using a testing tool, utilizing both white box and black box testing techniques to ensure software quality.	**K4**
C03	Evaluate effort and plan software projects using FP estimation and create a timeline chart (Gantt Chart or PERT Chart).	**K4**

List of Experiments

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. Study and usage of any Design Phase CASE tool
4. Perform the Design by using any Design Phase CASE tool
   - Data Flow Diagram (DFD) and Structured chart.
   - Use case diagram.
   - Class diagram and object diagram.
   - State-chart diagram and Activity diagram
   - Sequence diagram and Collaboration diagram
   - Component diagram and Deployment diagram
5. Develop the prototype of the product.
6. To perform various testing using the testing tool -unit testing, integration testing for a sample code of the suggested system.
7. Develop test cases for various white box testing techniques.
8. Develop test cases for various black box testing techniques.
9. Perform Estimation of effort using FP Estimation for chosen system.
10. To prepare time line chart/Gantt Chart/PERT Chart for selected software project.

Total hours 30

Reference Books:

1. Roger S. Pressman, "Software Engineering – A practitioner's Approach", 9th Edition, 2023, Mc Graw Hill International Edition.
2. Ian Sommerville, "Software Engineering", 10th Edition, 2017, Pearson Education Asia.
3. Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, 2009, PHI Learning Private Limited.
4. Kelkar S. A., "Software Engineering",2007, Prentice Hall of India Pvt Ltd.
5. Pankaj Jalote, "Software Engineering – A Precise Approach", 2010, Wiley India.
6. Ghezzi, "Fundamentals of Software Engineering", 2nd Edition, 2015, Pearson Education India.

Web URL(s):

1. https://archive.nptel.ac.in/courses/106/105/106105182/
2. https://nptel.ac.in/courses/106101061
3. https://learn-xpro.mit.edu/systems-engineering?utm_medium=ppc&utm_source=google&utm_campaign=SysEngx&utm_term

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U23ITP03	WEB ESSENTIALS LABORATORY	L	T	P	C
		0	0	4	2

Pre requisites : None

Objectives:

- To develop an ability to design and implement static and dynamic website.
- To learn about XML.
- To validate web pages using Java script.
- To understand, analyze and build web applications using PHP.
- To develop skills in web development using React JS.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Apply HTML and CSS to create simple websites.	**K3**
C02	Develop web pages using various XML technologies and perform form validation using JavaScript.	**K3**
C03	Create simple web applications with database connectivity using PHP and design web applications with the React framework.	**K6**

List of Experiments

1. Design a web site using various HTML Tags.
2. Use External, Internal, and Inline CSS to format the web site that you created.
3. Design a DTD, corresponding XML document and display it in browser using CSS.
4. Design an XML document and display it in browser using XSL.
5. Design XML Schema and corresponding XML document.
6. Implement form validation using JavaScript.
7. Creation of simple PHP scripts.
8. Create PHP database application using MySQL.
9. Design simple web page using React JS.
10. Mini Project.

Total hours 60

Reference Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web – How to Program", 6th edition, 2017, Pearson Education.
2. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML", 3rd Edition, 2014, O'Reilly publishers.
4. Greg Sidelnikov," React.js Book: Learning React JavaScript Library from Scratch", 2017.
5. Uttam K Roy, "Web Technologies", Oxford University Press.

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6. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, 2017, McGraw Hill Publishers.
7. Steven Holzener, "PHP – The Complete Reference", 1st Edition, 2017, Mc-Graw Hill,
8. Chris Minnick," Beginning ReactJS Foundations Building User Interfaces with ReactJS", 2022, John Wiley & Sons.

Web URL(s):

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/php
3. https://www.udemy.com/topic/react/free/

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		L	T	P	C
U23CSP03	**DATA STRUCTURES LABORATORY (Common to CSE, CSE(CS), AI&DS, IT)**	**0**	**0**	**4**	**2**

Pre-Requisites : U23CST01

Objectives:

This course provides knowledge to develop applications using linear and non-linear data structures.

Course Outcomes: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
CO1	Implement various operations on Linear and Non-Linear Data Structures.	**K3**
CO2	Implement Searching, Sorting and Hashing techniques to solve the given problem.	**K3**
CO3	Choose suitable Data Structures and solve the given problem.	**K3**

Course Contents

List of Experiments

1. Practice on Array Operations.
2. Implementation of Singly, Doubly and Circularly Linked List.
3. Implementation of Stack, Queue and its Applications.
4. Operations on Binary Search Tree and AVL tree.
5. Programs on Graph Traversal.
6. Implementation of searching and sorting algorithms.
7. Implementation of Hashing and Collision Resolution Techniques.
8. Mini Project.

Total Hours 60

Reference Books:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C” , 2015 ,Pearson Education.
2. A.K. Sharma, “Data Structure Using C”, 2011, Pearson Education.
3. Reema Thareja, “Data Structures Using C 2E”, 2014, Oxford University Press.
4. R.Venkatesan, S. Lovelyn Rose, “Data Stuctures” , 2015, by Wiely India pvt ltd.
5. Ahmad TalhaSiddiqui, ShoebAhadSiddiqui, “Data Structure Using C”, 2023, CRC Press.

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U23CST10	**DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE, CSE(CS), AI&DS, IT)**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Pre-Requisites : Data Structures

Objectives:

- Understand algorithm Analysis and asymptotic notations
- Apply brute-force and divide-and-conquer strategies.
- Solve problems using dynamic programming.
- Implement greedy algorithms for optimization.
- Solve combinatorial problems using backtracking and branch-and-bound.

Course Outcomes:
Upon completion of the course, students would be able to

		BT Level (highest level)
CO1	Analyse the efficiency of the algorithm using asymptotic notations and mathematical analysis	**K4**
CO2	Apply brute force and divide-and-conquer techniques and evaluate their complexity.	**K3**
CO3	Make use of dynamic programming to solve and analyse optimization problems.	**K4**
CO4	Implement greedy algorithms to optimize solutions in different problem domains.	**K3**
CO5	Use backtracking and branch-and-bound techniques to solve combinatorial problems.	**K4**

Course Contents:

Unit I FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCEY **9+3**

Algorithm – Notion of Algorithm-Characteristics-Fundamentals of Algorithmic problem solving – Analysis Framework – Asymptotic notations and Basic Efficiency Classes - Mathematical Analysis of Recursive and Non-Recursive algorithms – Empirical analysis of algorithm.

Unit II BRUTE FORCE AND DIVIDE AND CONQUER **9+3**

Brute Force - Selection sort and Bubble sort – Sequential search and String matching – Exhaustive search – Divide and Conquer – The General method- String matching Merge sort – Quick sort – Binary search- Finding the maximum and minimum element- Multiplication of Large Integers.

Unit III DYNAMIC PROGRAMMING **9+3**

Principles of optimality - Coin changing problem - Computing a Binomial Coefficient- Knapsack Problem - String editing- All Pairs Shortest Path - Optimal Binary Search Tree - Multistage Graphs.

Unit IV GREEDY APPROACH **9+3**

The General method- Job sequencing with Deadlines—Activity selection problem-Prim 's algorithm - Kruskal's Algorithm - Dijkstra's Algorithm– 0/1 Knapsack problem- Optimal Merge pattern – Huffman Trees and codes.

Unit V BACKTRACKING AND BRANCH & BOUND **9+3**

Backtracking- State Space Tree - Knapsack Problem - n-Queens problem - Hamiltonian Circuit Problem- Sum of subsets - Graph Colouring – Branch and Bound - Bounding Functions - 0/1 Knapsack Problem - Traveling Sales Person Problem – Assignment Problem- Introduction to P, NP Class Problems.

Total Hours 60

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Text Books:

1. Anany Levitin," Introduction to the Design and Analysis of Algorithms", Prentice Hall of India, 3rd Edition,2017
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran," Fundamentals of Computer Algorithms" , 2010, Galgotia,.

Reference Books:

1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithms",3rd Edition,2009, MITPress.
2. Donald E. Knuth," The Art of Computer Programming", 2009, Volumes 1& 3, Pearson Education,
3. Jeffrey J McConnell," Analysis of Algorithms", 2008, Jones and Bartlett Publishers.
4. Parag Himanshu Dave, Himanshu Bhalchandra Dave," Design and Analysis of Algorithms", 2008 Pearson Education.

Web URL(s):

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2. https://archive.nptel.ac.in/courses/106/106/106106131/
3. https://archive.nptel.ac.in/courses/106/101/106101060/

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U23ITT04	DATABASE MANAGEMENT SYSTEM (Common to IT, AI&DS)	L	T	P	C
		3	0	0	3

Pre requisites : None

Objectives:

- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To have an introductory knowledge about the Distributed databases NOSQL and Object-oriented database.

Course Outcomes:

Upon completion of the course, students shall have ability to		BT Level (highest level)
C01	Recall key database concepts including the purpose of a DBMS, data abstraction levels, database architecture, relational model concepts.	**K1**
C02	Understand E-R and EER modelling, functional dependencies, and normalization techniques from 1NF through 5NF support for effective database schema design.	**K2**
C03	Apply the concepts of transaction states, concurrency control mechanisms and recovery techniques to analyze and manage concurrent transactions.	**K3**
C04	Understand the principles of storage mechanisms, indexing and the fundamentals of query processing and optimization.	**K2**
C05	Apply the knowledge of NoSQL systems recognizing CAP theorem constraints and performing CRUD operations across document column-oriented, key-value, and graph data stores.	**K3**

Course Contents

UNIT I INTRODUCTION **9**

Purpose of DBMS - Applications - Views of data - Data Abstraction - Instances and Schemas - Data Models - Database Languages - Database Architecture - Database users and administrators. Introduction to Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL

UNIT II DATABASE DESIGN **8**

Entity- Relationship(E-R) Model: Basic concepts - Constraints - E-R Diagram -EER Diagram- Reduction of Relational schemas- Functional Dependencies – Non-Loss Decomposition– First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT **11**

Transaction Concepts and States - Concurrent Executions–Schedules - Serializability - Concurrency control: Lock Based Protocols: Locks, Granting of Locks, 2-phase locking protocol - Timestamp Based Protocols - Validation based protocols - Deadlock Handling. Recovery Systems: Failure classification - Log based Recovery - Recovery with concurrent Transactions – ARIES Algorithm.

UNIT IV STORAGE AND QUERY PROCESSING **8**

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RAID, Indexing: Basic concepts, Ordered Indices: Dense and Sparse Indices – Multi Level Indices - Index Update. B+-Tree Index Files: Structure of a B+-Tree - Queries in B+Trees -Hashing: Static Hashing, Dynamic Hashing -Query Processing Overview-Query Optimization.

UNIT V ADVANCED TOPICS 9

NOSQL Database - Characteristics – CAP theorem – Types of No SQL Data stores: Column Oriented, Document, Key-Value and Graph Types - Document-based: MongoDB / Firebase data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

Total Hours 45

Text Books:

1. Abraham Silberschatz, Henry F. Korth, Sudarshan, "Database System Concepts", 7th Edition, 2021, McGraw-Hill.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, 2023, Pearson Education.
3. Thomas M. Connolly, Carolyn E. Begg, “Database Systems – A Practical Approach to Design, Implementation, and Management”, 6th Edition, Global Edition, 2015, Pearson Education.

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd Edition, 2014,McGraw Hill Education.
2. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, “Database Modelingand Design–Logical Design”,5th Edition, 2011, Morgan Kaufmann Publishers.
3. G.K.Gupta, "Database Management Systems”, 2011, Tata McGraw Hill.
4. Peter Rob, Corlos M.Coronel, "Database Systems: Design, Implementation and Management," 10th edition, 2012, Thompson Learning Course Technology.

Web Url(s):

1. https://www.nptel.ac.in/courses/106105175
2. https://www.archive.nptel.ac.in/courses/106/105/106105175/
3. https://intellipaat.com/course-cat/database/

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U23ITT05 **PRINCIPLES OF OPERATING SYSTEM**

L	T	P	C
3	0	0	3

Pre requisites : Problem Solving and Programming in C, Data Structures

Objectives:

- To Understand the Basics of OS and its structure.
- To familiarize the operations performed by a process.
- To learn different memory management techniques.
- To explain the various approaches of File management.
- To impart various scheduling policies of OS.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Analyze the Evolution and Working of OS	**K4**
C02	Analyze the various concepts of process management and Synchronization	**K4**
C03	Apply various methods for handling deadlocks and memory allocation	**K3**
C04	Demonstrate the concepts of storage management	**K3**
C05	Analyze use of appropriate disk organization method	**K4**

Course Contents:

UNIT I OVERVIEW AND STRUCTURES OF OS 9

Introduction - operating system Functionalities: process management, memory management, storage management, protection and security Operating system services and systems calls, system programs, operating system structure-Virtual machines- OS design considerations for multiprocessor and multicore - Operating System generation - System boot.

UNIT II PROCESS MANAGEMENT AND SYNCHRONIZATION 11

PROCESS MANAGEMENT: Process concepts, scheduling queues, process scheduling-criteria and algorithms, Cooperating Processes –Interposes Communication-Multithreaded programming - SYNCHRONIZATION: Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers' problem, dining philosophers' problem, monitors.

UNIT III DEADLOCK AND MEMORY MANAGEMENT 11

Deadlocks – Methods for handling deadlock- Deadlock prevention – Deadlock avoidance – Deadlock detection- Recovery from deadlock using Banker's Algorithm - Swapping, contiguous memory allocation: MFT and MVT, non-contiguous memory allocation: paging, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing.

UNIT IV STORAGE MANAGEMENT 7

Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, directory implementation, allocation methods, free-space management, efficiency and performance.

UNIT V IO MANAGEMENT 7

Mass storage structure - overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, tertiary storage structure.

Total Hours 45

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Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, 2018, John Wiley and Sons Inc.
2. Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, 2022 , Pearson, New Delhi.

Reference Books:

1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, 2018, Prentice Hall.
2. Harvey M. Deitel M, “Operating Systems”, 2007, Pearson Education Pvt. Ltd,
3. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, 2010, Tata McGraw Hill Edition.
4. Achyut S.Godbole, AtulKahate, “Operating Systems”, 2016, McGraw Hill Education.

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2. https://www.swayam.gov.in/nd2_cec20_cs06/preview
3. https://www.nptel.ac.in

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U23ITT06	DATA COMMUNICATION AND NETWORKING (Common to IT, AI&DS)	L	T	P	C
		3	0	0	3

Pre requisites : Digital Principles and Computer Organization

Objectives:

- To understand the concepts of data communications and networking.
- To explore the various layers of OSI model.
- To learn functions of network layer and routing protocols.
- To introduce UDP and TCP models.
- To be familiarize about various Application layer protocols.

Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	"Apply data communication concepts, design media components, modes, standards, classifications, topologies, models; analyze conversion and media".	**K3**
C02	Analyze proficiency in network protocols, error detection, medium access control, and Ethernet configurations.	**K4**
C03	Apply the different addressing schemes and apply various routing protocols at network layer. Describe the network layer services and apply the suitable routing algorithms for the given network.	**K3**
C04	Illustrate the different transport layer protocols and employ suitable flow control mechanism. Understand the various protocols and services of Transport Layer.	**K3**
C05	Analyze the functionalities of various protocols in Application layer.	**K4**

Course Contents:

UNIT I DATA COMMUNICATIONS 9

Data communication process - Components of communication media – Modes of Communication – IEEE protocol and Standards – Network Classifications – Types of Networks topologies -Network Models: TCP/IP Protocol Model-OSI Model. Digital -to-digital conversion: Line coding-Line coding schemes-Transmission Media: Guided-Unguided media.

UNIT II DATA LINK LAYER 9

Introduction-Link layer Addressing- Error Detection and Correction: Introduction-Block coding, CRC-Checksum-Framing: HDLC-Point-to-point protocol-Medium Access Control Techniques: Random Access Protocol- Channelization, Round Robin, Reservation: ALOHA Pure and Slotted-Wired LAN-Standard Ethernet Connecting devices-Virtual LAN.

UNIT III NETWORK LAYER AND INTERNETWORKING 9

Network Devices: Router, Switch, HUB, Bridge, Network Layer Performance-Routing: Static Routing:-IPv4 Addresses-Introduction to Dynamic Routing: RIP v1 and RIP v2- OSPF-DSDV-IPv6 Addresses. Unicast Routing: Distance Vector-Link state routing-Routing Basic Internetworking: IP - CIDR – ARP-RARP-BOOTP– DHCP.

UNIT IV TRANSPORT LAYER AND SOCKET PROGRAMMING 9

Introduction-Transport layer protocol: Simple-Stop and Wait-Go-Back-N-Selective Repeat-Piggybacking--UDP-TCP-TCPBBR-Connection management: Flow control–Retransmission – TCP Congestion control, Congestion avoidance: DEC bit – RED – Socket Programming: TCP, UDP. QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

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UNIT V APPLICATION LAYER 9

HTTP/3-WebRTC-DOH and DOQ-gRPC-TLS 1.3-Electronic Mail: telnet- Secure shell-DNS-Multimedia Networking: Internet Telephony – RTP – RTCP – RTSP-Network Management: Introduction-SNMP

Total Hours 45

Text Books:

1. Behrouz and Forouzan," Data Communications and Networking", 6th Edition, 2022.
2. Andrew.S. Tenenbaum, Nick Feamster,David Wetherall, "Computer Networks", 6th Edition, 2021, Pearson.
3. William Stallings, Data and Computer Communication, 10th Edition, 2022, Pearson Prentice Hall India.

Reference Books:

1. Behrouz A. Forouzan," Data Communications and Networking with TCPIP Protocol Suite", 6th Edition,2022.
2. Alberto Leon Garcia and Indra Widjaja, "Communication Networks Fundamental Concepts and key Architectures",2nd Edition, 2009, Tata McGraw-Hill Publishing Co. Pvt., Ltd., New Delhi.
3. James F Kurose, Kaith W Ross, "Computer Networking A Top-Down Approach", 6th Edition, 2017, Pearson.
4. Larry L.Peterson and Peter S. Davie, "Computer Networks",2nd Edition, 2003, Harcourt Asia Pvt.Ltd., USA.

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U23ITP04	DATABASE MANAGEMENT SYSTEM LABORATORY	L	T	P	C
		0	0	4	2

Pre requisites : None

Objectives:

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a frontend tool for GUI based application development.

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Design databases with various key constraints and XML validation using XML schema.	**K3**
C02	Apply SQL (DML and DCL) and NOSQL queries to manage and manipulate data.	**K3**
C03	Analyze and integrate advanced database features, such as stored procedures and triggers, in GUI applications.	**K4**

List of Experiments:

1. Conceptual Database design using E-R Diagram
2. Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL, DML, DCL and TCL commands.
3. Queries to demonstrate implementation of Integrity Constraints
4. Query the database tables and explore sub queries and nested queries
5. Query the database tables and explore various Join operations.
6. Create View and Index for database tables.
7. Write user defined functions and stored procedures in SQL.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create Document, column and graph-based data using NOSQL database tools.
10. Develop a simple GUI based database application.

Total hours 60

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, 2018, John Wiley and Sons Inc.
2. Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, 2022 , Pearson, New Delhi.
3. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, 2018, Prentice Hall.
4. Harvey M. Deitel M, “Operating Systems”, 2007, Pearson Education Pvt. Ltd.
5. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, 2010, Tata McGraw Hill Edition.

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6. Achyut S.Godbole, AtulKahate, “Operating Systems”, 2016, McGraw Hill Education.

Web Url(s):

1. https://www.swayam.gov.in/nd1_noc20_cs04/preview
2. https://www.swayam.gov.in/nd2_cec20_cs06/preview
3. https://www.nptel.ac.in

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U23ITP05	PRINCIPLES OF OPERATING SYSTEM LABORATORY	L	T	P	C
		0	0	2	1

Pre requisites : None

Objectives:

- To learn UNIX commands and shell Programming.
- To practice process and thread concepts.
- To implement various CPU Scheduling Algorithms
- To implement Bankers Algorithm and page replacement algorithms
- To implement various memory allocation methods
- To be familiar with File Organization and file allocation strategies

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Analyse the performance of different types of CPU scheduling algorithms	**K4**
C02	Demonstrate Producer-Consumer problem reader-writers problem dining Philosophers Problem	**K3**
C03	Apply Bankers algorithms for handling deadlocks	**K3**

List of Experiments:

1. Illustrate Basics Command and shell Programs in Ubuntu
2. Programs to implement UNIX system calls and file management
3. Demonstrate various process and thread related concepts
4. Simulate CPU Scheduling Algorithms
5. Simulate Inter-Process communication techniques
6. Simulate Solutions to classical process synchronization problems
7. Implement Bankers algorithm for deadlock handling
8. Implementation of memory Allocation Methods
9. Implementation of Paging Techniques of Memory Management
10. Implement Page -Replacement algorithms
11. Implement File Allocation strategies
12. Implement Disk Scheduling algorithms

Total hours 30

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, 2018, John Wiley and Sons Inc.
2. Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, 2022 , Pearson, New Delhi.
3. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, 2018, Prentice Hall.
4. Harvey M. Deitel M, “Operating Systems”, 2007, Pearson Education Pvt. Ltd,
5. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, 2010, Tata McGraw Hill Edition.
6. Achyut S.Godbole, AtulKahate, “Operating Systems”, 2016, McGraw Hill Education.

Web Url(s):

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1. https://www.swayam.gov.in/nd1_noc20_cs04/preview
2. https://www.swayam.gov.in/nd2_cec20_cs06/preview
3. https://www.nptel.ac.in

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		L	T	P	C
U23ITP06	**DATA COMMUNICATION AND NETWORKING LABORATORY (Common to IT, AI&DS)**	**0**	**0**	**2**	**1**

Pre requisites : None

Objectives:

- To understand the working principle of various communication protocols
- To analyze structure and formats of TCP/IP layer protocols
- To know the concept of data transfer between nodes
- To implement routing algorithms
- To implement various network algorithms such as error control, error detection

Course Outcomes:

	Upon completion of the course, students shall have ability to	**BT Level (highest level)**
C01	Analyze the basics of how data flows from one node to another	**K4**
C02	Apply the error detection and correction techniques	**K3**
C03	Compare routing algorithms	**K3**

List of Experiments:

The following experiments are to be implemented in JAVA or simulated using Network simulator protocols.

1. Studies of LAN Transmission media's, topologies, inter connection devices & LAN standards.
2. Installation and Setup of Packet Tracer Tool. Study and execution of basic commands of Packet Tracer such as Trace route, IP config, Telnet and others, and Initialization and Setting up a Router with Encryption in Packet Tracer.
3. Implementation of Error detection and correction techniques.
4. Configure DHCP server.
5. Implementation of routing algorithm
6. TCP Socket Programming.
7. UDP Socket programming
8. Implementation of Transport Layer protocols.
9. To configure DNS server on windows server.
10. Create IPV4/IPV6 based small computer network using simulator (preferably open source-based simulator)

Total hours: 30

Reference Books:

1. Behrouz and Forouzan," Data Communications and Networking", 6th Edition, 2022.
2. Andrews. Tenenbaum, Nick Feamster, David Wetherall, "Computer Networks", 6th Edition, 2021, Pearson.
3. William Stallings, Data and Computer Communication, 10th Edition, 2022, Pearson Prentice Hall India.
4. Behrouz A. Forouzan," Data Communications and Networking with TCPIP Protocol Suite", 6th Edition,2022.
5. Alberto Leon Garcia and Indra Widjaja, "Communication Networks Fundamental Concepts and key Architectures",2nd Edition, 2009, Tata McGraw-Hill Publishing Co. Pvt., Ltd., New Delhi.

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6. James F Kurose, Kaith W Ross, "Computer Networking A Top-Down Approach", 6th Edition, 2017, Pearson.
7. Larry L.Peterson and Peter S. Davie, "Computer Networks",2nd Edition, 2003, Harcourt Asia Pvt.Ltd., USA.

Web URL(s):

1. http://www.nptel.ac.in/courses/106105082/
2. https://www.nptel.ac.in/courses/106/105/106105183/
3. https://archive.mu.ac.in/myweb_test/syllFybscit/dcn.pdf

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U23EGS01	**ENGLISH EXPERTISE AND CAREER MOXIE (Common to ALL)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Pre-Requisites : None

Objectives:

- To enable learners to develop their Professional communicative competence.
- To enhance the practical understanding of the placement activity with employability skills
- To facilitate learners' soft skills.

Course Outcomes: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
CO1	Analyse companies using SWOT analysis, and prepare biographies of founders/CEOs.	**K4**
CO2	Use latest AI tools, for preparing technical reports, and engaging in technical conversations.	**K3**
CO3	Develop effective oral presentations using audio-visual aids, observing time restrictions, and addressing audience questions.	**K6**
CO4	Build knowledge of formal corporate meetings, including project updates, innovation meetings, and governance cadence, and be able to prepare digital brochures, agendas, and minutes.	**K6**

Course Contents

1	Listening: Listen to latest corporate meetings.	**CO4**
2	Speaking: Excerpts from formal corporate meetings eg. i. Project status or update meeting, ii. Innovation meeting iii. Governance cadence etc	**CO4**
3	Interview Skills.	**CO4**
4	Biography of Founder / CEO's .	**CO1**
5	Work in pair or groups on Managing Time and Accepting Responsibility. Eg. Undertake small projects.	**CO3**
6	Organize and maintain a Portfolio of one's work.	**CO3**
7	Create Term Planners and schedules noting Key dates / events.	**CO2**
8	Address questions on specific company from the audience.	**CO3**
9	Oral presentations using latest audio-visual aids observing time restrictions.	**CO3**
10	Travel essential and preparation for domestic / International Business.	**CO4**
11	Creative Thinking: Preparing Digital Brochures, Agenda and minutes of meeting	**CO4**
12	Listening and completing technical conversation.	**CO2**
13	Filling up Self-assessment Forms – SWOT Analysis.	**CO1**
14	History of reputed companies.	**CO1**
15	Hands on training in latest AI Tools.	**CO2**
	Total Hours	**30**

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Web URL(s):

1 https://www.academiccourses.com/business-english

2 https://www.cambridgeenglish.org/

3 https://www.ted.com/talks

Semester V

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U23ITT07	**FOUNDATIONS OF ARTIFICIAL INTELLIGENCE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre requisites U23MAT03-Discrete Mathematics
U23MAT05-Probability and Statistics

Objectives:

Course Outcomes:

- To introduce the fundamentals, evolution, and applications of Artificial Intelligence, and explain the behaviour of intelligent agents in different environments.
- To impart knowledge on problem-solving techniques in AI using search algorithms, heuristic methods, game playing strategies, and constraint satisfaction problems.
- To develop an understanding of logical reasoning, knowledge representation, and inference under uncertainty using probabilistic methods and decision networks.
- To explore various learning paradigms such as supervised, unsupervised, decision trees, neural networks, reinforcement learning, and language processing techniques
- To familiarize students with expert systems, their development stages, tools, challenges, and real-world applications including AI-based game theory and intelligent decision-making systems.

Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Summarize the fundamentals, history, applications, and characteristics of Artificial Intelligence and the behaviour of intelligent agents in various environments.	**K2**
C02	Apply search algorithms, heuristic methods, and game-playing strategies to solve AI-related problems	**K3**
C03	Use logical reasoning, probabilistic techniques, and decision networks to make AI systems handle uncertainty	**K3**
C04	Analyse different learning techniques in artificial intelligence and differentiate their applications and communication methods.	**K4**
C05	Examine the challenges in developing expert systems, probability-based reasoning, and the role of game theory in AI-based decision-making systems.	**K4**

Course Contents:

UNIT I **INTRODUCTION** **9**

Definitions-Importance of AI, Evolution of AI-Applications of AI, Intelligent Agents-Agents and Environments, Good behaviour: The concept of Rationality, The nature of environments, the structure of Agents. Problem solving: Problem solving Agents, Knowledge Inferring systems and Planning, Uncertainty and towards Learning Systems

UNIT II **OVERVIEW TO PROBLEM SOLVING AND HEURISTIC APPROACH** **9**

Problem solving by Search - Problem space - State space - Performance Measurement - Game playing mini max algorithm, Alpha-Beta Pruning - Search Algorithms - Breadth-first search - Depth-first search, A* search - The effect of heuristic accuracy on performance - Generating heuristics from relaxed problems - Local Search and Optimization Problem - Hill-climbing search - Constraint Satisfaction Problem - Variations on the CSP formalism

UNIT III UNCERTAIN KNOWLEDGE AND REASONING 9

Logical Agents: Knowledge-Based Agents - Proportional Logic Constraints-Predicate Logic- First Order Logic: Syntax and Semantics - Inference in First-Order Logic - Ontological Representations and applications -Overview Definition of uncertainty - Bayes Rule Inference - Belief Network - Decision Network

UNIT IV LEARNING SYSTEMS 9

Knowledge in learning: Explanation based learning - Forms of Learning Types - Supervised, Unsupervised, Learning Decision Trees - Statistical learning methods: Instance based learning - Neural Network - Reinforcement learning: Passive and active communication: Formal grammar - Augmented Grammars - Future of AI.

UNIT V EXPERT SYSTEMS 9

Expert Systems - Stages in the development of an Expert System - Probability based Expert Systems - Expert System Tools - Difficulties in Developing Expert Systems - Applications of Expert Systems - Game theory, classification of games, game playing strategies, prisoner s Dilemma, Game playing techniques. Real world expert systems –CLIPS, IBM Watson

Total Hours 45

Text Books:

1. Stuart Russel, Peter Norvig Artificial Intelligence A Modern Approach, 4th Edition, Pearson Education 2020.
2. Frank Puppe Systematic Introduction to Expert systems : Knowledge representation and Problem solving methods Springer-verlog 2012

Reference Books:

1. W. Patterson Introduction to Artificial Intelligence and Expert Systems Prentice Hall of India 2006
2. Patrick H.Winston Artificial Intelligence Pearson Education 2006
3. Elain Rich and Kevin Knight Artificial Intelligence TataMcGraw Hill 2010

Web URL(s):

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://www.coursera.org/learn/ai-for-everyone
3. https://www.coursera.org/specializations/ai-foundations-for-everyone
4. https://nptel.ac.in/courses/106/105/106105077/
5. https://nptel.ac.in/courses/106/106/106106126/

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U23ITT08	DATA MINING AND ANALYTICS	L	T	P	C
		3	0	0	3

Pre requisites : None

Objectives:

- To understand the basic concepts and steps in data mining and data pre-processing.
- To learn different methods for finding patterns and making classifications in data.
- To study techniques for grouping data and identifying unusual data.
- To understand big data concepts and apply basic statistical methods to analyse data
- To apply prediction techniques and analyse text, time series, and other types of complex data

Course Outcomes:

Upon completion of the course, students shall have the ability to		**BT Level (highest level)**
C01	Summarize the concepts of data mining, KDD process, data mining techniques, data warehousing, and data pre-processing method	**K2**
C02	Apply association rules and classification methods like Apriori, Decision Tree, Bayesian, and SVM using tools like WEKA and RapidMiner	**K3**
C03	Apply different clustering techniques and outlier detection methods to find patterns and unusual data in datasets.	**K3**
C04	Analyse different types of big data architectures, statistical measures, data distributions, and probability concepts to interpret relationships within large datasets	**K3**
C05	Analyse predictive models, text analysis techniques, and data handling methods for different types of data	**K3**

Course Contents:

UNIT I **INTRODUCTION TO DATA MINING AND DATA PREPROCESSING** **9**

Data Mining Definitions – KDD Process– Stages of the Data Mining Process -Data Mining Techniques –Data Mining Functionalities and Applications Data Warehousing Concepts – Data Warehouse Architecture– Data Preprocessing: Overview - Cleaning - Integration - Reduction - Transformation and Discretization, Tools for preprocessing-KNIME, Orange.

UNIT II **ASSOCIATION AND CLASSIFICATION** **9**

Basic concepts of Association- Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules -The Apriori Algorithm, Classification - Decision Tree - Bayesian Classification – Rule Based Classification – Classification by Back propagation–Support Vector Machine-Lazy Learners– Other Classification Methods, Tools for Association Rule mining-WEKA, RapidMiner.

UNIT III **CLUSTER ANALYSIS AND OUTLIER DETECTION** **9**

Cluster Analysis - Partitioning Methods -k-means Clustering- Hierarchical methods - Distance based agglomerative and divisible clustering - Density-Based Methods - Grid-Based Methods - Evaluation of Clustering - Outliers and Outliers Analysis - Outlier Detection Methods - Statistical Approaches -

Proximity-Based Approaches - Clustering-Based Approaches-Classification-Based Approaches-Outlier Detection in High-Dimensional Data.

UNIT IV BIG DATA AND STATISTICAL FOUNDATIONS 9

Big Data and Data Science - Big Data Architecture - Data - Taxonomy - Example -Types of Data – Mean, Median and Mode–Standard Deviation and Variance–Probability Density Function and Mass Function–Types of Data Distributions–Percentiles and Moments–Correlation and Covariance–Conditional Probability–Bayes' Theorem.

UNIT V PREDICTIVE MODELLING AND TEXT ANALYSIS 9

Regression Models (Linear, Polynomial, Multivariate, Multi-Level)- Text Analytics (TF-IDF, Topic Modelling, Sentiment Analysis)- Data Handling (Loading, Wrangling, Storage Formats)- Visualization & Time Series Analysis-Spatial Data Mining – Multimedia Data Mining - Mining the World Wide Web.

Total Hours 45

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, 4th Edition, Morgan Kaufmann Publishers, 2022

2. Frank Pane, Hands On Data Science and Python Machine Learning, Packt Publishers, 2017

Reference Books:

1. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 4th Edition, Morgan Kaufmann, 2016.
2. An Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, 2nd Edition, Springer, 2021
3. Text Analytics with Python: A Practical Real-Life Approach to Gaining Actionable Insights from your Data by Dipanjan Sarkar, 2nd Edition, Apress, 2019
4. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney, 3rd Edition, O'Reilly Media, 2022.
5. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill, 2004.

Web URL(s):

1. https://nptel.ac.in/courses/106105174
2. https://nptel.ac.in/courses/106106179
3. https://www.coursera.org/specializations/data-mining
4. https://www.kaggle.com/learn

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U23ITT09	**WEB FRAMEWORKS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre requisites : U23ITT03 – WEB ESSENTIALS

Objectives:

- To Learn full-stack development using Angular, Express, and MongoDB.
- To Understand client-server architecture and MVC framework structure.
- To Develop secure, dynamic, and responsive web applications.
- To Integrate frontend, backend, and database technologies efficiently.
- To Deploy web applications to cloud platforms for production use.

Course Outcomes:

Upon completion of the course, students shall have the ability to		**BT Level (highest level)**
C01	Understand the fundamentals, types, and architectures of modern web frameworks.	**K2**
C02	Analyze and compare the structure, capabilities, and use cases across frontend frameworks - React.js, Vue.js, and Angular.	**K3**
C03	Analyze the design and functional architecture of Express.js-based applications	**K3**
C04	Analyze diverse database technologies - comparing SQL, SQLite, PostgreSQL, Django ORM, and NoSQL -MongoDB with Node.js, Mongoose, MongoDB	**K3**
C05	Apply the techniques for authentication, security, state management, Firebase integration, and deployment using different technologies.	**K3**

Course Contents:

UNIT I INTRODUCTION TO WEB FRAMEWORKS 9

Fundamentals of Web Development, Client-Server Architecture, Overview of Web Frameworks: Definition, Need, and Types, MVC (Model-View-Controller) Architecture, Advantages and Limitations of Web Frameworks.

UNIT II FRONTEND WEB FRAMEWORKS-ANGULAR 9

Introduction to React.js and vue.js and its functionalities -Introduction to Angular- Angular Components, Templates, and Data Binding- Angular Services and Dependency Injection- Angular Routing and Navigation- Angular Forms- Styling and Theming Angular Applications- Introduction to Angular Testing.

UNIT III BACKEND WEB FRAMEWORKS -EXPRESS 9

Introduction to Express.js- Working with RESTful APIs in Express.js- Express Middleware- Connecting Express with MongoDB- Authentication and Security in Express.js- Testing Express.js Applications.

UNIT IV DATABASE INTEGRATION-MANGODB 9

Overview of Databases: SQL vs NoSQL- CRUD Operations in MongoDB with Node.js- Mongoose Data Modelling and Validation- MongoDB Aggregation and Indexing- Django ORM and MongoDB Integration, Other database technologies-SQLite, PostgreSQL.

UNIT V AUTHENTICATION, SECURITY & DEPLOYMENT 9

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User Authentication and Authorization, Sessions and Cookies Management, JSON Web Tokens (JWT) Implementation, Web Application Security Issues: XSS, CSRF, SQL Injection, Introduction to Firebase and its functionalities, Deployment of Web Applications: GitHub.

Total Hours 45

Text Books:

1. Flavio Copes, *"The Web Development Handbook"*, Self-Published, 2023 Edition**.**
2. Ethan Brown, *"Web Development with Node and Express: Leveraging the JavaScript Stack"*, 2nd Edition, O'Reilly, 2023.
3. Brad Dayley, Brendan Dayley, "Node.js, MongoDB and Angular Web Development", Addison-Wesley.
4. Dixon, Chris- *Vue.js 3 and Firebase for Beginners*. 1st ed., Packt, 2023. ISBN 978-1-80512-572-3.

Reference Books:

1. Robin Wieruch, *"The Road to React: The One with Hooks"*, 2023 Edition.
2. Antonio Mele, *"Django 4 By Example"*, 4th Edition, Packt Publishing, 2023.
3. Brad Traversy**,** *"Modern Full-Stack Development"*, Packt Publishing, 2023.
4. Eric Elliott, *"Programming JavaScript Applications"*, O'Reilly, 2023.

Web URL(s):

1. https://www.freecodecamp.org/learn
2. https://developer.mozilla.org/en-US/docs/Web
3. https://www.coursera.org/specializations/full-stack-react

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		L	T	P	C
U23ITV01	**DATA SCIENCE USING PYTHON**	3	0	0	3

Pre requisites : Basic knowledge in Python Programming, Statistics, and Data Structures

Objectives:

- To provide a strong foundation in the fundamentals of Data Science using Python.
- To apply data preprocessing, analysis, and visualization techniques to real-world problems.
- To implement learning algorithms and evaluate model performance using open-source libraries.

Course Outcomes:

Upon completion of the course, students shall have the ability to		**BT Level (highest level)**
C01	Explain data science concepts and python programming constructs.	**K2**
C02	Interpret data using Pandas and visualization libraries.	**K2**
C03	Apply statistical methods for analysis and wrangling.	**K3**
C04	Use supervised learning algorithms and evaluate model performance metrics.	**K3**
C05	Apply unsupervised learning methods to identify patterns and cluster data in practical applications.	**K3**

Course Contents:

UNIT I DATA SCIENCE AND PYTHON 9

Introduction to Data Science – Applications of Data Science – Data Science Lifecycle – Role of Python in Data Science - Python Basics – Data Types – Control Flow – Functions – Modules – File Handling – Exception Handling – Introduction to NumPy - Arrays – Vectorized Operations

UNIT II DATA HANDLING AND PREPROCESSING 9

Pandas for Data Handling – Series and Data Frame – Data Loading – Cleaning and Preparation – Handling Missing Data – Data Transformation – Encoding Categorical Variables – Feature Scaling – Exploratory Data Analysis – Descriptive Statistics – Data Visualization using Matplotlib and Seaborn.

UNIT III STATISTICAL ANALYSIS AND DATA WRANGLING 9

Introduction to Statistics – Mean, Median, Mode – Variance and Standard Deviation – Correlation and Covariance – Hypothesis Testing – t-test, chi-square test – ANOVA – Data Wrangling Techniques – Outlier Detection and Treatment – Feature Engineering.

UNIT IV SUPERVISED LEARNING 9

Supervised Learning – Linear Regression – Logistic Regression – Decision Trees – Random Forest – Model Evaluation Metrics – Accuracy, Precision, Recall, F1-score – Cross-validation – Confusion Matrix – Introduction to Scikit-learn – Model Training and Testing.

UNIT V UNSUPERVISED LEARNING 9

Unsupervised Learning – Clustering Techniques: K-Means – Hierarchical Clustering – DBSCAN – Dimensionality Reduction using PCA – Association Rule Learning: Apriori Algorithm - Introduction to Time Series – Case Studies.

Total Hours 45

Text Books:

1. Joel Grus, Data Science from Scratch: First Principles with Python, 2nd Edition, O'Reilly Media, 2019.

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2. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 3rd Edition, O'Reilly Media, 2022.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, O'Reilly Media, 2022.
4. Cathy O'Neil and Rachel Schutt, Doing Data Science, 1st Edition, O'Reilly Media, 2020.
5. Jake VanderPlas, Python Data Science Handbook, 2nd Edition, O'Reilly Media, 2023.

Reference Books:

1. Allen B. Downey, Think Stats: Exploratory Data Analysis in Python, 2nd Edition, O'Reilly, 2020.
2. Steven L. Scott, Machine Learning for Data Streams, 1st Edition, Springer, 2020.
3. Alberto Boschetti, Python Data Science Essentials, 2nd Edition, Packt Publishing, 2021.
4. Prateek Joshi, Artificial Intelligence with Python, 2nd Edition, Packt Publishing, 2020.
5. Tom Fawcett, Data Science for Business, 2nd Edition, O'Reilly, 2022.

Web URL(s):

1. https://nptel.ac.in/courses/106106179
2. https://nptel.ac.in/courses/106106212
3. https://www.coursera.org/specializations/data-science-python
4. https://scikit-learn.org/stable/user_guide.html
5. https://www.kaggle.com/learn/python

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U23ITP07 **ARTIFICIAL INTELLIGENCE LABORATORY**

L	T	P	C
0	0	2	1

Pre-requisite : Fundamentals of Programming (Python/ Prolog)

Objectives:

- To Understand the foundational concepts of AI and expert systems.
- To Apply AI techniques to solve real-world problems T
- To develop simple expert systems using appropriate tools.
- To Evaluate the performance of AI algorithms in various scenarios.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Implement basic AI search algorithms and problem-solving techniques.	**K3**
CO2	Develop simple expert systems using Prolog and Python.	**K4**
CO3	Design and evaluate AI models for real-world applications.	**K4**

LIST OF EXPERIMENTS:

1. Implement basic search strategies – 8-Puzzle.
2. Implement 8 - Queens problem, Cryptarithmetic.
3. Implement A* and memory bounded A* algorithms
4. Implement Minimax algorithm for game playing (Alpha-Beta pruning) Programs on Graph Traversal
5. Solve constraint satisfaction problems
6. Implement propositional model checking algorithms
7. Implement forward chaining, backward chaining, and resolution strategies
8. Build naive Bayes models.
9. Implement local search algorithms for CSP.
10. Mini Project: Expert system prototype

Total Hours 30

Reference Books:

1. Russell, S., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach* (4th ed.). Prentice Hall.
2. Patterson, D. W. (2015). *Introduction to Artificial Intelligence and Expert Systems*. Pearson Education India.
3. Gupta, I., & Nagpal, G. (2020). *Artificial Intelligence and Expert Systems*. Mercury Learning and Information.

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4. Flach, P., & Sokol, K. (2022). *Simply Logical – Intelligent Reasoning by Example* (Fully Interactive Online Edition).

Web URL(s):

1. https://www.tensorflow.org/
2. https://scikit-learn.org/stable/
3. SWI-Prolog Site
4. CLIPS Downloads:CLIPS (NASA's public domain expert system tool):

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U23ITP08	**DATA MINING AND ANALYTICS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Pre-Requisites : None

Objectives:

- Understand how to clean and prepare data using essential preprocessing techniques.
- Gain practical skills in using Python libraries like NumPy, Pandas, and SciPy for data analysis.
- Learn to build and evaluate classification and clustering models on real-world datasets.
- Apply data visualization techniques to explore and communicate insights effectively.
- Complete an end-to-end mini project involving data collection, modeling, and reporting.

Course Outcomes: Upon completion of the course, students would be able to		**BT Level (highest level)**
CO1	Apply data preprocessing and basic data handling techniques using Python libraries.	**K3**
CO2	Implement and analyze classification, clustering, and association algorithms on real-world datasets.	**K4**
CO3	Perform data visualization and statistical analysis to derive insights and develop a complete data analytics mini project.	**K4**

LIST OF EXPERIMENTS:

1. Apply essential Pre-Processes Techniques on any data set.
2. Generate Association Rules using Apriori Algorithm.
3. Implement of Decision Tree Algorithm and Back Propagation classification on any data set.
4. Applying Agglomerative Clustering and DBSCAN on any data set.
5. Implementation of Data Clustering using K – Means Clustering
6. a) Install Numpy Package and Working with Numpy Array – Array Creation Using Numpy.
   b) Install Panda Package and Working with Panda Data frame.
   c) Install Scipy Package from Scipy.
7. a) Reading Data from Text Files and Exploring Various Commands for Doing Some Descriptive Analysis.
   b) Reading Data from Excel and Exploring Various Commands for Doing Some Descriptive Analysis.
8. a) Apply and explore various plotting functions on any datasets.
   b) Visualize data using any plotting framework.
9. a) Use the diabetes data set to perform Univariate analysis.
   b) Use the diabetes data set to perform Bivariate analysis: Linear, multi and logistic regression modelling.
10. Mini Project: End-to-end project — Data Collection, Preprocessing, Model Building (Classification/Clustering) and Report.

Total Hours 30

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Reference Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 4th Edition, Morgan Kaufmann, 2021.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 3rd Edition, Pearson, 2021.
3. Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", 4th Edition, Morgan Kaufmann, 2016.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, 2nd Edition, 2009.
5. Jure Leskovec, Anand Rajaraman, Jeffrey Ullman, "Mining of Massive Datasets", 3rd Edition, Cambridge University Press, 2020.
6. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

Web URL(s):

1. https://scikit-learn.org/stable/
2. https://spark.apache.org/
3. https://www.kaggle.com/
4. https://numpy.org
5. https://matplotlib.org
6. https://www.coursera.org/learn/data-mining

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U23ITP09	WEB FRAMEWORKS LABORATORY	L	T	P	C
		0	0	2	1

Pre requisites : None

Course Objectives

- To impart hands-on knowledge in building interactive web applications using frontend frameworks like Angular.
- To develop the ability to create RESTful APIs and implement server-side logic using Express.js.
- To provide practical exposure to database integration and manipulation using MongoDB.
- To enable the implementation of secure web applications with authentication, authorization, and middleware.
- To facilitate the deployment of full-stack web applications on modern cloud platforms.

Course Outcome: Upon completion of the course, students shall have ability to		**BT Level (highest level)**
C01	Design and develop dynamic client-side web applications using Angular components, forms, and routing mechanisms.	K3
C02	Build and test RESTful APIs using Express.js for backend functionality and data exchange.	K3
C03	Perform CRUD operations and data modelling using MongoDB and Mongoose with Node.js.	K3
C04	Implement user authentication, session handling, and secure communication using JSON Web Tokens in Express.js.	K3
C05	Deploy full-stack web applications using platforms such as GitHub.	K3

List of Experiments

1. Developing a static webpage using HTML, CSS, and JavaScript to demonstrate Client-Server Architecture.
2. Creating a basic Angular application to implement MVC (Model-View-Controller) architecture using components, templates, and data binding.
3. Implementing Angular Forms with validation and user input handling using reactive or template-driven approaches.
4. Developing a single-page Angular application with routing and navigation between components.
5. Creating a RESTful API using Express.js with CRUD operations for a sample data entity.
6. Integrating MongoDB with Express.js using Mongoose and performing CRUD operations with proper data validation.
7. Implementing middleware and authentication in Express.js using JSON Web Tokens (JWT).
8. Performing MongoDB aggregation operations and demonstrating indexing for performance optimization.
9. Deploying a full-stack MERN application using GitHub
10. Mini Project: Building and deploying a complete full-stack web application with frontend (Angular,vue.js,react.js), backend (Express.js), database (MongoDB), and secure authentication features.

Total hours: 30

Reference Books:

1. **Flavio Copes**, *"The Web Development Handbook"*, Self-Published, **2023 Edition**.
2. **Ethan Brown**, *"Web Development with Node and Express: Leveraging the JavaScript Stack"*, 2nd Edition, O'Reilly, 2023.

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3. Brad Dayley, Brendan Dayley, "Node.js, MongoDB and Angular Web Development", Addison-Wesley.
4. **Robin Wieruch**, *"The Road to React: The One with Hooks"*, 2023 Edition.
5. **Antonio Mele**, *"Django 4 By Example"*, 4th Edition, Packt Publishing, 2023.
6. **Brad Traversy**, *"Modern Full-Stack Development"*, Packt Publishing, 2023.
7. **Eric Elliott**, *"Programming JavaScript Applications"*, O'Reilly, 2023.

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