

B.E.COMPUTER SCIENCE AND ENGINEERING

REGULATION 2022 (Choice Based Credit System)

CURRICULUM & SYLLABUS



ADHIYAMAAN COLLEGE OF ENGINEERING

(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai) (Accredited by NAAC)

Dr.M.G. RNagar, Hosur-635109, Tamilnadu, India REGULATION 2022

CHOICE BASED CREDIT SYSTEM

B.E.-COMPUTER SCIENCE AND ENGINEERING

Vision

To mould young and fresh minds into challenging professionals with ethical values and shaping them with contemporary skills to contribute fully in current and future world demands.

Mission

To produce competent and quality professionals by imparting computer concepts and techniques to facilitate the students to work with modern tools, inventive technologies, innovative research capabilities and leadership abilities by inculcating the spirit of ethical values.

I. Programme Educational Objectives (PEOs)

PEO1: The graduates of the program will have sound knowledge in Mathematical, Scientific, and Engineering concepts necessary to formulate, analyse, design, and solve Engineering problems and to prepare them for higher learning, research, and industry.

PEO2: The graduates of the program will possess innovative skills to assess and apply the rapid changes in technology and to engage in research leading to novel solutions for human, social, and global competency.

PEO3: The graduates of the program will acquire knowledge and grab opportunities to work as teams on Multi-disciplinary environment, communicate ideas effectively with diverse audiences, and demonstrate leadership qualities with ethical values.

II. Programme Outcomes (POs)

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

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

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

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

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

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

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

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

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

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

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

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

Programme Specific Outcomes (PSOs)

PSO1 Professional Skills: An ability to interpret the fundamental concepts and methodology of computer systems. To enhance skills among students to synthesize data and technical ideas for software design and development.

PSO2 Problem Solving Skills: The ability to understand the structure and development methodologies of software systems. Possess knowledge of software design processes using open-ended programming environments to deliver a quality product for business success.

PSO3 Successful career and entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies.

	PO's								PSO's						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PEO1	3	2	2	1	2	1	3	2	2	1	3	1	1	1	2
PEO2	2	1	3	1	3	2	1	2	1	2	1	1	1	2	3
PEO3	2	2	3	2	3	1	1	3	2	2	3	1	1	2	1

Correlation of PEO's with PO's and PSO's





(AUTONOMOUS), HOSUR

B.E.COMPUTER SCIENCE AND ENGINEERING COMPONENTS OF THE CURRICULUM REGULATION 2022 Choice Based Credit System

Course component	Curriculum content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic sciences	13.6	60	22
Engineering sciences	11.1	45	18
Humanities and social sciences	5.6	45	9
Program core	45.6	840	74
Program electives	11.1	270	18
Open electives	5.6	135	9
Project(s) (EEC)	7.4	390	12
Total numb	per of credits		162





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ADHIYAMAAN COLLEGE OF ENGINEERING (AUTONOMOUS), HOSUR B.E.COMPUTER SCIENCE AND ENGINEERING REGULATION 2022 Choice Based Credit System



Т

STRUCTURE OF THE CURRICULUM

Course	Course Title	Tot	al Number	of contact h	ours	Credit's
Code		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
122ENI01	Professional English-I	2	0	2	45	3
122MAT02	Matrices and Calculus	3	1	0	60	4
122PHT03	Engineering Physics	2	0	0	45	2
122CYT04	Engineering Chemistry	2	0	0	45	2
122PPT05	Python Programming	3	0	0	45	3
122EET06	Basic Electrical Electronics and Instrumentation Engineering	3	0	0	45	3
122HST07	தமிழர் மரபு /Heritage of Tamils	1	0	0	45	1
122PHP08	Engineering Physics Laboratory	0	0	2	30	1
122PPP09	Python Programming Laboratory	0	0	2	30	1
222ENI01	Professional English-II (Embedded)	2	0	2	45	3
222MAT02	Probability and Statistics	3	1	0	60	4
222EST03	Environmental Science and Sustainability	2	0	0	45	2
222EGT04	Engineering Graphics	2	0	4	45	4
222PIT05	Physics for Information Science	2	0	0	45	2
222CPI06	Programming in C	3	0	2	45	4
222HST07	Tamils and Technology	1	0	0	45	1
222CYP08	Engineering Chemistry Laboratory	0	0	2	30	1
222EPP09	Engineering Practice Laboratory	0	0	2	30	1
322DMT01	Discrete Mathematics	3	1	0	60	4
322CST02	Digital Electronics	3	0	0	45	3
322CSI03	Foundation of Data Science	3	0	2	45	4
322CIT04	Object Oriented Programming	3	0	0	45	3
322CIT05	Data Structures	3	0	0	45	3
322CIT06	Computer Organization	3	0	0	45	3
322CIP07	OOPs Laboratory	0	0	2	30	1
322CIP08	Data Structures Laboratory	0	0	2	30	1
322GEV01	Professional Development	0	0	2	30	1
422CST01	Object Oriented Software Engineering	3	0	0	45	3
422CIT02	Design and Analysis of algorithm	3	0	0	45	3
422CIT03	Database Management System	3	0	0	45	3
422CIT04	Operating Systems	3	0	0	45	3
422CII05	Network Essentials	3	0	2	45	4
422CST06	Theory of Computation	3	0	0	45	3
422CIP07	Database Management System Laboratory	0	0	2	30	1
422CIP08	Operating Systems Laboratory	0	0	2	30	1
522CIT01	Artificial Intelligence and Machine Learning	3	0	0	45	3

522CSI02	Cryptography and Block Chain Technologies	3	0	2	45	4
522CST03	Compiler Design	3	0	0	45	3
522CIT04	Web Essentials	3	0	0	45	3
X22XXExx	Professional Elective-I	3	0	0	45	3
X22XXOxx	Open Elective-I	3	0	0	45	3
522MCTxx	Mandatory Course – I	1	0	0	45	1
522CIP07	Artificial Intelligence and Machine Learning Laboratory	0	0	2	30	1
522CIP08	Web Essentials Laboratory	0	0	2	30	1
522CSVxx	Value Added Course	0	0	2	-	1
622CIT01	Full Stack Development	3	0	0	45	3
622CII02	Cloud Computing	3	0	0	45	3
622CST03	Mobile Application Development	3	0	0	45	3
622CSI04	Devops	3	0	2	45	4
X22XXExx	Professional Elective–II	3	0	0	45	3
X22XXOxx	Open Elective-II	3	0	0	45	3
622CIP07	Full Stack Development Laboratory	0	0	2	30	1
622CSP08	Mobile Application Development Laboratory	0	0	2	30	1
EEC	Internship	0	0	4	-	2
722CIT01	ARVR and Metaverse	3	0	2	45	4
722CST02	Internet of Things	3	0	0	45	3
722CST03	Human Values and Ethics	3	0	0	45	3
X22XXExx	Professional Elective - III	3	0	0	45	3
X22XXOxx	Professional Elective - IV	3	0	0	45	3
722BAOxx	Management Elective	3	0	0	45	3
722CSP07	Internet of Things Laboratory	0	0	2	30	1
722CSP08	Mini Project	0	0	4	30	2
X22XXExx	Professional Elective - V	3	0	0	45	3
X22XXExx	Professional Elective - VI	3	0	0	45	3
822CSP01	Project Work & Viva Voce	0	0	18	240	9

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Choice Based Credit System

(Applicable to the students admitted from the Academic year 2022-2023 onwards)

SEMESTER – I

S.	Category	Category Course Code Course Title		L	Т	Р	С		Mark	S
No	81							CA	EA	ТОТ
-	-	122IP001	Induction Programme	-	-	-	-	-	-	-
			THEORY							
1	HS	122ENI01	Professional English-I	2	0	2	3	50	50	100
2	BS	122MAT02	Matrices and Calculus	3	1	0	4	40	60	100
3	BS	122PHT03	Engineering Physics	2	0	0	2	40	60	100
4	BS	122CYT04	Engineering Chemistry	2	0	0	2	40	60	100
5	ES	122PPT05	Python Programming	3	0	0	3	40	60	100
6	ES	122EET06	Basic Electrical Electronics and Instrumentation Engineering	3	0	0	3	40	60	100
7	HS	122HST07	தமிழர்மரபு /Heritage of Tamils	1	0	0	0	40	60	100
			PRACTICALS							
7	BS	122PHP08	Engineering Physics Laboratory	0	0	2	1	60	40	100
8	ES	122PPP09	Python Programming Laboratory	0	0	2	1	60	40	100
	TOTAL			16	1	6	19			

SEMESTER – II

S.	Category Cours		Category Course Course Title	L	Т	Р	С		Mark	S
No	81	Code						CA	EA	ТОТ
			THEORY							
1	HS	222ENI01	Professional English-II (Embedded)	2	0	2	3	50	50	100
2	BS	222MAT02	Probability and Statistics	3	1	0	4	40	60	100
3	BS	222EST03	Environmental Science and Sustainability	2	0	0	2	40	60	100
4	ES	222EGT04	Engineering Graphics	2	0	4	4	40	60	100
5	BS	222PIT05	Physics for Information Science	2	0	0	2	40	60	100
6	ES	222CPI06	Programming in C	3	0	2	4	40	60	100
7	HS	222HST07	Tamils and Technology	1	0	0	1	40	60	100
			PRACTICALS							
7	BS	222CYP08	Engineering Chemistry Laboratory	0	0	2	1	60	40	100
8	ES	222EPP09	Engineering Practice Laboratory	0	0	2	1	60	40	100
		ſ	TOTAL	14	1	12	21			

SEMESTER – III

S.	Category Course Code Course Title	Course Title	L	Т	Р	С	Marks			
NO								CA	EA	ТОТ
			THEORY							
1	BS	322DMT01	Discrete Mathematics	3	1	0	4	40	60	100
2	ES	322CIT02	Digital Electronics	3	0	0	3	40	60	100
3	PC	322CSI03	Foundation of Data Science	3	0	2	4	50	50	100
4	PC	322CIT04	Object Oriented Programming	3	0	0	3	40	60	100
5	PC	322CIT05	Data Structures	3	0	0	3	40	60	100
6	PC	322CIT06	Computer Organization	3	0	0	3	40	60	100
			PRACTICALS							
7	PC	322CIP07	OOPs Laboratory	0	0	2	1	60	40	100
8	PC	322CIP08	Data Structures Laboratory	0	0	2	1	60	40	100
9	EEC	322GEV01	Professional Development	0	0	2	1			100
		ΤΟΤΑ		18	1	8	22			

SEMESTER – IV

S.	Category	Course	Course Title	L	Т	Р	С	Marks		
No		Code						CA	EA	ТОТ
			THEORY							
1	PC	422CST01	Object Oriented Software Engineering	3	0	0	3	40	60	100
2	PC	422CIT02	Design and Analysis of Algorithm	3	0	0	3	40	60	100
3	PC	422CIT03	Database Management System	3	0	0	3	40	60	100
4	PC	422CIT04	Operating Systems	3	0	0	3	40	60	100
5	PC	422CII05	Network Essentials	3	0	2	4	50	50	100
6	PC	422CST06	Theory of Computation	3	0	0	3	40	60	100
			PRACTICALS							
7	PC	422CIP07	Database Management System Laboratory	0	0	2	1	60	40	100
8	PC	422CIP08	Operating Systems Laboratory	0	0	2	1	60	40	100
9	EEC	422GEV02	Maths Solver	0	0	2	1			100
		TAL	18	0	8	21				

S.	Category	Course	Course Code Course Title	L	Т	Р	С		Mark	KS
No		Code						CA	EA	ТОТ
			THEORY							
1	PC	522CIT01	Artificial Intelligence and Machine Learning	3	0	0	3	40	60	100
2	PC	522CSI02	Cryptography and Block Chain Technologies	3	0	2	4	50	50	100
3	PC	522CST03	Compiler Design	3	0	0	3	40	60	100
4	PC	522CIT04	Web Essentials	3	0	0	3	40	60	100
5	PE	X22xxExx	Professional Elective-I	3	0	0	3	40	60	100
6	OE	X22xxoxx	Open Elective-I	3	0	0	3	40	60	100
7	MC	522MCTxx	Mandatory Course – I	1	0	0	1			100
			PRACTICALS							
8	РС	522CIP07	Artificial Intelligence and Machine Learning Laboratory	0	0	2	1	60	40	100
9	PC	522CIP08	Web Essentials Laboratory	0	0	2	1	60	40	100
10	VAD	522CSVxx	Value Added Course	0	0	2	1			100
	TOTAL					10	21			

SEMESTER – V

SEMESTER – VI

S.	Category	ory Course Code Course Title		L	Т	Р	С	Marks			
No								CA	EA	ТОТ	
			THEORY								
1	PC	622CIT01	Full Stack Development	3	0	0	3	40	60	100	
2	PC	622CII02	Cloud Computing	3	0	0	3	50	50	100	
3	PC	622CST03	Mobile Application Development	3	0	0	3	40	60	100	
4	PC	622CSI04	Devops	3	0	2	4	50	50	100	
5	PE	X22XXExx	Professional Elective – II	3	0	0	3	40	60	100	
6	OE	X22XXOxx	Open Elective – II	3	0	0	3	40	60	100	
7	MC	X22MCTxx	Mandatory Course - II	3	0	0	1	40	60	100	
			PRACTICALS								
8	PC	622CIP07	Full Stack Development Laboratory	0	0	2	1	60	40	100	
9	PC	622CSP08	Mobile Application Development Laboratory	0	0	2	1	60	40	100	
10	EEC	EEC	Internship	0	0	4	2	60	40	100	
	TOTAL			21	0	10	23				

SEMESTER – VII

S. No	5. No Category Course Course Title	Course Title	L	Т	Р	C	Marks			
		Code						CA	EA	ТОТ
			THEORY							
1	PC	722CIT01	ARVR and Meta averse	3	0	2	4	40	60	100
2	PC	722CST02	Internet of Things	3	0	0	3	40	60	100
3	HSMC	722CST03	Human Values and Ethics	3	0	0	3	40	60	100
4	PE	X22XXExx	Professional Elective - III	3	0	0	3	40	60	100
5	PE	X22XXExx	Professional Elective - IV	3	0	0	3	40	60	100
6	OE	722BAOxx	Management Elective	3	0	0	3	40	60	100
			PRACTICALS							
7	PC	722CSP07	Internet of Things Laboratory	0	0	2	1	60	40	100
8	EEC	722CSP08	Mini Project	0	0	4	2	60	40	100
		ТОТА	L	18	0	8	22			

SEMESTER – VIII

S. NoCategoryCourse CodeCourse Title	L	Т	Р	C	C Marks					
INO								CA	EA	ТОТ
			THEORY							
1	PE	X22XXExx	Professional Elective - V	3	0	0	3	40	60	100
2	PE	X22XXExx	Professional Elective - VI	3	0	0	3	40	60	100
			PRACTICALS							
3	EEC	822CSP01	Project Work & Viva Voce	0	0	18	9	40	60	100
	TOTAL				0	18	15			

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LIST OF MANDATORY COURSES – I

S. No	Category	Course	Course Title	L	Т	Р	С		Marks	8
No	01	Code						CA	EA	ТОТ
1	MC	522MCT01	Indian Constitution	3	0	0	1			100
1	MC	522MCT02	Gender, Culture and Development	3	0	0	1			100
2	MC	522MCT03	Elements of Literature	3	0	0	1			100
3	MC	522MCT04	Introduction to women & gender Studies	3	0	0	1			100
4	MC	522MCT05	Disaster Management	3	0	0	1			100

LIST OFMANDATORY COURSES - II

S.	Category	Course Course Title	L	Т	Р	С		Mark	5			
No		Code						CA	EA	ТОТ		
	THEORY											
1	MC	622MCT01	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	3	0	0	1			100		
2	MC	622MCT02	History of Science and Technology in India	3	0	0	1			100		
3	MC	622MCT03	Political and Economic Thought for a Humane Society	3	0	0	1			100		
4	MC	622MCT04	State, Nation Building and Politics in India	3	0	0	1			100		
5	MC	622MCT05	Industrial Safety	3	0	0	1			100		

S.	Category	Course	Course Title	L	T	Р	С		Mark	ŝ			
NO		Code						CA	EA	ТОТ			
	THEORY												
1	HSMC	722BAO01	Principles of Management	3	0	0	3	40	60	100			
2	HSMC	722BAO02	Total Quality Management	3	0	0	3	40	60	100			
3	HSMC	722BAO03	Human Resource Management	3	0	0	3	40	60	100			
4	HSMC	722BAO04	Knowledge Management	3	0	0	3	40	60	100			
5	HSMC	722BAO05	People Management	3	0	0	3	40	60	100			
6	HSMC	722BAO06	Management Information System	3	0	0	3	40	60	100			

LIST OF ELECTIVE-MANAGEMENT (SEMESTER VII)

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PROFESSIONAL ELECTIVE COURSES- VERTICALS

S.	Category	Course	Course Title	L	Т	Т	Т	Т	Т	Р	С		Mar	ks
No		Code						CA	EA	ТОТ				
THEORY														
1	PC	X22CIE01	Big Data Analytics	3	0	0	3	40	60	100				
2	PC	X22CIE02	Exploratory Data Analysis	3	0	0	3	40	60	100				
3	PC	X22CIE03	Recommended Systems	3	0	0	3	40	60	100				
4	PC	X22CIE04	Text and Speech Analysis	3	0	0	3	40	60	100				
5	PC	X22CIE05	Image and Video Analytics	3	0	0	3	40	60	100				
6	PC	X22CIE06	Business Analytics	3	0	0	3	40	60	100				
7	PC	X22CIE07	Cognitive Science	3	0	0	3	40	60	100				

VERTICAL 1: AI & DATA SCIENCE

VERTICAL 2: FULL STACK DEVELOPMENT

S.	Category	Course	Course Title	L	Т	Т	Р	Р	Р	Р	С		Marl	KS
No		Code						CA	EA	ТОТ				
THEORY														
1	PC	X22CIE08	C# & NET	3	0	0	3	40	60	100				
2	PC	X22CIE09	Advanced Scripting	3	0	0	3	40	60	100				
3	PC	X22CIE10	UI and UX Design	3	0	0	3	40	60	100				
4	PC	X22CIE11	Advanced Python Programming	3	0	0	3	40	60	100				
5	PC	X22CIE12	Cloud Services and Management	3	0	0	3	40	60	100				
6	PC	X22CIE13	Web Application Security	3	0	0	3	40	60	100				
7	PC	X22CIE14	Software Testing and Automation	3	0	0	3	40	60	100				

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VERTICAL 3: CLOUD AND DATA CENTER TECHNOLOGIES

S No	Catagory	Course Code	Course Title	Т	Т	р			Mark	KS			
5. 110	Category	Course Coue	Course Thie	L			C	CA	EA	ТОТ			
	THEORY												
1	PC	X22CIE15	Devops	3	0	0	3	40	60	100			
2	PC	X22CIE16	Virtualization	3	0	0	3	40	60	100			
3	PC	X22CIE17	Cloud Services and Management	3	0	0	3	40	60	100			
4	PC	X22CIE18	Storage Technologies	3	0	0	3	40	60	100			
5	PC	X22CIE19	Software Defined Networks	3	0	0	3	40	60	100			
6	PC	X22CIE20	Stream Processing	3	0	0	3	40	60	100			
7	PC	X22CIE21	Security and Privacy in Cloud	3	0	0	3	40	60	100			

VERTICAL 4: CYBER SECURITY AND DATA PRIVACY

S. No	Category	Course Code	Course Title	L	Т	Р	С	Marks					
								CA	EA	ТОТ			
	THEORY												
1	PC	X22CIE22	Ethical Hacking	3	0	0	3	40	60	100			
2	PC	X22CIE23	Digital and Mobile Forensics	3	0	0	3	40	60	100			
3	PC	X22CIE24	Cyber Security	3	0	0	3	40	60	100			
4	PC	X22CIE21	Security and Privacy in Cloud	3	0	0	3	40	60	100			
5	PC	X22CIE26	Social Network Security	3	0	0	3	40	60	100			
6	PC	X22CSE27	Crypto Currency	3	0	0	3	40	60	100			
7	PC	X22CSE28	Network Security	3	0	0	3	40	60	100			

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VERTICAL 5: CREATIVE MEDIA

S.	Category	Course Course Title		L	T	Т	Т	T	Т	T	Т	T	Р	С		Mark	(S
NO		Code						CA	EA	ТОТ							
	THEORY																
1	PC	X22CIE29	Multimedia and Animation	3	0	0	3	40	60	100							
2	РС	X22CIE30	Multimedia Data Compression and Storage	3	0	0	3	40	60	100							
3	PC	X22CIE10	UI and UX Design	3	0	0	3	40	60	100							
4	PC	X22CIE32	Visual Effects	3	0	0	3	40	60	100							
5	PC	X22CIE33	Game Development	3	0	0	3	40	60	100							
6	PC	X22CIE34	Video Creation and Editing	3	0	0	3	40	60	100							
7	PC	X22CSE35	Image and video Analytics	3	0	0	3	40	60	100							

VERTICAL 6: EMERGING TECHNOLOGIES

S.	Category	Course	Course Title	L	Т	T	Р	C		Mark	S	
NO		Code						CA	EA	ТОТ		
	THEORY											
1	PC	X22CIE01	Big Data Analytics	3	0	0	3	40	60	100		
2	PC	X22CSE37	Neural Networks and deep learning	3	0	0	3	40	60	100		
3	PC	X22CIE24	Cyber Security	3	0	0	3	40	60	100		
4	PC	X22CSE39	Robotics process Automation	3	0	0	3	40	60	100		
5	PC	X22CIE10	UI and UX Design	3	0	0	3	40	60	100		
6	PC	X22CIE15	Devops	3	0	0	3	40	60	100		
7	PC	X22CSE42	Design Thinking	3	0	0	3	40	60	100		

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Choice Based Credit System

Applicable to the students admitted from the Academic year (2022-2023 onwards)

S.No	Semester	Credits
1	Ι	19
2	II	21
3	III	22
4	IV	21
5	V	21
6	VI	23
7	VII	22
8	VIII	15
	Total	164

B.E. COMPUTER SCIENCE AND ENGINEERING

R2022-CURRICULUM

Choice Based Credit System

SDG IMPLEMENTATION INITIATIVE

COURSES INTRODUCED	RELATED TO SDG
222EST03 - Environmental Science and Sustainability	SDG 11
322GEV01 - Professional Development	SDG 8
Human Values and Ethics	SDG 5, SDG 8, SDG 10, SDG 12
Introduction to Women and Gender Studies	SDG 5, SDG 10
For all Courses	SDG 4

SEMESTER – III

S.	Category	Course Code	Course Title	L	Т	Р	С		Mar	ks			
NO								CA	EA	ТОТ			
	THEORY												
1	1 BS 322DMT01 Discrete Mathematics 3 1 0 4 40 60 100												
2	ES	322CST02	Digital Electronics	3	0	0	3	40	60	100			
3	PC	322CSI03	Foundation of Data Science	3	0	2	4	40	60	100			
4	PC	322CIT04	Object Oriented Programming	3	0	0	3	40	60	100			
5	PC	322CIT05	Data Structures	3	0	0	3	40	60	100			
6	PC	322CIT06	Computer Organization	3	0	0	3	40	60	100			
			PRACTICALS										
7	PC	322CIP07	OOPs Laboratory	0	0	2	1	60	40	100			
8	PC	322CIP08	Data Structures Laboratory	0	0	2	1	60	40	100			
9	EEC	322GEV01	Professional Development	0	0	2	1			100			
	TOTAL					8	22						

322DMT01

DISCRETE MATHEMATICS

3104100

(B.E. Computer Science and Engineering, B. Tech. Information Technology and B. Tech. Artificial Intelligence and Data Science)

COURSE OBJECTIVES:

- To master combinatorics which deals with the counting principles.
- To identify the basic properties of graph and model simple applications.
- To understand the concept of logic and hence to construct valid mathematical arguments.
- To expose the basic properties and concepts of algebraic structures.
- To introduce the concept of Lattices and Boolean algebra.

UNIT I: COMBINATORICS

Mathematical Induction – The basics of Counting Principle - The Pigeonhole principle - Permutations and Combinations – Recurrence relations- Solving linear recurrence relations - Generating functions – Inclusion and exclusion principle.

UNIT II: GRAPHS

Graphs – preliminaries - Types of graphs – properties – walks, trials and paths – Isomorphism of graphs – Matrix representations of graphs - Connectivity of a graph – Bipartite graphs - Euler and Hamilton graphs - Coloring of graphs - Chromatic number of a graph.

UNIT III: LOGICS AND PROOFS

Propositional Logic – Propositional equivalences - Predicates and quantifiers – Nested Quantifiers – Rules of inference - introduction to proofs – proof methods and strategy.

UNIT IV: ALGEBRAIC STRUCTURES

Algebraic systems – Semi groups and monoids – Groups-Subgroups and homomorphism's – Cosets and Lagrange's theorem – Rings & Fields (basic definitions and problems): Elementary properties of Rings-Isomorphism-Types of Rings-Sub Rings-Homomorphism of rings - Fields of quotients of an integral domain.

UNIT V: LATTICES AND BOOLEAN ALGEBRA

Partial ordering – Posets – Lattices as Posets – Properties of Lattices-Lattices as algebraic systems – Sub lattices – direct product and Homomorphism – Some special lattices – Boolean algebra.

Total Hours: 45 Periods

COURSE OUTCOMES:

On successful completion the students will be able to

- **CO 1:** Demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics.
- **CO 2:** Acquaint with the graph theory concepts which serves as the base for the real time applications in network analysis.
- **CO 3:** Expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiments.
- **CO 4:** Internalize the abstract algebraic structures which provide the ability to deal the theory of sequential machines, formal languages and syntactic analysis.
- **CO 5:** Apply the concept of Lattices and Boolean algebra.

9+3

9+3

9+3

9+3

9+3

TEXT BOOKS:

- 1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Seventh edition, Special Indian edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2011.
- 2. T. Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw– Hill Pub. Co. Ltd, New Delhi, 2006.

REFERENCES:

- 1. Trembly J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, thirtieth re-print 2007.
- 2. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, 2007.
- 3. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2006.
- 4. Herstein. I.N., "Topics in Algebra", Second Edition, Wiley India Pvt. Ltd., 2006.
- 5. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publications Inc., First edition, 2016.

	322DMT01-DISCRETE MATHEMATICS														
CO's/ PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	2	2	2	-
CO2	3	3	1	2	1	-	-	-	-	-	-	2	2	2	-
CO3	3	3	3	2	-	-	-	-	-	-	-	2	2	2	-
CO4	3	2	1	-	-	-	-	-	-	-	-	2	2	2	-
CO5	3	2	2	1	1	-	-	-	-	-	-	2	2	2	-
AVG	3	2	2	2	1	-	-	-	-	-	-	2	2	2	-

COs-PO's & PSO's MAPPING:

3-High 2-Moderate 1-Low '-'- No Correlation

DIGITAL ELECTRONICS

L T P C 3 0 0 3

COURSE OBJECTIVES:

- Minimize the Boolean expression and identify the various operations of Logic gates
- Design and analyze of various combinational circuits
- Design various sequential circuits like counters, registers, etc
- Understand the concept of memories and programmable logic devices.
- Design and analyze synchronous and asynchronous sequential circuits

UNIT I: MINIMIZATION TECHNIQUES AND LOGIC GATES

Review of binary number systems - Binary arithmetic – Binary codes – Boolean algebra and theorems - Boolean functions – Simplifications of Boolean functions using Karnaugh map and tabulation methods – Logic gates

UNIT II: COMBINATIONAL CIRCUITS

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, parallel binary Subtractor - Serial Adder/Subtractor - Binary Multiplier – Binary Divider - Multiplexer/ DE multiplexer – decoder - encoder – code converters - Magnitude Comparator.

UNIT III: SYNCHRONOUS SEQUENTIAL CIRCUITS

Latches, Flip-flops - SR, JK, D, T, and Master-Slave –Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, – Counters, shift registers - Shift counters

UNIT IV: ASYNCHRONOUS SEQUENTIAL CIRCUITS

Stable and Unstable states, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits

UNIT V: MEMORY AND I/O

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 Periods

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COURSE OUTCOMES

On successful completion the students will be able to

CO1: Solve and implement various Boolean expression with minimized logic gates

CO2: Implement the various combinational circuits for real time applications

CO3: Design and analyze various synchronous sequential circuits like counters, registers, etc.

CO4: Implement asynchronous sequential circuits

CO5: Demonstrate the concept of memories and I/O.

TEXT BOOKS

- 1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 5th Edition, 2013
- 2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2006

REFERENCE BOOKS

- 1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
- 2. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 4th Edition, 2002.
- 3. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company, 1982.
- 4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4 th Edition, 2007

	322CST02 - DIGITAL ELECTRONICS														
CO's/ PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	2	1	-	-	-	-	1	3	2	2
CO2	3-	2	3	3	1	2	1	-	-	-	-	1	3-	2	2
CO3	3	2	3	3	1	2	1	-	-	-	-	1	3	2	2
CO4	3	2	3	3	1	2	1	-	-	-	-	1	3	2	2
CO5	3	2	3	3	1	2	1	-	-	-	-	1	3	2	2
AVG	3	2	3	3	1	2	1	-	-	-	-	1	3	2	2

CO's-PO & PSO's MAPPING:

3-High, 2 Moderate, 1-Low, '-'No Correlation

COURSE OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

UNIT I: INTRODUCTION

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Machine Learning – Applications for machine learning in data science – The Modeling process

UNIT II: DESCRIBING DATA

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

UNIT III: DESCRIBING RELATIONSHIPS

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

UNIT IV: PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT V: DATA VISUALIZATION

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting

- Geographic Data with Basemap - Visualization with Seaborn

Total Hours: 45 Periods

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PRACTICAL EXERCISES:

- 1. Download, install and explore the features of NumPy, SciPy, Jupyter, Stats models and Pandas packages.
- 2. Working with Numpy arrays
- 3. Working with Pandas data frames Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
- 4. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate analysis: Linear and logistic regression modeling
 - c. Multiple Regression analysis
 - d. Also compare the results of the above analysis for the two data sets.
- 5. Apply and explore various plotting functions on UCI data sets.
 - a. Normal curves
 - b. Density and contour plots
 - c. Correlation and scatter plots
 - d. Histograms
 - e. Three dimensional plotting
- 6. Visualizing Geographic Data with Basemap

COURSE OUTCOMES

On successful completion the students will be able to

CO1: Gain knowledge on data science process

- CO2: Understand different types of data description for data science process
- CO3: Explore the relationships between data using correlation and regression techniques
- CO4: Perform Data Wrangling using Python Libraries

CO5: Apply visualization Libraries in Python to interpret and explore data

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.

2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.

3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCES:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

CO's-PO & PSO's MAPPING:

	322CST03-FOUNDATIONS OF DATA SCIENCE														
CO's/ PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2
CO2	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2
CO3	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2
CO4	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2
CO5	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2
AVG	3	3	2	3	3	-	-	-	1	-	-	1	2	2	2

3-High, 2 Moderate, 1-Low, '- 'No Correlation

322CIT04

COURSE OBJECTIVE(S):

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT - I: INTRODUCTION TO OOP AND JAVA

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

UNIT- II: INHERITANCE, PACKAGES AND INTERFACES

Overloading Methods - Objects as Parameters - Returning Objects - Static, Nested and Inner Classes. Inheritance: Basics-

Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with

Inheritance. Packages and Interfaces: Packages – Packages and Member Access – Importing Packages – Interfaces.

UNIT – III: EXCEPTION HANDLING AND MULTITHREADING

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing. Introduction to Collection Framework: Array List – Map – Set.

UNIT- IV: I/O, GENERICS, AND DATABASE CONNECTIVITY

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Accessing database using JDBC - Applet Architecture- Applet Lifecycle-Simple Applet.

UNIT- V: STRING HANDLING AND EVENT HANDLING

Strings: Basic String class, methods and String Buffer Class, JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane, Menus.

Total Hours: 45 Periods

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COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Apply the concepts of classes and objects to solve simple problems

CO2: Develop programs using inheritance, packages and interfaces

CO3: Make use of exception handling mechanisms and multithreaded model to solve real world Problems

CO4: Build Java applications with I/O packages, Collections and generics concepts using Database

connectivity

CO5: Integrate the concepts of event handling and Java components for developing GUI based applications.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 13th Edition, McGraw Hill Education,

New Delhi, 2019

2. Herbert Schildt, "Introducing Java 8 Programming", 1stEdition, McGraw Hill Education,

New Delhi, 2015

REFERENCES:

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 Th Edition, Prentice Hall, 2018.

2. PaulDeitel HarveyDeitel, Java - How to Program, Prentice Hall; 9th edition, 2011.

3. Cay Horseman BIG JAVA, 4th Edition, JohnWileySons, 2009

4. NicholasS.Williams, Professional Java for Web Applications, Wrox Press, 2014

5. T. Budd (2009), an Introduction to Object Oriented Programming, Addison Wesley Longman, 2002

6. E. Balagurusamy. "Programming with JAVA" A primer, Tata McGraw Hill Publication Company, Sixth edition, 2019.

CO's-PO's & PSO's MAPPING

	322CIT04-OBJECT ORIENTED PROGRAMMING														
CO's/ PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3
AVG	3	3	3	2	2	-	-	-	-	-	-	3	3	3	3

3- High, 2- Moderate, 1-Low, '- 'No Correlation

DATA STRUCTURES

COURSE OBJECTIVES

- Understand the need and fundamental concepts of List ADT.
- Acquire knowledge in Stack and Queue data structures.
- Learn Trees, graph data structure to solve problems.
- Familiar with Sorting, Searching and Hashing algorithms.

PREREQUISITES: Programming in C

UNIT I: LINEAR DATA STRUCTURES – LIST

Introduction-Abstract Data Types - The List ADT - Array based Implementation - Linked List Implementation-Doubly Linked List - Circular Linked List - Applications of Linked List - Polynomial Operations- Multi lists

UNIT II: LINEAR DATA STRUCTURES – STACKS AND QUEUES

The Stack ADT - Array Implementation - Linked List Implementation - Applications of Stack - Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion - The Queue ADT - Array Implementation - Linked List Implementation - Circular Queue - Application of Queue- BFS-Printer Queue.

UNIT III: NON LINEAR DATA STRUCTURES – TREES

Preliminaries - Binary Trees - Array Implementation - Linked List Implementation - Tree Traversals - Expression Trees - Binary Search Tree - Operations on Binary Search Tree – AVL Trees - Heaps - Binary Heaps - Operations of Heaps -Binomial Queues - B-Tree -B⁺ Trees.

UNIT IV: NON LINEAR DATA STRUCTURES - GRAPHS

Representation of Graphs –Breadth First Traversal- Depth First Traversal - Bi-connectivity – Cut vertex – Euler circuits– Topological Sorting– Application of Graphs - Shortest Path Algorithm: Floyd Warshall - Bellman Ford - Dijkstra's Algorithm -Minimum Spanning Trees: Prim's Algorithm - Kruskal's Algorithm.

UNIT V: SEARCHING, SORTING AND HASH TECHNIQUES

Searching: Linear Search - Binary Search. **Sorting:** Insertion Sort - Selection Sort - Shell Sort - Bubble Sort - Quick Sort - Merge Sort - Radix Sort. **Hashing**: Hash Functions - Separate Chaining -Open Addressing - Rehashing -Extendible Hashing.

Total Hours: 45 Periods

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COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Implement List ADT to solve real time problems.

- **CO2:** Develop applications using Stack and Queues data structures.
- **CO3**: Design and Implement applications on trees.
- **CO4:** Implement graph data structure for solving problems.
- **CO5:** Develop various Sorting, Searching and Hashing algorithms to small and large data sets.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, McGraw Hill/ MIT Press, 2022.

2.Data Structures and Algorithms in Java, An Indian Adaptation 2022by Michael T.Goodrich; Roberto Tamassia; Michael H. Goldwasser; Subhasish Banerjee, 6 edition, wiley– 21 June

3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second edition, Pearson Education, January 2020

REFERENCES:

- 1. Data Structures and Algorithms Made Easy in Java, Narasimha Karumanchi (Author)- 16 December 2011
- 2. Data Structures, Algorithm, and Software Principles in C, Thomas A Standish, Addison Wesley 2017
- 3. Problem Solving in Data Structures & Algorithms Using Java Book by Hemant Jain October2016

CO's-PO's & PSO's MAPPING

	322CIT05- DATA STRUCTURES														
CO's/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PO's															
CO1	2	3	3	1	2	-	-	-	-	-	-	3	3	3	3
CO2	2	3	3	1	2	-	-	-	-	-	-	3	3	3	3
CO3	2	3	3	1	2	-	-	-	-	-	-	3	3	3	3
CO4	2	3	2	2	1	-	-	-	-	-	-	3	3	3	3
CO5	2	3	2	2	1	-	-	-	-	-	-	3	3	3	3
AVG	2	3	2.6	1.4	1.6	-	-	-	-	-	-	3	3	3	3

3-High, 2 Moderate, 1-Low, '- 'No Correlation

322CIT06

COURSE OBJECTIVES:

- To have insight into the basic structure of computers.
- To understand the design and implementation of ALU.
- To comprehend the importance of the memory and I/O communication.

COMPUTER ORGANIZATION

• To familiarize basic concepts of Parallelism.

PREREQUISITES: NIL

UNIT-I: BASIC STRUCTURE OF COMPUTER SYSTEM

Functional Units of a Digital Computer: Von Neumann Architecture – Basic operational concepts – Bus structures – Memory Locations and Addresses – Instructions and instruction sequencing - Addressing modes – RISC and CISC - Basic I / O Operations.

UNIT-II: COMPUTER ARITHMETIC AND CONTROL UNIT

Number Representation and Arithmetic Operations - Addition and Subtraction of Signed Numbers – Multiplication of Positive Numbers – Signed Operand Multiplication– Integer Division - Floating Point Numbers and operations - Control Units - Fundamental concepts – Instruction Execution– Hardwired control – Micro programmed control.

UNIT-III: PIPELINING

Basic concepts – Data hazards – Instruction hazards - Unconditional branches – Conditional branches – Branch Prediction – Influence on instruction sets – Data path and control considerations - Super Scalar Operations-Performance considerations- Pipeline optimization techniques: Compiler techniques for improving performance.

UNIT-IV: MEMORY & I/O ORGANIZATION

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories –**cache size vs. block size-mapping functions**- Performance Considerations of Cache memory - Virtual memory - Accessing I/O devices – Interrupts – Direct Memory Access – Interface circuits – Standard I/O Interfaces: USB, Fire wire.

UNIT-V: PARALLELISM

 ILP – Concepts & Challenges – Compiler Techniques – Reducing branch costs – Dynamic scheduling - Parallel Processing and Performance- Hardware Multithreading – Flynn's Classification (SISD, MIMD, SIMD, SPMD)
Vector (SIMD) Processing - Shared-Memory Multiprocessors -Cache Coherence - Message-Passing Multi computers - Parallel Programming for Multiprocessors - Performance Modeling.

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COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Understand basic operational concepts of computers, ALU and Instructions.

CO2: Demonstrate arithmetic and control unit operations using different methods

CO3: Analyse the Hazard classifications and Pipeline concepts

CO4: Illustrate the various memory mechanisms and I/O Interfaces

CO5: Understand Instruction Level Parallelism and Multiprocessor architectures.

TEXT BOOKS:

1. Carl Hamacher, ZvonkoVranesic and Safwat Zaky&NaraigManjikian- "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2021.

2. John L. Hennessey and David A. Patterson, - "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Sixth Edition, 2017.

REFERENCE BOOKS:

1. David A. Patterson and John L. Hennessy, - "Computer Organization and Design: The Hardware /Software interface", sixth Edition, Elsevier, 2021.

2. William Stallings, - "Computer Organization and Architecture – Designing for Performance" 11th Edition, Pearson Education, 2019.

	322CIT06 - COMPUTER ORGANIZATION														
CO's/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PO's															
CO1	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2
CO2	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2
CO3	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2
CO4	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2
CO5	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2
AVG	3	2	3	1	2	-	-	-	-	-	-	1	3	3	2

CO's-PO's & PSO's MAPPING

3- High, 2 Moderate, 1-Low, '- 'No Correlation
322CIP07

L T P C 0 0 2 1

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS:

- Implement class, method and static member.
- Implement Inheritance (overriding).
- Implement packages and interfaces.
- Implement method and constructor overloading.
- Implement exception handling and creation of user defined exceptions.
- Write a java program that implements a multi-threaded application
- Implement collection class (Array list, Map, Set).
- Write a program to perform file operations.
- Implement string handling functions.
- Develop an application using Java concepts, JavaFX controls, layouts and menus with Database Connectivity.

TOTAL: 30

COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Design and develop java programs using object oriented programming concepts

- **CO2:** Develop simple applications using object oriented concepts such as package, exceptions
- **CO3:** Implement multithreading, and generics concepts
- **CO4:** Create GUIs and event driven programming applications for real world problems
- **CO5:** Implement and deploy web applications using Java.

CO's-PO's & PSO's MAPPING

			3	322CIP	07-OBJ	ECT OR	IENTED	PROG	RAMM	ING LAB	ORATO	RY			
CO's/	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO1	PO12	PSO1	PSO2	PSO
PO's											1				3
CO1	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO2	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO3	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO4	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO5	3	3	2	2	1	-	-	-	2	-	-	3	3	3	3
AVG	3	3	2.8	2	1.8	-	-	-	2	-	-	3	3	3	3

3-High, 2 Moderate, 1-Low, '- 'No Correlation

322CIP08

COURSE OBJECTIVES:

- To demonstrate array and list implementation of linear data structure algorithms.
- To implement the applications using stack.
- To implement Binary search tree, AVL tree algorithms and Heap algorithm.
- To implement Dijkstra's, Prim's and krushkal algorithm.
- To implement Sorting, Searching and hashing algorithms.

LIST OF EXERCISES:

- 1. Array implementation & linked list of Singly, Doubly and Circular Linked List
- 2. Array implementation of Stack and Queue.
- 3. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
- 4. Implementation of Binary Search Trees
- 5. Implementation of Tree Traversal
- 6. Implementation of Heaps using Priority Queues
- 7. Implementation of Dijkstra's Algorithm, Prim's Algorithm and krushkal Algorithm
- 8. Implementation of Linear Search and Binary Search
- 9. Implementation of Insertion Sort, Selection Sort, Quick sort, Merge Sort
- 10. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Implement linear data structures algorithm.

CO2: Build applications using stack and queue data Structure

CO3: Design Tree data structures and develop application using it.

CO4: Apply different graph algorithms to find shortest path

CO5: Develop the various searching, sorting algorithms and Hash techniques

CO's-PO's & PSO's MAPPING

				32	22CIP08	3	DATA S	STRUCT	URES L	ABORAT	ORY				
CO's/	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PSO3
PUS															
CO1	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO2	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO3	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO4	3	3	3	2	2	-	-	-	2	-	-	3	3	3	3
CO5	3	3	2	2	1	-	-	-	2	-	-	3	3	3	3
AVG	3	3	2.8	2	1.8	-	-	-	2	-	-	3	3	3	3

3-High, 2 Moderate, 1-Low, '- 'No Correlation

Total: 30 Periods

322GEV01

PROFESSIONAL DEVELOPMENT

COURSE OBJECTIVES:

To be proficient in important Microsoft Office tools: MS WORD, EXCEL, and POWERPOINT.

• To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the preventability and overall utility value of content.

• To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered

• To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, preventability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD:

- 1. Create and format a document Working with tables
- 2. Working with Bullets and Lists
- 3. Working with styles, shapes, smart art, charts
- 4. Inserting objects, charts and importing objects from other office tools
- 5. Make a custom cover page in Microsoft Word
- 6. Creating and Using document templates
- 7. Inserting equations, symbols and special character Working with Table of contents and References, citations Insert and review comments
- 8. Create bookmarks, hyperlinks, endnotes footnote Viewing document in different modes
- 9. Working with document protection and security Inspect document for accessibility

MS EXCEL

10 Hours

10 Hours

- 1. Create worksheets, insert and format data
- 2. Work with different types of data: text, currency, date, numeric etc. Split, validate, consolidate, and Convert Data
- 3. Sort and filter data
- 4. Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,) Work with Lookup and reference formulae
- 5. Create and Work with different types of charts
- 6. Use pivot tables and power pivot to summarize and analyse data Perform data analysis using own formulae and functions
- 7. Combine data from multiple worksheets using own formulae and built-in functions to generate results
- 8. Export data and sheets to other file formats Working with macros, Index Match and offset function
- 9. Protecting data and Securing the workbook

MS POWERPOINT:

10 Hours

- 1. Select slide templates, layout and themes
- 2. Formatting slide content and using bullets and numbering Insert and format images, smart art, tables, charts
- 3. Using Slide master, notes and handout master Working with animation and transitions Organize and Group slides
- 4. Import or create and use media objects: audio, video, animation
- 5. Perform slideshow recording and Record narration and create presentable videos

Total: 30 Periods

COURSE OUTCOMES:

On successful completion the students will be able to

CO1: Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements

CO2: Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements

and visualize data for ease of understanding

CO3: Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

CO's-PO's & PSO's MAPPING

				:	322GE\	/01 - H	PROFES	SIONA	L DEV	ELOPME	NT				
CO's/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PSO3
PO's															
CO1	-	2	I	-	I	1	-	-	2	3	2	3	-	I	2
CO2	-	2	-	-	-	-	-	-	2	3	2	3	-	1	2
CO3	-	2	1		-	-	-	-	2	3	2	3	-	1	2
AVG	-	2	-	-	-	-	-	-	2	3	2	3	-	0.6	2

3-High, 2 - Moderate, 1-Low, '- '-No Correlation

COURSE OBJECTIVES:

- To understand Software Engineering Lifecycle Models
- To Perform software requirements analysis
- To understand various design patterns
- To understand software testing and testing tools
- To work on project management concepts and its activities

Prerequisite: Nil

UNIT I: SOFTWARE PROCESS AND AGILE DEVELOPMENT

Introduction to Software Engineering - Software Process - Perspective and Specialized Process Models - Introduction to Agility-Agile process-Extreme Programming-XP Process-Case study.

UNIT II: REQUIREMENTS ANALYSIS AND SPECIFICATION

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petri nets -Introduction to OOAD with OO Basics- Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram

UNIT III: DESIGN PROCESS AND PATTERNS

Software Design-Design Process-Design Concepts-Coupling-Cohesion-Design Patterns - Creational - Factory

Method - Structural - Bridge - Adapter - Behavioral- Strategy-Observer-Applying GoF -Design Patterns-Mapping Design to Code.

UNIT IV: SOFTWARE TESTING

Software Testing Fundamentals - Internal and External Views of Testing - White box Testing - Basis Path Testing - Control Structure Testing - Black Box Testing - Regression Testing - Unit Testing - Integration Testing - User Acceptance Testing - Validation Testing - System Testing - Case Study : Software testing tool – Selenium.

UNIT V: PROJECT MANAGEMENT

Software Project Management- Software Project Management principles- Software Configuration Management - Project Scheduling- Case Study

Total Hours: 45 Periods

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Understand and Compare various software process models

CO2: Perform formal analysis on specifications and use UML diagrams for analysis

CO3: Illustrate design activities and design patterns

CO4: Apply various software testing techniques to ensure the quality and reliability of Software

CO5: Develop software projects based on Project management Activities

TEXT BOOKS:

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009.

2. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.

REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.

2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.

3. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016

4. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.

5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010. 6. Unmesh Gundecha, Selenium Web Driver 3 Practical Guide: End-to-End Automation Testing for Web and Mobile Browsers with Selenium Web Driver, Second Edition, 2018

				42	2CST02	L-OBJE	CT ORIE	NTED S	OFTW	ARE ENG	GINEERIN	NG			
CO's / PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	-	-	-	2	1	2	3	2	3	3
CO2	2	3	2	2	3	-	-	-	2	1	2	3	2	3	3
CO3	2	3	2	2	3	-	-	-	2	1	2	3	2	3	3
CO4	2	3	2	2	3	-	-	-	2	1	2	3	2	3	3
CO5	2	3	2	2	3	-	-	-	2	1	2	3	2	3	3
AVG	2	3	2	2	3	-	_	-	2	1	2	3	2	3	3

CO's-PO's & PSO's MAPPING

3-High, 2- Moderate, 1-Low, '-'-No Correlation

COURSE OBJECTIVES:

- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT I: INTRODUCTION

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework - Asymptotic Notations and their properties – Empirical analysis - Mathematical analysis of Recursive and Non- recursive algorithms – Visualization.

UNIT II: BRUTE FORCE AND DIVIDE AND CONQUER

Brute Force – String Matching - Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Multiplication of Large Integers and Stassen's Matrix /Multiplication – Closest-Pair and Convex - Hull Problems. Decrease and Conquer: - Topological Sorting-Transform and Conquer: Presorting – Heaps and Heap Sort.

UNIT III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

Dynamic programming – Principle of optimality - Coin changing problem – Wars hall's and Floyd's algorithms Optimal Binary Search Trees - Multi stage graph - Knapsack Problem and Memory functions. Greedy Technique – Dijkstra's algorithm - Huffman Trees and codes - 0/1 Knapsack problem.

UNIT IV: ITERATIVE IMPROVEMENT

Linear programming problem-The Simplex Method-Ford Fulkerson algorithm for Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem-Analysis of Gale Shaply algorithms-local search heuristics

UNIT V: LIMITATIONS OF ALGORITHM POWER

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking – N- Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search -Assignment problem – Knapsack Problem – Traveling Salesman Problem - Approximation Algorithms for NP- Hard Problems – Traveling Salesman problem – Knapsack problem.

Total Hours: 45 Periods

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically

- **CO2**: Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
- **CO3**: Implement and analyze the problems using dynamic programming and greedy algorithmic techniques.
- **CO4**: Solve the problems using iterative improvement techniques for optimization.
- **CO5**: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques.

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TEXT BOOKS:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, Published by Pearson (July 14, 2021) © 2012

REFERENCES:

- 1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
- 2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2022.
- 3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2022.
- 4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

					42	2CIT02-	DESIGN	AND A	NALYSI	S OF AL	GORITH	MS			
CO's / PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2
CO 2	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2
CO 3	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2
CO 4	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2
CO 5	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2
AVG	3	3	3	2	1	-	-	-	-	-	-	3	3	2	2

CO's-PO's & PSO's MAPPING

3-High, 2 -Moderate, 1-Low, '-'- No Correlation

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COURSE 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 database security

UNIT I: RELATIONAL DATABASES

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II: DATABASE DESIGN

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III: TRANSACTIONS

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control – Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update - Shadow paging - ARIES Algorithm

UNIT IV: IMPLEMENTATION TECHNIQUES

RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage-Indexing and Hashing -Ordered Indices - B+ tree Index Files - B tree Index Files - Static Hashing - Dynamic Hashing - Query Processing Overview - Algorithms for Selection, Sorting and join operations - Query optimization using Heuristics - Cost Estimation.

UNIT V: ADVANCED STORAGE OPTIMIZATION & SECURITY TECHNIQUES

Distributed Databases: Architecture, Data Storage, Transaction Processing, and Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores - Column Based Systems - Graph Databases. Database Security: Security issues - Access control based on privileges - Role Based access control - SQL Injection - Statistical Database security - Flow control – Encryption and Public Key infrastructures – Challenges.

Total Hours: 45 Periods

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

- **CO1:** Construct SQL Queries using relational algebra
- CO2: Design database using ER model and normalize the database
- **CO3:** Construct queries to handle transaction processing and maintain consistency of the database
- **CO4:** Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
- **CO5:** Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

TEXT BOOKS:

- 1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
- 2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

					422CI	103 -DA T	TABASE	MANAG	EMENT	SYSTEM					
CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	2	-	-	-	-	-	3	3	3	3
CO2	2	2	1	3	2	2	-	-	-	-	-	3	3	3	3
CO3	2	3	1	3	2	2	-	-	-	-	-	3	3	3	3
CO4	2	3	1	2	3	2	-	-	-	-	-	3	3	3	3
CO5	2	2	1	3	2	2	-	-	-	-	-	3	3	3	3
Avg.	2	2.4	1	2.8	2.4	2	-	-	-	-	-	3	2	1	2.6

CO's-PO's & PSO's MAPPING

3-High, 2 -Moderate, 1-Low, '-'-No Correlation

COURSE OBJECTIVES:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, intercrosses communication and I/O in Unix

Prerequisites: Computer Organization and Architecture

UNIT I: OPERATING SYSTEM

Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT II: CPU SCHEDULING

Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management- fork, exit, wait, waitpid, exec Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT III: PROCESS MANAGEMENT AND SYNCHRONIZATION

The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT IV: MEMORY MANAGEMENT AND VIRTUAL MEMORY

Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT V: FILE SYSTEM, VIRTUAL MACHINES AND MOBILE OS

Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Virtual Machines – History, Benefits and Features, Mobile OS - iOS and Android

Total Hours: 45 Periods

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1 Gain extensive knowledge about OS and OS structures

CO2 Apply the concepts of process management and scheduling algorithms

CO3 Illustrate process synchronization and methods of dead lock handling

CO4 Compare and contrast various memory management schemes, functionality of file systems

CO5 Explore OS protection and security mechanism

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TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCES:

- 1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems A Spiral Approach", Tata McGraw Hill Edition, 2010.
- 2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall, 2018.
- 3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

					4	22CIT)4- OP	ERATI	NG SY	STEMS					
CO's /PO's	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	I	-	-	I	-	-	3	3	3	2
CO2	3	2	2	2	3	-	-	-	-	-	-	3	3	3	2
CO3	3	2	2	1	3	-	-	-	-	-	-	3	3	3	2
CO4	3	2	2	1	3	-	-	-	-	-	-	3	3	3	2
CO5	3	1	1	1	2	-	-	-	-	-	-	3	3	3	2
AVG	3	1.8	1.8	1.2	2.6	-	-	-	-	-	-	3	3	3	2

CO's-PO's & PSO's MAPPING

3-High, 2 Moderate, 1-Low, '-'No Correlation

COURSE OBJECTIVES:

422CII05

- To understand the basics of networking
- To brief about network simulation and communication
- To describe about Network addressing
- To understand the services of transport and application layer
- To know about the configuration of network security and troubleshooting

UNIT I: BASICS OF NETWORKING AND SIMULATION

Basics of Network Communication - Network Types, Data Transmission, Bandwidth and Throughput -Clients and Servers, Network Components- Network Structure. Online Connections - Wireless Networks, Local Network connections, Network documentation. Network Simulation using Wire shark: Wire shark Network Simulator, The Wire shark User Interface, Wire shark Network Configuration

NETWORK ESSENTIALS

UNIT II: PHYSICAL AND DATA LINK LAYER

Physical Topologies and Network Standards- OSI and TCP/IP models-Error Detection and Correction: Types of Errors–Redundancy– LRC – CRC – Checksum- Data Link Control: Flow and Error Control Protocols: Stop and wait - Stop and wait ARQ - Go Back-N ARQ - Selective repeat ARQ- Sliding window – HDLC.

UNIT III: NETWORK ADDRESSING

Process of encapsulation and Ethernet framing -Network communication at the access layer -Broadcast Containment, Routing between networks – Routing table -IPv4 Addressing – Binary conversion, IPv4 Address structure, Classful IPv4 Addressing, Public and Private IPv4 Addresses, Unicast, Broadcast, and Multicast Addresses -Static and Dynamic Addressing, DHCPv4 Configuration. IPv4 and IPv6 Address Management - Network Boundaries, Network Address Translation, IPv4 Issues, **IPv6** Features

UNIT IV: TRANSPORT LAYER

Transport Layer Services - The Client Server Relationship, TCP and UDP, Port Numbers. Process to process delivery –User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control Techniques- Congestion Management-Congestion Prevention Policies -Quality of services (QoS) – Techniques to improve QoS - Integrated Services - Differentiated Services.

UNIT V: APPLICATION LAYER

Domain Name Space (DNS) – SMTP – POP3 – WWW - FTP – HTTP – SNMP – SSO- Streaming audio and video. Case Study: Cisco Switches: Switch Boot Process, Cisco Routers, Router Boot Process - Cisco IOS Command Line- IOS Navigation, navigation of Cisco IOS to configure network devices - Building a Small Cisco Network - Basic Switch Configuration, Initial Router Settings, and Switch to router connection

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

- **CO1:** Understand the basic layers and its functions in computer networks.
- **CO2:** Explore various flow and error control protocols in data link layer.
- **CO3:** Describe the functions of Network Layer and different addressing mechanisms
- **CO4:** Analyze flow control and congestion control algorithm for QoS at end to end level.
- **CO5:** Explore the features and working of various application layer protocols.

Text Books:

- 1. Jeffrey S. Beasley, Networking Essentials, 6th edition Published by Pearson IT Certification (December 9,2021) © 2022.
- Jeffrey S. Beasley, Networking Essentials: A CompTIA Network+ N10-007 Textbook (Pearson It Cybersecurity Curriculum) Paperback – Import, 19 April 2018.
- 3. Networking Essentials Companion Guide, Cisco Networking Academy, Published Mar 10, 2022 by CiscoPress.
- 4. A. S. Tanenbaum, "Computer Networks", Prentice-Hall of India 2008, 4th Edition.
- 5. Stallings, "Data and Computer Communications", Pearson Education 2012, 7th Edition.

LAB EXPERIMENTS:

- 1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and trace route. Capture ping and trace route PDUs using a wire shark and examine.
- 2. Write a HTTP web client program to download a web page using TCP sockets
- 3. Applications using TCP sockets like: 2 Echo client and echo server? Chat? File Transfer
- 4. Simulation of DNS using UDP sockets.
- 5. Write a code simulating ARP /RARP protocols.
- 6. Simulation of Congestion Control Algorithms using NS.
- 7. Simulation of Distance Vector/Link State Routing algorithm.
- 8. Do the following using NS3 Simulator
 - a. Simulate to Find the Number of Packets Dropped
 - b. Simulate to Find the Number of Packets Dropped by TCP/UDP
 - c. Simulate to Find the Number of Packets Dropped due to Congestion
 - d. Simulate to Compare Data Rate& Throughput.
 - e. Simulate to Plot Congestion for Different Source/Destination
 - f. Simulate to Determine the Performance with respect to Transmission of Packets

Programming Languages to be used: C/Python/Java

CO's-PO's & PSO's MAPPING

						422CI1	05- N	etwo	RK ESS	ENTIAL	S				
CO's /PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2
CO2	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2
CO3	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2
CO4	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2
CO5	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2
AVG	3	2	2	2	2	-	-	-	-	-	-	1	3	2	2

3- High, 2 -Moderate, 1-Low, '-'-No Correlation

422CIT06

THEORY OF COMPUTATION

LPTC 3003

COURSE OBJECTIVES:

- To understand foundations of computation including automata theory.
- To construct models of regular expressions and languages.
- To design context free grammar and push down automata.
- To understand Turing machines and their capability.
- To understand Undesirability and NP class problems.

UNIT I: INTRODUCTION TO AUTOMATA

Need for automata theory - Introduction to formal proof- Finite Automata – Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA) – Finite automata with Epsilon transitions–Equivalence of DFA's and NFA's - Applications of finite state automata- Equivalence of NFAs with and without ε -moves-Conversion of NFA into DFA – Minimization of DFAs.

UNIT II: REGULAR EXPRESSIONS AND LANGUAGES

Regular languages - Regular Expressions – Finite automata and regular expressions – Properties of regular sets–Properties of Regular Language: Proving languages not to be Regular (Pumping Lemma for Regular Language), Closure properties of Regular Language.

UNIT III: CONTEXT FREE LANGUAGES AND PUSH DOWN AUTOMATA

Context Free Grammar (CFG) – Derivation trees – Ambiguity-Normal Forms, Chomsky Normal Form (CNF) and Griebach Normal Form (GNF)– Introduction to Push Down Automata (PDA) – PDA definition – Equivalence of PDA and Context Free Grammar – CFG to PDA-PDA to CFG-Deterministic pushdown automata – Properties of Context Free Languages.

UNIT IV: TURING MACHINES

Church-Turing thesis: Turing machines - Language of a TM, TM as accepters and deciders. Programming techniques for TM -Storage in state, multiple tracks, and subroutines. Variants of Turing Machines-Encoding of a TM-Universal Turing machine.

UNIT V: DECIDABILITY AND REDUCIBILITY

Decidability: Decidable languages Halting problem: Diagonalization Method-Halting Problem is Undecidable- Reducibility: Undecidable problems from Language theory –Rice theorem and Properties of RE Languages - A simple Undecidable problem: Post's Correspondence Problem (PCP) –Modified PCP-MPCP to PCP- Undesirability of PCP.

Total Hours: 45 Periods

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Construct automata, regular expression for any pattern.

CO2: Design grammars and Automata (recognizers) for different language classes.

CO3: Write Context free grammar for any construct.

CO4: Design turing machines for any language and propose computation solutions using turing machines

CO5: Derive whether a problem is decidable or not.

TEXT BOOKS:

- 1. John E. Hopcroft and Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", third edition, Pearson Education, New Delhi, 2020.
- 2. John C. Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
- 3. Rajendra Kumar, "Theory of Automata Languages and Computation", first edition Tata McGrawHill Education Pvt. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

- 1. S.N.Sivanadam, M.Janaki Meena, "Theory of Computation", I.K.International Publishing HousePvt. Ltd, ISBN: 9789380026206, 2009.
- 2. Michael Sipser , "Introduction to the Theory of Computation", third edition, PWS Publications, Boston, 2021.
- 3. Harry R. Lewis, Chris H Papadimitriou, "Elements of the Theory of Computation", SecondEdition, 2015 PHI / Pearson Education, New Delhi, 1997.
- 4. Peter Linz, "An Introduction to Formal Language and Automata", sixth edition, Narosa Publishers, New Delhi, 2016.

					422CIT	06-TH	EORY (OF CON	ИРИТА	TION					
CO's / PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3
AVG	3	3	3	2	2	-	-	-	-	-	-	2	3	3	3

CO's-PO's & PSO's MAPPING

422CIP07 DATABASE MANAGEMENT SYSTEM LABORATORY LT P C

0021

COURSE 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 front end tool for GUI based application development.

LIST OF EXPERIMENTS:

- 1. Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.
- 2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
- 3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
- 4. Query the database tables and explore sub queries and simple join operations.
- 5. Query the database tables and explore natural, equi and outer joins.
- 6. Write user defined functions and stored procedures in SQL.
- 7. Execute complex transactions and realize DCL and TCL commands.
- 8. Write SQL Triggers for insert, delete, and update operations in a database table.
- 9. Create View and index for database tables with a large number of records.
- 10. Create an XML database and validate it using XML schema.
- 11. Create Document, column and graph based data using NOSQL database tools.
- 12. Develop a simple GUI based database application and incorporate all the above mentioned features
- 13. Case Study using any of the real life database applications from the following list
- a) Inventory Management for a EMart Grocery Shop
- b) Society Financial Management
- c) Cop Friendly App Eseva
- d) Property Management E-Mall
- e) Star Small and Medium Banking and Finance
 - Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.

- Apply Normalization rules in designing the tables in scope.
- Prepared applicable views, triggers (for auditing purposes), and functions for enabling enterprise grade features.
- Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
- Ability to showcase ACID Properties with sample queries with appropriate settings.

Total: 45 Periods

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1 Create databases with different types of key constraints.

- **CO2** Construct simple and complex SQL queries using DML and DCL commands.
- **CO3** Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
- **CO4** Create an XML database and validate with meta-data (XML schema).
- **CO5** Create and manipulate data using NOSQL database

CO's-PO's & PSO's MAPPING

				422CI	P07- D	DATAB	ASE M	IANAG	IEMEN	IT SYSTE	M LABOF	RATORY			
CO's/ PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO2	3	3	2	2	2	-	-	-	2	-	-	3	3	З	3
CO3	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO4	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO5	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
AVG.	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3

3- High, 2 - Moderate, 1-Low, '-'-No Correlation

L T P C 0 0 2 3

COURSE OBJECTIVES:

- To provide an understanding of the design aspects of operating system concepts through simulation
- To introduce basic Unix commands, system call interface for process management, Inter process communication and I/O in Unix
- To Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.

Pre-Requisites: Programming in C LIST

OF EXPERIMENTS:

- Write C programs to simulate the following CPU Scheduling algorithms

 a) FCFS b) SJF c) Round Robin d) priority
- 2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, font, seek, stat, opendir, readdir)
- 3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
- 4. Write a C program to implement the Producer Consumer problem using semaphores using UNIX/LINUX system calls.
- 5. Write C programs to illustrate the following IPC mechanisms
 - a) Pipes b) FIFOs c) Message Queues d) Shared Memory
- 6. Write C programs to simulate the following memory management techniques
 - a) Paging b) Segmentation
- 7. Write C programs to simulate Page replacement policies
 - a) FCFS b) LRU c) Optimal

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Implement basic services and functionalities of operating system using system call.

- **CO2:** Implement various CPU scheduling algorithm.
- CO3: Simulate Producer Consumer problem for process synchronization
- **CO4:** Implement memory management and file allocation techniques algorithms.
- **CO5:** Build disk scheduling algorithms.

CO's-PO's & PSO's MAPPING

				4220	CIP08- (OPERT	AING S	YSTEM	S LABO	ORATO	RY				
CO's / PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO2	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO3	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO4	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
CO5	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3
AVG	3	3	2	2	2	-	-	-	2	-	-	3	3	3	3

3-High, 2 -Moderate, 1-Low, '-'-No Correlation

SEMESTER – V

S.	Category	Course	Course Title	L	Т	Р	С		Mark	(S
NO		Code						CA	EA	ТОТ
			THEORY							
1	PC	522CIT01	Artificial Intelligence and Machine Learning	3	0	0	3	40	60	100
2	PC	522CSI02	Cryptography and Block Chain Technologies	3	0	2	4	40	60	100
3	PC	522CST03	Compiler Design	3	0	0	3	40	60	100
4	PC	522CIT04	Web Essentials	3	0	0	3	40	60	100
5	PE	X22XXExx	Professional Elective-I	3	0	0	3	40	60	100
6	OE	X22XXOxx	Open Elective-I	3	0	0	3	40	60	100
7	MC	522MCTxx	Mandatory Course – I	1	0	0	1			100
			PRACTICALS							
8	РС	522CIP07	Artificial Intelligence and Machine Learning Laboratory	0	0	2	1	60	40	100
9	PC	522CIP08	Web Essentials Laboratory	0	0	2	1	60	40	100
10	VAD	522CSVxx	Value Added Course	0	0	2	1			100
		Г	TOTAL	19	0	10	21			

HOD

L T P C

COURSE OBJECTIVES:

- To understand the Characteristics of Intelligent Agents
- To solve problems using various Search Strategies & Knowledge Representation Scheme
- Tounderstandthebasicconceptslearning and hypothesis
- TohaveathoroughunderstandingofthewidelyusedMachinelearningalgorithms

UNIT-I INTRODUCTION TO AI

Introduction – Definition - Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem solving Methods - Search Strategies: **Informed - Uninformed - Heuristics**- Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation -Backtracking Search.

UNIT-II KNOWLEDGE REPRESENTATION

Propositional Logic - First Order Logic: Syntax and Semantics – Extensions & Notational variations – Using First Order Logic – Logical agents of Wumpus world - Knowledge Engineering – General ontology – Inference in First order Logic: Inference Rules involving quantifiers – Forward and Backward Chaining – Resolution – Completeness of Resolution – Case Study: Basics of Prolog

UNIT-III INTRODUCTION TO ML

Learning – Types of Machine Learning – SupervisedLearning – The Brain and the Neuron –Design a Learning System –Issues in Machine Learning–ConceptLearningTask – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version pacesandtheCandidateEliminationAlgorithm– Perceptron–LinearSeparability - Linear Regression.

UNIT-IV LINEAR MODELS

Multi-layer Perception – Going Forwards – Going Backwards: Back Propagation Error– Multi-layer Perception in Practice–ExamplesofusingtheMLP–Overview–DerivingBack-Propagation–Radial Basis Functions and Splines–Concepts–RBF Network–Curse of Dimensionality–Inter polations and Basis Functions –Support Vector Machines

UNIT-V TREEAND UNSUPERVISED LEARNING MODELS

LearningwithTrees–DecisionTrees–ConstructingDecisionTrees–ClassificationandRegressionTrees– EnsembleLearning–Boosting–Bagging–DifferentwaystoCombineClassifiers–Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms –VectorQuantization– SelfOrganizingFeatureMap. Applications of AI and ML – Future of AI – Ethics in AI.

TOTAL: 45 PERIODS

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COURSE OUTCOMES

On successful completion of the course the students will be able to

CO1: Understand various problem solving approaches for AI problems

CO2: Utilize various Knowledge Representation Techniques in solving complex real-life problems

CO3: Apply the learning concepts and derive hypothesis for a real world problem

CO4: Develop model using supervised learning techniques

CO5: Select the suitable machine learning strategy to real-world applications.

TEXTBOOK:

- 1. Stuart J Russell and Peter Norvig," Artificial Intelligence A Modern Approach", Third Edition, Prentice Hall of India/ Pearson Education, New Delhi, 2015.
- 2. StephenMarsland,—MachineLearning– AnAlgorithmicPerspective,SecondEdition,ChapmanandHall/CRCMachine LearningandPatternRecognitionSeries,2014.
- 3. TomMMitchell,—MachineLearning,FirstEdition,McGrawHillEducation,2013.

Reference Books:

- 1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Barlett Publishers, Inc., First Edition 2008.
- 2. Stuart Russell (Author), Peter Norvig, Artificial Intelligence: A Modern Approach, Global Edition Paperback 13 May 2021
- 3. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
- 4. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth edition, Springer, 2003.
- 5. Eaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2008.
- 6. SaikatDutt (Author), Subramanian Chandramouli (Author), Amit Kumar Das, Machine Learning, FirstEdition Paperback Pearson 1 October 2018
- 7. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense ofData,FirstEdition,CambridgeUniversityPress,2012.
- 8. JasonBell,-Machinelearning-
 - HandsonforDevelopersandTechnicalProfessionals,FirstEdition,Wiley,2014

COs-PO's & PSO's MAPPING

	522CIT01 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
AVG	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3

1-Low 2-Medium, 3-High, "-"- No Correlation

522CSI02

COURSE OBJECTIVES:

- To learn the fundamentals of Cryptography.
- To comprehend the Mathematical Foundations of Security Principles.
- To describe the principles of Public Key Cryptosystem, Hash Function, Key Management and Internet Security.
- To understand the basics of Block chain
- To learn the components of Ethereum and Smart Contracts.

UNIT-I SYMMETRIC KEYENCRYPTION

Computer Security Concepts– The OSI Security Architecture– Security Attacks –Security Services and Mechanisms – A Model for Network Security – Classical Encryption Techniques – Block Ciphers and the DataEncryptionStandard–BlockCipherOperation–AdvancedEncryptionStandard: AES Structure, AES Transformation Function.

UNIT-II NUMBERTHEORYANDPUBLIC KEYENCRYPTION

BasicConceptsinNumberTheory:PrimeNumbers–ModularArithmetic–TheEuclideanAlgorithm– Fermat'sand Euler's Theorem – Testing for Primality – The Chinese Remainder Theorem – Public Key Cryptography –Diffie-Hellman Key Exchange and RSA – Cryptographic Hash Functions: Applications, Secure Hash Algorithm(SHA)–Digital Signature :DSS, RSA, andElgamalDigital Signature.

UNIT-III KEY MANAGEMENT AND INTERNET SECURITY

Key Management and Distribution – Authentication Applications: Kerberos – Biometrics – Electronic MailSecurity: PGP,S/MIME–IPSecurityOverview.

UNIT-IV INTRODUCTION OF BLOCKCHAIN

Introduction–OriginofBlockchain–BlockchainSolution–ComponentsofBlockchain–BlockinaBlockchain – The Technology and the Future – Decentralization and Distribution – Types of Block chain – ConsensusProtocol.

UNIT-V ETHEREUM AND SMARTCONTRACTS

Introduction – Code Is Law and Ethereum Classic – Ethereum Components – Mining Works in Ethereum –Merkle Patricia Tree – Architecture of Ethereum – Workflow of Ethereum – Smart Contracts – Characteristicsof a Smart Contract – Types of Smart Contracts – Types of Oracles – Smart Contracts in Ethereum – Smart Contracts in Industry-Solidity Programming.

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COURSEOUTCOMES:

On successful completion of the course the students will be able to

CO1: Understand the fundamentals of network security and apply the symmetric encryption techniques to convert plaintext to cipher text.

CO2: Understand number theory concepts and use them in public key encryption.

CO3: Apply key management and authentication techniques to provide secure communication.

CO4: Understand Block chain's fundamental components.

CO5: ImplementBlockchainapplicationsusingtheEthereumplatform.

TEXTBOOKS:

- 1. William Stallings, "Cryptography and Network Security," Seventh Edition, Prentice Hall, New Delhi, 2017.
- Subramanian, Chandramouli& George A., Asha & K.A., Abhilash&Karthikeyan, Meena. 2020."BLOCKCHAIN TECHNOLOGY," Universities Press (India) Pvt. Ltd., First edition, ISBN-10: 9389211638, ISBN-13:978-9389211634.

REFERENCES:

- 1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing," Fifth Edition, Prentice Hall, 2018.
- 2. Arun, Jai Singh & Cuomo, Jerry & Gaur, Nitin. 2019. "Block chain for Business," Pearson Education, First Edition, and ISBN-10:938958888X, ISBN-13:978-9389588880.
- 3. Tulajadas Choudhry, Ambadas&SarfarzAriff, Arshad & M.R. Sham., 2020. "Block chain for Enterprise Application Developers," Wiley, First edition, ISBN-10: 8126599960, ISBN-13: 978-8126599967.

Lab Experiments:

- 1. Write acode toimplementAESEncryptionAndDecryption
- 2. Implement Diffie–Hellman Algorithm and RSA Algorithm
- 3. ImplementDigitalSignature UsingRSAandSHAAlgorithm
- 4. Creating Merkle tree
- 5. CreationofBlock
- 6. Block chain Implementation
- 7. Write a program to understand the solidity variables and arrays with regards to fixed length array and dynamic array.
- 8. Deploy a Smart Contract for Marks Management System using solidity.

Programming Languages to be used: Java

TOTAL: 30 PERIODS

	522CSI02-CRYPTOGRAPHY AND BLOCK CHAIN TECHNOLOGIES														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2	3	-	-	-	-	-	-	3	3	1
CO2	3	3	3	1	2	3	-	-	-	-	-	-	3	3	1
CO3	3	3	3	1	2	3	-	-	-	-	-	-	3	3	1
CO4	3	3	3	1	2	3	-	-	-	-	-	-	3	3	1
CO5	3	3	3	1	2	3	-	-	-	-	-	-	3	3	1
AVG	3	3	3	1	2	3	-	_	-	-	-	-	3	3	1

CO's-PO's&PSO'S MAPPING

3-High 2-Moderate 1-Low '- '- No Correlation

COMPILER DESIGN

L T P C 3 0 0 3

PREREQUISITES: Theory of Computation.

COURSE OBJECTIVES

- To understandthephasesofcompiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment
- To Perceivethevariousstorageallocationtechniques
- To Acquainthowtogenerateandoptimizethecode

UNIT-I INTRODUCTIONTOCOMPILER & LEXICAL ANALYSIS

Introduction – The Phases of Compiler – Lexical Analysis: Role of lexical analyzer – Input Buffering – Specification ofTokens–RecognitionofTokens– FiniteAutomata – RegularExpressiontoFA (Direct Method) – Minimizing DFA – Lex Tool.

UNIT-II SYNTAX ANALYSIS

Role oftheparser –Context-Free Grammar - **TopDownParsing:** Recursive Descent Parser - Predictive Parser – LL(1)Parser – **Bottom Up Parsing:**Shift Reduce Parser –Operator Precedence Parser - LR Parser – LR (0) Item - Construction of SLR Parsing Table – CLR Parser- Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer - YACC tool.

UNIT-III SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODEGENERATION

Syntax Directed Definitions: Construction of Syntax Trees– Bottom-Up Evaluation of S-AttributeDefinitions–L-AttributedDefinitions -Specification of a simple type Checker - Equivalence of Type Expressions - Type Conversions. **Intermediate Languages:** Three Address Code, Types and Declarations, Assignment Statements, Arrays, BooleanExpressions andback patching.

UNIT-IV RUN-TIMEENVIRONMENT ANDCODEGENERATION

Runtime Environments: Source language issues – Storage organization – **Storage Allocation Strategies**: Static, Stack and Heap allocation - Parameter Passing-Symbol Tables - Dynamic Storage Allocation– **Code generation**: Issues in the Design of a code generator – Instruction Costs - Basic Blocks and Flow graphs - Design of a simple Code Generator.

UNIT-V CODE OPTIMIZATION

Principal Sources of Optimization – Peep-hole optimization – DAG - Optimization of Basic Blocks -Global Data Flow Analysis - ConstantPropagation-PartialRedundancyElimination-loops inFlowGraphs-Case Study: LLVM Compiler.

TOTAL: 45 PERIODS

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COURSE OUTCOMES

On successful completion of the course the students will be able to

CO 1: Design a lexical analyzer for a sample language and learn to use the LEX tool.

CO2: Apply different parsing algorithms to develop a parser and learn to use YACC tool.

CO3: Construct the intermediate code representation and generation.

CO4: Apply knowledge of run-time environments to debug and optimize programs during execution. **CO5:** Apply the optimization technique to generate optimized code.

TEXTBOOK

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, —Compilers: Principles, TechniquesandTools, SecondEdition, PearsonEducation, 2014(reprint).

REFERENCES

- 1. Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
- 2. Steven S. Muchnick, "Advanced Compiler Design Implementation", First Edition Elsevier Science India, Morgan Kaufmann Publishers, 2008
- 3. JeanPaulTremblay, PaulGSerenson, "TheTheoryandPracticeofCompilerWriting", McGraw Hill, NewDelhi, 2007.
- 4. DickGrone, HenriEBal, CerielJHJacobsandKeenGangendoen, ModernCompilerDesign", JohnWiley, NewDelhi, 2009.
- 5. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.

	522CIT01 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	3	3	1	3	2	3	2
CO2	3	3	3	3	3	-	-	-	3	2	3	2	2	1	2
CO3	3	3	2	2	3	-	-	-	3	1	1	1	2	2	3
CO4	3	2	2	1	1	-	-	-	2	3	2	3	1	2	1
CO5	3	3	3	2	1	-	-	-	2	1	1	3	2	1	2
AVG	3	2.8	2.6	2.2	1.8	-	-	-	2.6	2	1.6	2.4	1.8	1.8	2

CO's-PO's&PSO'S MAPPING

1 – Low 2 - Medium, 3-High, "-"- No Correlation

522CIT()4
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WEB ESSENTIALS

L T P C 3 0 0 3

COURSE OBJECTIVES:

- To understand different Internet Technologies
- To learn java-specific web services architecture
- To Develop web applications using frameworks

UNIT-I WEBSITE BASICS, HTML5, CSS3 and WEB3.0

Web Essentials: Introduction to web3.0 – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – BorderImages – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework

UNIT-II CLIENT SIDE PROGRAMMING

Java Script: Introduction to JavaScript: Basic Syntax-variables and data types-statements-operators- literalsfunctions-objects-arrays-JSON introduction – Syntax – Function Files

UNIT-III DOM MANIPULATION and EVENT HANDLING in WEBDEVELOPMENT

IntroductiontotheDOM–IntrinsicEventHandling-ModifyingElements-The DocumentTree-Node objects-The Document Node-Element Nodes-Text Nodes-DOM Event Handling-The event object and Event Listeners-Mouse Events-Event Propagation-Properties of Window

UNIT-IV SERVER-SIDEPROGRAMMING

IntroductiontoJSP: JSPProcessing, Declarations, Directives, Expressions, CodeSnippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP.

UNIT-V PHP AND WEBSERVICES

An introduction to PHP – PHP Variables – Program control – Built-in functions – Form Validation –XML: Basic XML – Document Type Definition – XML Schema – Basics of web services-components of web services-SOAP and restful web services

TOTAL : 45 PERIODS.

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Construct a basic website using HTML and Cascading Style Sheets

CO2: Develop web pages using Java script with event-handling mechanism

CO3: Develop server-side programs using JSP

CO4: To build dynamic and interactive web applications.

CO5: Constructs webpage's in PHP and represent data in XML format.

TEXTBOOKS:

1. RobinNixon, "LearningPHP, MySQL, JavaScript, CSS&HTML5"ThirdEdition, O'Reilly Publishers, 2014.

2. Deitel and Deitel and Nie to, Internet and World Wide Web-How to Program, Prentice Hall, 5th Edition, 2012.

3. Web3.0: The Internet of Value" by Alex Tap scott, published by Tap Scott Group in 2021

REFERENCES:

- 1. James F.Kurose, "Computer Networking: Atop-Down Approach", Sixth Edition, PearsonEducation, 2012
- 2. Web RTC APIs:and RTC WEB Protocols of the HTML5 Real-Time Web, September 4,2012
- 3. Steven Holzener, "PHP–The Complete Reference", 1st Edition, Mc-GrawHill, 2017
- 4. Fritz Schneider, Thomas Powell, "Java Script–The Complete Reference", 3rd Edition, Mc-Graw Hill Publishers, 2017
- 5. Bates, "Developing Web Applications", WileyPublishers, 2006

	522CIT04-WEB ESSENTIALS														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	-	-	-	-	-	3	3	3	2
CO2	3	3	2	3	3	-	-	-	-	-	-	3	3	3	2
CO3	3	2	2	2	3	-	-	-	-	-	-	3	3	3	2
CO4	3	2	2	3	3	-	-	-	-	-	-	3	3	3	2
CO5	2	2	2	3	3	-	-	-	-	-	-	3	3	3	2
AVG	2.8	2.4	2	2.8	3	-	-	-	-	-	-	3	3	3	2

CO'S-PO'S & PSO'S MAPPING

1–Low 2-Medium, 3-High, "-"- No Correlation

UI AND UX DESIGN

COURSE OBJECTIVES:

- Toprovidea soundknowledgein UI& UX •
- Tounderstandthe importance of user interface design principles •
- To Illustrate web interface design and Mobile interface design
- Toexplorethevarious Tools used inUI&UX
- To Createawireframeandprototype •

UNIT-I FOUNDATIONS OF DESIGN

Introduction: Introduction about UX - Five Main Ingredients of UX - Three "Whats" of User Perspective - Pyramid of UX Impact - UI vs. UX Design - Core Stages of Design Thinking- Divergent and Convergent Thinking -BrainstormingandGamestorming-Observational Empathy- Behavior Basics: Psychology versus Culture - User Psychology - Experience - Conscious Vs Subconscious Experience - Emotions - Gain and Loss – Motivations. Case Study: Exploring variousUlInteraction Patterns.

UNIT-II USER INTERFACE DESIGN

Designing Behavior: Designing with Intention - Rewards and Punishments - Conditioning and Addiction - Timing Matters - Gamification - Social/Viral Structure-Trust - Hidden versus Visible. Basic Visual Design Principles: Visual Weight - Contrast - Depth and Size - Color. Layout: Page Framework - Footers - Navigation -Images, and Headlines - Forms - One Long Page or a Few Short Pages - Input Types - Labels and Instructions - Buttons - Adaptive and Responsive Design - Touch versus Mouse. Case Study: ExploreaninterfacewithproperUIStyleGuides, Invent a Sample Pattern Library for that product (Mood board, Fonts, Colors based onUlprinciples)

WEB INTERFACE & MOBILE INTERFACE DESIGN UNIT-III

Designing Web Interfaces – Drag and Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Using Motion for UX - Design Patterns: Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Case Study: Make use of a Responsivelayout forasocietalapplication, Criticize a Design ThinkingProcess for a new product.

UNIT-IV WIREFRAMING, PROTOTYPINGANDTESTING

Sketching Principles - Sketching Red Routes - Responsive Design - Wire framing -CreatingWireflows-BuildingaPrototype-BuildingHigh-FidelityMockups-esigningEfficientlywithTools-Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods -SynthesizingTestFindings -Prototype Iteration. Case Study: Prioritize a Wire Flow diagram for application using open source software, Utilize a popular tool to build a prototype and perform usability testing and identifyimprovements.

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UNIT-V RESEARCH, DESIGNING, IDEATING, &INFORMATION ARCHITECTURE

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - CreatingPersonas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams – FlowMapping-Information Architecture**Case Study: Estimate end to end user research, creating personas, ideation process (User stories, Scenarios),Flow diagrams, Flow Mapping.**

TOTAL:45 PERIODS

COURSE OUTCOMES:

On successful completion of the course the students will be able to

- **CO1:** Build UI Interface for user Applications
- CO2: Evaluate UX design of any product or application
- **CO3:**Design web and mobile interface for product development
- CO4:CreateWireframeandPrototype
- **CO5:**ImplementSketching principles

TEXTBOOKS

- 1. JoelMarsh, "UXforBeginners", O'Reilly, 2022
- 2. Xia Jiajia, "UI UX Design", O"Reilly, Artpower International, 2016.
- 3. Brian Fling, "Mobile Design and Development", O"Reilly Media Inc., 1st Edition, 2009.

REFERENCES

- 1. JeniferTidwell, CharlesBrewer, AynneValencia, "DesigningInterface" 3rdEdition, O'Reilly 2020
- 2. SteveSchoger,AdamWathan"RefactoringUI",2018
- 3. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition, 2015
- 4. https://www.nngroup.com/articles/
- 5. <u>https://www.interaction-design.org/literature</u>.

	522CIE10- UI AND UX DESIGN														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	3	3	3	2	3	3	2
CO2	2	3	2	3	3	-	-	-	2	2	3	3	2	2	3
CO3	2	3	3	3	3	-	-	-	3	2	2	3	2	3	3
CO4	2	2	3	3	3	-	-	-	3	2	2	3	3	3	3
CO5	2	2	3	3	3	-	-	-	3	2	2	2	3	2	2
AVG	2	2	3	3	3	-	-	-	3	2	2	3	3	2	3

CO'S-PO'S & PSO'S MAPPING

3-High 2-Moderate 1-Low '-'- No Correlation

COURSE OBJECTIVES:

- To know the various parts of robots and fields of robotics.
- To get knowledge in automation and sensor.
- To understand and analyze the kinematics and inverse path planning.
- To learn the robot programing methods and language.
- To study some industrial applications of the robot.

UNIT I INTRODUCTION TO ROBOTICS

Definitions, Types of Robots, Grippers, Representing Position and Orientation, Representing Pose in 2-Dimensions, Representing Orientation in 3-Dimensions, Hydraulic, pneumatic and electric drives-Application of Robots

UNIT II UI AUTOMATION AND SENSOR

The key components of the UiPath Studio user interface (UI) - steps of the process to be built based on the business needs- using Arguments in Studio- UI Automation with the Classic Design Experience – Robotic sensors: Torque sensors –touch sensors- proximity sensors-light sensorselements of wrist sensors- fiber optic and tactile sensors-image processing and analysis.

UNIT III ROBOT ARM KINEMATICS AND PATH PLANNING

Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Debugging in Studio-Debugging features - remote debugging - overview of the debugging features Handler-Different types of exceptions.

UNIT IV ROBOT PROGRAMMING AND LANGUAGES

Robot languages and classification-Methods of Robot programming – lead through programming methods – robot program as a path in space – motion interpolation – weight, signal and delay commands – Branching capabilities — Robot programming examples for pick and place application using VAL-ARC welding program-point to point path robot and to protruding in a pallet object-MCL Language

UNIT V RPA TESTING AND INDUSTRIAL APPLICATIONS

RPA testing in the overall automation process and features for testing, Causes that affect the robot stability and how they can be tackled- Robots in manufacturing and non-manufacturing application – field robotics- Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Knowing the various parts of robots and fields of robotics.

CO2: Providing knowledge in automation and sensors.

CO3: Understanding and analyze the kinematics and path planning.

CO4: Learning the robot programing methods and language.

CO5: Reviewing some industrial applications of the robot.

TEXT BOOKS:

1. Fu, K.S., Gonzalez RC., and Lee C.S.G., "Robotics control, sensing, vision and intelligence," McGraw Hill, 1987.

2. Mikell P. Groover, Milchel Wein Roger Nagel and Nicholas G. Ordy, "Industrial Robotics, Technology, Programming and Applications", McGraw Hill, Last Print, 2005.

REFERENCES:

- 1. Deb.S.R, "Robotics Technology and Flexible Machine Design", Tata McGraw Hill, 2005.
- 2. Jankai Raman "Robotics and Image processing", Tata McGraw Hill, 1995
- 3. Ganesh S.Hegde "A text book on Industrial Robotics". Laxmi Publictions, 2006.
- Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo "Robot modeling, planning and control", 2011.

	522MEE17-ROBOTICS PROCESS AND INDUSTRIAL AUTOMATION														
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	2	1	-	2	-	2	-	-	1	2	-	1
CO2	1	-	-		1	-	2	-		-	-	1	2	-	1
CO3	2	-	-		1	-		-		-	-	-	-	-	1
CO4	2	1	-	1	1	-		-	1	-	1	-	-	-	1
CO5	1	2	-	2	1	-	2	-		-	1	-	-	-	1
AVG	1.4	1.6	-		1		2		1.5		1	1	2	1	1

CO'S-PO'S & PSO'S MAPPING

1-Low 2-Medium, 3-High, "-"- No Correlation
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COURSE OBJECTIVES:

- Familiar with basic principles of AI toward problem solving, and learning
- Understand and Practice ML algorithms

List of Experiments:

- 1. Implementation of Uninformed search algorithm (BFS,DFS)
- 2. Implementation of Informed Search algorithm
- 3. Implement Candidate Elimination algorithm
- 4. Implement linear regression
- 5. Implement Back-propagation algorithm
- 6. Implement Support Vector Machine algorithm
- 7. Implement Decision Tree algorithm
- 8. Implement k-Nearest Neighbors algorithm
- 9. Implement K- Means Clustering algorithm

Recommended Projects: Students shall select any <u>one project</u> from the following:

- 1. Predictive Text Generator Students will develop a text generator using models that can predict the next word in a sentence based on previous words.
- 2. Al Chabot -This project focuses on creating a Chabot that can understand and respond to user queries using natural language processing
- 3. Voice-Activated System This project involves creating a system capable of recognizing spoken words and converting them into actions or responses.
- 4. Recommendation System Build a recommendation engine that suggests products or content to users based on their past behaviour and preferences.
- 5. Disease Prediction Using Machine Learning
- 6. Fake News Detection using Machine Learning
- 7. Sentiment analysis with Twitter /Face book data
- 8. Handwritten Digit Recognition using Neural Network

TOTAL: 30 PERIODS

COURSE OUTCOMES:

On success full completion of the course the students will be able to

- **CO1:** Apply different searching algorithms
- **CO2:** Choose hypothesis to solve real world problem.
- **CO3:** Evaluate neural network models
- **CO4:** Solve different classification and clustering problems
- **CO5:** Select suitable Machine learning model for any problem.

COs-PO's & PSO's MAPPING

522CIP07 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
AVG	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3

1–Low 2-Medium, 3-High, "-"-No Correlation

COURSE OBJECTIVES:

- To be familiar with web page design using HTML and style sheets.
- To use JavaScript to access and utilize web services for dynamic content.
- To create dynamic web pages using server-side scripting.

List of Experiments

- Design a webpage for your college containing descriptions of courses, departments, faculties, library, etc
- 2. Createawebpageanduseinline, embedded, and external CSS to style various elements. Experiment with CSS3 features like background images, border images, colors, and shadows.
- 3. Create a student registration form for job applications and validate the form fields using JavaScript.
- 4. Create a quiz program with adaptive questions along with statistical variations using JavaScript
- 5. Design a JSP to insert the details of the users who register through the registration page and store the details in to the database.
- 6. Implement Event Handling in the WebPages.
- 7. Create a simple widget (e.g., weather, stock ticker) using JSON data fetched from an API.
- 8. JDBC connectivity to retrieve bank customers' transaction details.
- 9. Develop a PHP program to validate the fields of the Registration page

Recommended projects: Students shall select any **one project** from the following:

- Personal Portfolio Website
- Weather Forecast App
- E-commerce Product Page
- Interactive Learning Management System
- Expense Tracker
- Online Job Portal
- Online Feedback Form
- Social Media Networking Site

TOTAL: 30 PERIODS

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Design webpage's using HTML and style sheets.

CO2: Construct client-side validation using scripting languages.

CO3: Implement basic validation techniques to improve forms using JavaScript.

CO4: Create a database connectivity solution using JSP.

CO5: Develop and implement applications using web technology.

Software Requirements Operating System: Linux/Windows Programming Language&IDE: HTML5, JDK1.7, PHP and Notepad++. Server: ApacheTomcatServer/XAMPP/LAMP Backend: MySQL / SQLite

CO'S-PO'S & PSO'S MAPPING

522CIP08-WEB ESSENTIALS LABORATORY															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	3	3	3	2
CO2	3	1	2	2	2	-	-	-	-	-	-	3	3	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	3	3	3	2
CO4	3	2	2	2	2	-	-	-	-	-	-	3	3	3	2
CO5	3	2	2	2	2	-	-	-	-	-	-	3	3	3	2
AVG	3	2	2	2	2	-	-	-	-	-	-	3	3	3	2

1– Low2-Medium, 3-High, "-"- No Correlation

SEMESTER – VI

S.	Category	Course Code	Course Title	L	Т	Р	С		Marks CA EA TO 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10 40 60 10			
NO								CA	EA	ТОТ		
			THEORY									
1	PC	622CIT01	Full Stack Development	3	0	0	3	40	60	100		
2	PC	622CII02	Cloud Computing	3	0	2	4	40	60	100		
3	PC	622CST03	Mobile Application Development	3	0	0	3	40	60	100		
4	PC	622CSE04	Devops	3	0	2	4	40	60	100		
5	PE	X22XXExx	Professional Elective – II	3	0	0	3	40	60	100		
6	OE	X22XXOxx	Open Elective – II	3	0	0	3	40	60	100		
7	MC	3	0	0	1	40	60	100				
			PRACTICALS									
8	PC	622CIP07	Full Stack Development Laboratory	0	0	2	1	60	40	100		
9	9 PC 622CSP08 Mobile Application Developmen Laboratory					2	1	60	40	100		
10	0 EEC EEC Internship						2	60	40	100		
		ТОТ	21	0	10	23						

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COURSE OBJECTIVES:

- To learn the basics and design Principles.
- To present idea, information, product and service on websites.
- To know how to apply programming principles to construct websites.
- To develop fully working web based project on Full Stack.

UNIT-I GETTING STARTED WITH ANGULAR

Understanding the basic web Development Framework-Getting Started with Angular – Features of Angular - Angular Development Environment Setup - Angular application setup – Elements in Angular - Angular Components - Creating Components - Modules in Angular - Basics of Angular Modules –Front end Security (Content Security Policy(CSP))[Hands-on Exercises for Web Application Development Using Capstone Project]

UNIT- II ANGULAR BUILDING BLOCK – 1

Angular Templates – Template basics – Elements of Templates – Change Detection - Directives in Angular –Types of Directives - Component Directives – Structural Directives – Attribute Directives - Data Binding – Types of Data Binding – Property Binding – Attribute binding - Pipes – Built-in- Pipes- Custom Pipes - Nested Components - [Hands-on Exercises for Web Application Development Using Capstone Project]

UNIT- III ANGULAR BUILDING BLOCK – 2

Forms in Angular – Types of Forms – Model Driven Forms – Reactive Forms – Dependency Injection – Angular Services –Services basics – Communication with different backend services using Angular – Angular Routing – Route Guards – Asynchronous Routing – Nested Routing -Angular Capstone Projects [Hands-on Exercises for Web Application Development Using Capstone Project]

UNIT -IV NODE.JS AND EXPRESS.JS

Node.js: Importance of Node.js - Create a web server in Node.js - Node Package Manager -Modular programming in Node.js - Restarting Node Application - File Operations. Implementing HTTP services in Node.js. Express.js: Express Development Environment - defining a route -Handling Routes - Route and Query Parameters – Middleware - Chaining of Middleware's -Types of Middleware's - connecting to MongoDB with Mongoose - Validation Types and Defaults – Models - CRUD Operations - API Development - Session Management – Cookies – Securing Express Application - Helmet Middleware - Using a Template Engine Middleware -Stylus CSS Pre-processor. Back end Security (Cross –Site Request Forgery Protection (CSRF))

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UNIT -V MONGO DB

Mongo DB: Introduction Module Overview- Document Database Overview- Understanding JSON- MongoDB Structure and Architecture- MongoDB Remote Management- Installing MongoDB on the local computer (Mac or Windows)- Introduction to MongoDB Cloud-Create MongoDB Atlas Cluster- GUI tools Overview- Install and Configure MongoDB Compass- Introduction to the MongoDB Shell- MongoDB Shell JavaScript Engine- MongoDB Shell JavaScript Syntax- Introduction to the MongoDB Data Types- Introduction to the CRUD Operations on documents- Create and Delete Databases and Collections- Introduction to MongoDB Queries. Simple Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On successful completion of the course the students will be able to

CO1: Define component-based application using Angular Components

CO2: Describe component-based application using Angular Templates and Directives

CO3: Develop Angular forms and bind them with model data using data binding.

CO4: Analyse Node.js and identify when to use, create and run Node.js.

CO5: Design schema using advanced queries.

TEXT BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018

2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.

REFERENCE BOOKS

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018

2. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

3. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp

4. https://www.coursera.org/specializations/full-stack-react

5. https://www.udemy.com/course/the-full-stack-web-development

COs-PO's & PSO's MAPPING

622CIT01-FULL STACK DEVELOPMENT															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-		-	-	2	1	3	1	1	-
CO2	1	2	1	1	-	-		-	-	-	3	-	3	2	1
CO3	2	2	-	3	1	-		-	-	2	2	2	1	2	1
CO4	-	1	2	2	2	-		-	-	3	3	1	3	2	1
CO5	3	-	2	1	2	-		-	-	1	1	3	-	2	1
AVG	1.8	1.2	1.4	1.6	1.4	-		-	-	1.6	2	1.8	1.8	2	1

1–Low 2-Medium, 3-High,"-"- No Correlation

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COURSE OBJECTIVES:

- To understand the principles of Cloud Architecture, Models and Infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure and Cloud deployment environments.
- To understand the Cloud Platforms in Industry and Software Environments.
- To learn about the security issues in the cloud environment.

UNIT-I INTRODUCTION ABOUT CLOUD ARCHITECTURE MODEL

Introduction - Historical Development - Cloud Computing Architecture – The Cloud Reference Model-NIST Cloud Computing Reference Architecture – Cloud Characteristics – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds - Cloud Delivery Models: IaaS,PaaS, SaaS –AWS Cloud Infrastructure: Architectural Design of Compute and Storage Clouds -- Design Challenges.

UNIT-II VIRTUALIZATION

Virtualization - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques– Pros and Cons of Virtualization - Implementation Levels of Virtualization -Virtualization Types: Full Virtualization -- Para Virtualization -- Hardware Virtualization - Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V.

UNIT-III CLOUD COMPUTING MECHANISM

Cloud Infrastructure Mechanism: Cloud Storage-Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3-Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

UNIT-IV CLOUD INDUSTRIAL PLATFORMS AND SOFTWARE ENVIRONMENTS 9

Cloud Platforms in Industry: Amazon Web Service - Google cloud Platform - Microsoft Azure; Cloud Software Environments -Hadoop –Map Reduce -Eucalyptus –Open Nebula, Open Stack;

UNIT-V SECURITY IN THE CLOUD

Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, IAM Challenges - IAM Architecture and Practice, MFA, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images. VM migration attack – hyper jacking; Data Security and Storage, Zero-Trust Security Model.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Understand the architecture of Cloud computing stack

CO2: Apply the concept of Virtualization and its techniques.

CO3: Identify the architecture, storage, infrastructure and delivery models of cloud computing

CO4: Analyse the Cloud platforms in industry and Software Environments.

CO5: Understand the necessity and approaches for cloud security.

TEXT BOOK:

- 1. Thomas Erl, Zaigham Mahood, Ricardo uttini, "Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2014.
- 2. Rittinghouse, John. and James F. Ransome Cloud Computing: Implementation, Management and Security. CRC Press, 2017.

REFERENCE BOOKS:

- 1. Toby Velte, Anthony Velte, Robert C. Elsenpeter, Cloud Computing, A Practical Approach Tata McGraw-Hill Edition, 2010.
- 2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, Tata McGraw-Hill, 2013.
- 3. Arshdeep Bahga, Vijay Madisetti, Cloud Computing: A Hands- On Approach , Universities Press, 2014.
- 4. Tom White, Hadoop: The Definitive Guide, O'Reilly Media, 4th Edition, 2015.
- 5. James E Smith and Ravi Nair, -Virtual Machines, Elsevier, 2005.
- 6. John Rittinghouse and James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
- 7. Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2010.

COs-PO's & PSO's MAPPING

622CII02- CLOUD COMPUTING															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	2	3
AVG	3	3	3	3	3	-	-	_	-	-	-	2	3	2	3

1–Low 2-Medium, 3-High, "-"- No Correlation

LIST OF EXPERIMENTS:

1. EC2 creation [4 hours]

- Concepts [2 hours] AWS Global Infra Regions & Availability Zones, EC2 AMI , Instance type , SSH, SSH Keys, Linux commands, Web Server
- Hands-On [2 hour]
- Create an instance in the US-East-1 (N. Virginia) region with an Ubuntu OS and install Nginx for making them web servers.
- Change the default website with a page displaying the message: "Hello World"

2. EBS creation [2 hours]

- Concepts [1 hour] Elastic Block Storage , Volume Types, Volume Creation, Volume Snapshot, Volume Attachment
- Hands-On [1 hour]
- Launch a Linux EC2 instance.
- Create an EBS volume with 20 GB of storage and attach it to the created EC2 instance.
- Resize the attached volume and make sure it reflects in the connected instance.

3. EFS creation [2 hours]

- Concepts [1 hour] Shared File System, Difference between Block Storage (EBS) vs Shared File System (EFS), creating, mounting and accessing EFS.
- Hands-On [1 hour]
- Create an EFS and connect it to 3 different EC2 instances. Make sure that all instances have different operating systems. For instance, Ubuntu, Red Hat Linux and Amazon Linux

4. S3 Bucket creation [2 hours]

• Concepts [1 hour] - Object Storage, Bucket , Bucket Properties, creation and data transfer.

Hands-On [1 hour]

- Create an S3 Bucket for file storage.
- Upload 5 objects with different file extensions.

5. VPC creation [6 hours]

• Concepts [4 hour] - Network, IP Address, Subnet, Subnet Mask, CIDR, VPC, VPC scope, VPC creation, Subnet creation, Public vs Private Subnet, Internet Gateway, NAT Gateway

- Hands-On [2 hour]
- Create a VPC with 120.0.0/16 CIDR block.
- Create 1 public subnet 2 private subnets and make sure you connect a NAT gateway for internet connectivity to a private subnet.

6. IAM users & roles [2 hours]

- Concept [1 hour] Identity & Access Management in AWS, Users, groups, permissions, policies, roles, role assignment, assume role
- Hands-On [1 hour]Create IAM policy to restrict access to EC2 only.
- Create a new role and assign this IAM policy.
- Create a new user with console access and assign this role to user.
- Assume this role without sign out and check

7. RDS creation [2 hours]

- Concept [1 hour] AWS Relational Database Service, Database Engines, Database Instance, Storage, Creation and access
- Hands-On [1 hour]
- Create a new EC2 instance or use an existing one
- Create a RDS MySQL DB Instance & provide access to EC2. o Access MySQL DB from EC2 instance and perform SQL tasks.

8. CASE STUDY: [6 hours]

Problem: You are tasked to deploy a 3-tier web application on AWS. The application should consist of a web server, an application server, and a database. **Deployment Steps:**

Deployment Steps.

- 1. Create an AWS Account:
 - o Sign up for an AWS account and create an IAM user with appropriate permissions.
- 2. Create a VPC:
 - o Create a VPC with public and private subnets.
 - o Configure internet gateway and route tables.
- 3. Launch EC2 Instances:
 - o Launch two EC2 instances: one for the web server and one for the application server.
 - o Attach EBS volumes to both instances for storage.
 - o Configure security groups to allow necessary traffic.
- 4. Deploy the Web Server:
 - o Install and configure a web server (e.g., Nginx, Apache) on the web server instance.
 - o Configure the web server to serve static content and forward dynamic requests to the application server.
- 5. Deploy the Application Server:
 - o Install and configure the application server (e.g., Node.js, Python) on the application server instance.
 - o Deploy the application code to the instance.
 - o Configure the application server to connect to the database.
- 6. Create an RDS Database:
 - o Create an RDS instance for the database.
 - o Configure database parameters, security groups, and backups.
 - o Grant database access to the application server.
- 7. Connect the Components:
 - o Configure the application server to connect to the database.
 - o Configure the web server to forward requests to the application server.
- 8. Test and Deploy:
 - o Test the application thoroughly to ensure it functions as expected.
 - o Deploy the application to production.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Software: AWS, Ubuntu, MySQL, HTML, Python/ Node.js **Hardware:** Standalone desktops 30 Nos

622CST03	MOBILE APPLICATION	DEVELOPMENT
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Prerequisites: Java Programming

COURSE OBJECTIVE(S):

- To learn the characteristics of mobile applications.
- To learn about the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development of mobile applications.

UNIT-I GETTING STARTED WITH MOBILITY

Mobility landscape, Mobile platforms – Apple iPhone Platform- Google Android Platform – Eclipse Simulator, Mobile apps development, setting up the mobile app development environment along with an emulator – Mobile payment System- Security issues- Case Study on Mobile App development.

UNIT-II BUILDING BLOCKS OF MOBILE APPS – I

App user interface designing – mobile UI resources (Layout, UI elements, Drawable Menu), Activitystates and life cycle, interaction amongst activities-Event handling- App functionality beyond user interface - Threads, A Sync task, Services – states and lifecycle, Notifications.

UNIT-III BUILDING BLOCKS OF MOBILE APPS – II

Broadcast receivers, Telephony and SMS APIs , Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet).-Firebase and admob-Service Content Provider.

UNIT-IV SPRUCING UP MOBILE APPS

Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, Embedded Systems-IOT Nodes-Smart gadgets (smart watches, fitness trackers, and smart home devices) – Accessibility in mobile Apps- using the camera to take and process pictures.

UNIT-V TESTING MOBILE APPS AND TAKING APPS TO MARKET

Debugging mobile apps, Mobile Automation Testing, Mobile Cloud Testing, App Security Testing, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, Monkey Talk, Deploying Android Application to the world, Versioning, signing and packaging mobile apps, distributing apps on mobile market place.

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COURSE OUTCOMES

On successful completion of the course the students will be able to

CO1: Familiarize with Mobile apps development aspects.

- CO2: Design and implement the user interfaces for mobile applications
- **CO3:** Develop useful mobile applications using Google Android and Eclipse simulator.
- CO4: Develop mobile applications using graphics and animation and smart gadgets
- **CO5:** Perform testing, signing, packaging and distribution of mobile apps

TEXT BOOK:

1. Anubhav Pradhan, Anil V Deshpande, "Mobile Apps Development", First Edition, Wiley India, (2013).

2.Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2010

REFERENCE BOOKS:

1. Barry Burd, "Android Application Development All in one for Dummies", First Edition, Wiley India,

(2011)

2. Lauren Darcey, Shane Conder, "Teach Yourself Android Application Development in 24 Hours", Second Edition, Wiley India, (2012)

3."Inclusive Design for a Digital World: Designing with Accessibility in Mind" by Regine M. Gilbert

4."Embedded Systems: Introduction to Arm Cortex-M Microcontrollers" by Jonathan W. Valvano

622CST03-MOBILE APPLICATION DEVELOPMENT															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	3	2	-	-	-	-	2	3	2	1	3
CO2	3	2	-	2	-	2	-	-	-	-	2	3	2	1	3
CO3	3	1	2	2	1	2	-	-	-	-	2	3	2	2	3
CO4	2	1	3	2	-	2	-	-	-	-	2	3	2	1	3
CO5	3	1	3	2	1	2	-	-	-	I	2	3	2	-	3
AVG	3	1	2	2	1	2	-	-	-	-	2	3	2	1	3

COs-PO's & PSO's MAPPING

1–Low 2-Medium, 3-High, "-"- No Correlation

	3	0	2	4
COURSE OBJECTIVES:				
 Understand and implement DevOps principles. 				
 Learn CI/CD pipelines concepts and related tools. 				
 Learn infrastructure management using IaC. 				
 Build expertise configuration management and monitoring systems. 				
Illustrate the benefits and drive the adoption of cloud-based Devops tools to so	olve r	eal v	vorlo	b
problems				
UNIT- I : INTRODUCTION TO DEVOPS			6	
Introduction to DevOps - Core Principles-Automation, Continuous Improvement, DevOps Lifecycle-Develop, Build, Test, Release, Deploy, Monitor.	Colla	bora	ation	1-

UNIT- II: VERSION CONTROL AND CI/CD

Introduction to Version Control - Types of Version Control Systems-Centralized, Distributed - Git Concepts-Repositories, Commits, Branches, Merging - Git Commands - Continuous Integration (CI) -CI Pipeline Stages-Build, Test, Deploy - Continuous Delivery (CD)-Release Strategies, Automated Deployments - CI/CD Tools-Jenkins, GitHub Actions

UNIT -III: INFRASTRUCTURE AS CODE (IAC)

Introduction to Infrastructure as Code (IaC) - Declarative vs. Imperative IaC - Versioning Infrastructure Code - IaC Tools-Terraform, Cloud-specific IaC Tools - Terraform Core Concepts -Providers, Resources, State Management - Terraform Commands - Init, Plan, Apply, Destroy

UNIT -IV: CONTAINERS AND ORCHESTRATION

Introduction to Containers - Docker Concepts-Docker Images, Containers, Dockerfile -Building and Managing Containers - Container Orchestration - Container Orchestration with Kubernetes -Kubernetes Architecture - Kubernetes Operations

UNIT -V: CONFIGURATION MANAGEMENT AND MONITORING

Introduction to Configuration Management - Configuration Management Tools- Ansible, Chef, Puppet - Automating Server Configuration-Desired State Configuration, Idempotency - Monitoring and Logging - Monitoring Tools- Prometheus, Grafana, ELK Stack

TOTAL: 45 PERIODS

COURSE OUTCOMES

On successful completion of the course the students will be able to

CO1: Understand and implement core DevOps principles and practices.

CO2: Manage version control and CI/CD pipelines.

CO3: Automate infrastructure deployment using Terraform and IaC tools.

CO4: Build, deploy, and orchestrate containerized applications using Docker and Kubernetes.

CO5: Monitor applications and manage configurations with Ansible, Prometheus, and Grafana.

622CSI04

DEVOPS



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TEXT BOOK:

1. "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", Gene Kim, Patrick Debois, John Willis, and Jez Humble, IT Revolution Press, 2016.

REFERENCE BOOKS:

1. "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", Jez Humble, David Farley, 2017

2. "Terraform: Up & Running: Writing Infrastructure as Code", Yevgeniy Brikman, O'Reilly, 2019

3. "Kubernetes: Up and Running: Dive Into the Future of Infrastructure", Brendan Burn, Joe Beda &

Kelsey Hightower, O'Reilly, 2017

4. "Ansible for DevOps: Server and Configuration Management for Humans", Jeff Geerling, 2015

LAB EXPERIMENTS:

- 1. Provision a Virtual Machine (VM) in AWS/Azure using Terraform
- 2. Provision a Virtual Machine (VM) in AWS with Cloud Formation / Azure with ARM
- 3. Use Ansible to configure the VM and install Nginx
- 4. Create a CI pipeline using Jenkins with stages for code checkout, build and test
- 5. Deploy a sample application inside the VM using Jenkins (CD Pipeline)
- 6. Run a container using pre-build docker image
- 7. Build and Run a Custom Docker Image
- 8. Implement Logging and Monitoring with Prometheus and Grafana

TOTAL: 30 Hours

622CSI04-DEVOPS															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	1	-	-	-	3	3	3	2	2	2
CO2	3	2	1	2	1	1	-	-	-	3	3	3	2	2	2
CO3	3	2	1	3	1	1	-	-	-	3	3	3	2	2	2
CO4	3	2	1	3	1	1	-	-	-	3	3	3	2	2	2
CO5	3	2	1	3	1	1	-	-	-	3	3	3	2	2	2
AVG	3	1.8	1	2.6	1	1	-	-	-	3	3	3	2	2	2

COs-PO's & PSO's MAPPING

1–Low 2-Medium, 3-High, "-"- No Correlation

622CSE05	DIGITAL MARKETING	L	т	Ρ	С
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COURSE OBJECTIVES

- The primary objective of this module is to examine and explore the role and importance of
- Digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT-I: INTRODUCTION TO ONLINE MARKET

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT-II: SEARCH ENGINE OPTIMISATION

Search Engine optimization - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement

UNIT –III: E- MAIL MARKETING

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-

UNIT- IV: MEDIA MARKETING

Social Media Marketing - Social Media Channels- Leveraging Social media for brand Conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing-Building Customer relationships - Creating Loyalty drivers - Influence Marketing.

UNIT- V: DIGITAL TRANSFORMATION

Digital Transformation & Channel Attribution- Analytic- Ad-words, Email, Mobile, Social Media, Web Analytic - Changing your strategy based on analysis- Recent trends in Digital marketing.

TOTAL: 45 HOURS

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COURSE OUTCOMES:

On successful completion of the course the students will be able to

- **CO1:** To examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- **CO2:** To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.
- **CO3:** To know the key elements of a digital marketing strategy.
- CO4: To study how the effectiveness of a digital marketing campaign can be measured
- **CO5:** To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TEXT BOOK

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia; Publisher: Pearson Education; First edition (July 2017); ISBN-10: 933258737X; ISBN-13: 978-9332587373.

2. Digital Marketing by Vandana Ahuja; Publisher: Oxford University Press (April 2015). ISBN- 10: 0199455449

3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st

Edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN:8126566930.

4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.

5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South- Western ,Cengage Learning.

6. Pulizzi, J Beginner's Guide to Digital Marketing , Mcgraw Hill

622CSE05-DIGITAL MARKETING															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	-	-	-	-	1	2	3	3	3	3
CO2	2	2	2	2	3	-	-	-	-	1	2	3	3	3	3
CO3	1	1	1	3	2	-	-	-	-	1	2	1	3	2	1
CO4	3	3	2	3	1	-	-	-	-	1	3	3	2	3	2
CO5	2	2	1	2	3	-	-	-	-	2	3	2	1	2	1
AVG	2.2	2.2	1.6	2	2.4	-	-	-	-	1.2	2.4	2.4	2.4	2.6	2

COs-PO's & PSO's MAPPING

1–Low 2-Medium, 3-High, "-"- No Correlation

OBJECTIVES

- To develop full stack applications with clear understanding of user interface, business logic and data Storage.
- To design and develop user interface screens for a given scenario
- To develop the functionalities as web components as per the requirements
- To implement the database according to the functional requirements
- To integrate the user interface with the functionalities and data storage

LIST OF EXPERIMENTS:

- 1. Create a basic Angular Application which Demonstrates About the parent and child components.
- 2. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter
- 3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.
- 4. Design a following static web pages required for online book store website
 - Home page Login page Catalogue page Cart page Registration page
- 5. Develop a Angular JS application that displays a list of shopping items and allow user to add and remove items from the list using directives and controllers
- 6. Write a program to create a simple calculator Application using React JS
- 7. Write a program to create a voting application using React JS.
- 8. Write a server side program for manipulating mongo DB from Node.js
- 9. Develop a project using Angular, Node. js, Express .js and Mongo DB from .This has to be CRUD Application for managing items(e.g., a task manager or inventory app) and emphasis on integrating Security Practices.

TOTAL: 60 PERIODS

COURSE OUTCOMES

On successful completion of the course the students will be able to

CO1: Design full stack applications with clear understanding of user interface, business logic and data Storag **CO2:** Design and develop user interface screens

- **CO3:** Implement the functional requirements using appropriate tool
- **CO4:** Design database based on the requirements
- **CO5:** Develop all the necessary components of the application.

COs-PO's & PSO's MAPPING	
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622CIP07-FULL STACK DEVELOPMENT LABORATORY															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	1	1	1	2	1	1	1	2	2	1
CO2	3	3	3	2	3	1	1	1	2	1	1	1	2	2	1
CO3	3	3	3	3	3	1	1	1	2	1	1	1	2	2	1
CO4	3	3	3	3	3	2	1	1	1	1	2	1	1	2	1
CO5	3	3	3	3	2	1	1	1	1	1	1	1	2	2	1
AVG	3	3	3	2	3	1	1	1	1	1	1	1	2	2	1

1–Low 2-Medium, 3-High, "-"-No Correlation

COURSE OBJECTIVE(S):

- Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Can able to draw basic graphical primitive on the mobile application and EV Charging station Locator.

LIST OF EXPERIMENTS:

- 1. Develop an application that uses GUI components, Font and Colors
- 2. Develop an application that uses Layout Managers and event listeners.
- 3. Develop a mobile application to send an email.
- 4. Write an application that draws basic graphical primitives on the screen.
- 5. Develop an application that makes use of database.
- 6. Develop a mobile Application "Voice-to-Text with External Audio Input Devices"
- 7. Implement an application that creates an alert upon receiving a message.
- 8. Develop a mobile app that connects to a wearable fitness tracker or a heart rate monitor via Bluetooth.
- 9. Design a mobile app to "Capturing and Processing Audio with External Microphones"
- 10. Electric Vehicle (EV) Charging Station Locator
- Scenario: The growth of EVs has increased the need for charging infrastructure.

Exercise:

- Build an app that helps users locate EV charging stations nearby.
- Use maps APIs (e.g., Google Maps or OpenStreetMap) for navigation.
- Add features like real-time availability, pricing, and booking options.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1: Design and Implement various mobile applications using emulators.

CO2: Develop a mobile app that integrates with external audio input devices (e.g., microphones,

audio interfaces) to capture high-quality voice input.

CO3: Develop an app using basic graphical primitives and databases.

CO4: Develop a mobile app that interfaces with external Bluetooth devices, such as wearable fitness trackers or heart rate monitors.

CO5: Design and develop user Interfaces for the Android platform.

LIST OF EQUIPMENTS:

- Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development
- Tools with appropriate emulators and debuggers.
- Google Speech-to-Text API (or an equivalent like IBM Watson or AWS Transcribe)
- Bluetooth headset or smart speaker with microphone support.

COs-PO's & PSO's MAPPING

622CSP08-MOBILE APPLICATION DEVELOPMENT LABORATORY															
CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1	2
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
AVG	2	3	2	2	1	-	-	-	2	1	3	2	2	2	2

1–Low 2-Medium, 3-High,"-"- No Correlation