NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode-638 052, Tamilnadu, India, Phone: 04294 – 225585

Curriculum and Syllabi

for

B.TECH –Information Technology [R22]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the Academic year 2024-2025 onwards)

April 2025

INSTITUTE VISION AND MISSION	
VISION	• To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society.
MISSION	• To provide quality education to produce ethical and competent professionals with social Responsibility • To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems. • To create a learner centric environment and improve continually to meet the changing global needs.

B.TECH – INFORMATION TECHNOLOGY	
VISION	• To build a prominent academic platform by disseminating quality technical education in the field of Information Technology to meet the changing needs of society.
MISSION	Department of Information Technology is committed to • To produce professionally competent and ethically responsible graduates through a balanced curriculum. • To empower the students in the thrust areas of information technology and Allied disciplines and to impart Entrepreneurial skills in the continually changing global market. • To establish a learner-centered environment that encourages the adoption of emerging technologies in the changing needs of the society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	The graduates of Information Technology will be able to **PEO 1: Core Competency:** Apply the knowledge of mathematics, science and engineering fundamentals to identify and solve technological problems by deploying various software tools for societal development. **PEO 2: Research, Innovation and Entrepreneurship:** Implement recent tools, technologies and innovative ideas for leading successful careers in research / entrepreneurship and to excel in solving real world problems. **PEO 3: Ethics, Human Valued and Life-Long Learning:** Exhibit professional ethics in the industry and possess the necessary skills for working in multi-disciplinary areas with focus on life-long learning.
PROGRAMME SPECIFIC OUTCOMES (PSO)	• **PSO 1:** Analyze, design and apply mathematical foundations, principles of computing, Algorithms, modeling and design of Information Technology based systems. • **PSO 2:** Develop problem-solving skills in the broad area of programming concepts and to manage interdisciplinary projects.

PROGRAM OUTCOMES:

At the end of this programme the students will be able to

a-l	GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
a	Engineering Knowledge	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b	Problem Analysis	PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c	Design and Development of Solutions	PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d	Investigation of Complex Problems	PO4	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.
e	Modern Tool Usage	PO5	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.
f	The Engineer and Society	PO6	Apply reasoning acquired by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
g	Environment and Sustainability	PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the Knowledge of, and need for sustainable development.
h	Ethics	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i	Individual and Team Work.	PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j	Communication	PO10	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.
k	Project Management and Finance	PO11	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.
l	Lifelong Learning	PO12	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.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Educational Objectives and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	3	3	1	1	1	2	1	2
2	3	3	3	3	3	2	2	1	2	2	1	1
3	3	3	3	1	1	1	2	3	3	3	3	3

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	3	1	1	1	1	1	1	2
2	3	3	3	3	3	2	1	1	3	3	3	2

Contribution 1: Reasonable 2: Significant 3: Strong

SEMESTER: I									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
I	22MAN01	Induction Programme	MC	-	-	-	-	-	-
THEORY									
2	22EYA01	Professional Communication - I	HSMC	-	4	2	0	2	3
3	22MYB01	Calculus and Linear Algebra *	BSC	-	4	3	I	0	4
4	22PYB01	Semiconductor Physics	BSC	-	3	3	0	0	3
5	22ECC01	Basics of Electronics Engineering	ESC	-	3	3	0	0	3
6	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
7	22GYA01	தமிழர் மரபு / Heritage of Tamils*	HSMC	-	I	I	0	0	I
PRACTICAL									
8	22ECP01	Basics of Electronics Engineering Laboratory	ESC	-	4	0	0	4	2
9	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
10	22PYP01	Physics Laboratory*	BSC	-	2	0	0	2	I
Mandatory Non Credit Courses									
11	22MAN03	Yoga – I *	MC	-	I	0	0	I	0
				TOTAL	**32**	**16**	**I**	**15**	**22**

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SEMESTER: II									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3
2	22MYB03	Statistics and Numerical Methods *	BSC	-	4	3	1	0	4
3	22ITC01	Data structures using C*	ESC	22CSC01	3	3	0	0	3
4	22ITC02	Python Programming *	ESC	-	3	3	0	0	3
5	22ITC03	Digital Principles and Computer Organization *	ESC	-	3	3	0	0	3
6	22GYA02	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology*	HSMC	-	1	1	0	0	1
PRACTICAL									
7	22ITP01	Data Structures Laboratory*	ESC	22CSP01	4	0	0	4	2
8	22ITP02	Python Programming Laboratory	ESC	-	4	0	0	4	2
9	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2
Mandatory Non Credit Courses									
10	22MAN02R	Soft Analytical Skills – I**	MC	-	3	1	0	2	0
11	22MAN05	Yoga - II*	MC	-	1	0	0	1	0
				TOTAL	**34**	**16**	**1**	**17**	**23**

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SEMESTER: III									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MYB05	Discrete Mathematics	BSC	-	4	3	1	0	4
2	22ITC04	Algorithms	PCC	-	3	3	0	0	3
3	22ITC05	Operating Systems	PCC	-	3	3	0	0	3
4	22ITC06	Java programming	PCC	-	3	3	0	0	3
5	22ITC07	Computer Networks	PCC	-	3	3	0	0	3
6	22ITC08	Design Thinking	PCC	-	3	3	0	0	3
PRACTICAL									
7	22ITP03	Algorithms Laboratory	PCC	-	4	0	0	4	2
8	22ITP04	Java Programming Laboratory	PCC	-	4	0	0	4	2
9	22ITP05	Computer Networks Laboratory	PCC	-	4	0	0	4	2
Mandatory Non Credit Courses									
10	22MAN04R	Soft / Analytical Skills – II**	MC	-	3	1	0	2	0
11	22MAN09	Indian Constitution	MC	-	1	1	0	0	0
				TOTAL	**35**	**20**	**1**	**14**	**25**

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SEMESTER: IV									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22ITC09	Theory of Computation	PCC	22MYB05	4	3	1	0	4
2	22ITC10	Fundamentals of Data Science	PCC	-	3	3	0	0	3
3	22ITC11	Database Management System	PCC	-	3	3	0	0	3
4	22ITC12	Agile Methodologies	PCC	-	3	3	0	0	3
5	22ITC13	Advanced Java Programming**	PCC	22ITC06	3	3	0	0	3
6	22CYB07	Environmental Science and Engineering	BSC	-	3	3	0	0	3
PRACTICAL									
7	22ITP06	Database Management System Laboratory	PCC	-	4	0	0	4	2
8	22ITP07	Advanced Java Programming Laboratory**	PCC	22ITP04	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN07R	Soft/Analytical Skills – III**	MC	-	3	1	0	2	0
10	22GED01	Personality and Character Development	EEC	-	1	1	0	0	0
				TOTAL	**31**	**20**	**1**	**10**	**23**

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SEMESTER: V									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22ITC14	Artificial Intelligence and Machine learning	PCC	-	3	3	0	0	3
2	22ITC15	Cloud Computing	PCC	-	3	3	0	0	3
3	22ITC16	Internet of Things and its Applications	ESC	-	3	3	0	0	3
4	E1	Elective(PEC)	PEC	-	3	3	0	0	3
5	E2	Elective(PEC)	PEC	-	3	3	0	0	3
6	E3	Elective(OEC/PEC)	PEC/OEC	-	3	3	0	0	3
PRACTICAL									
7	22ITP08	Cloud Computing Laboratory	PCC	-	4	0	0	4	2
8	22ITP09	Internet of Things and its Applications Laboratory	ESC	-	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN08R	Soft/Analytical Skills – IV**	MC	-	3	1	0	2	0
				TOTAL	**30**	**19**	**0**	**11**	**22**

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SEMESTER: VI									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22ITC17	Full Stack Development	PCC	-	3	3	0	0	3
2	22ITC18	Mobile Application Development	PCC	22ITC07	3	3	0	0	3
3	EM1	Elective (Management)***	HSMC	-	3	3	0	0	3
4	E4	Elective(PEC)	PEC	-	3	3	0	0	3
5	E5	Elective(PEC)	PEC	-	3	3	0	0	3
6	E6	Elective(OEC/PEC)	PEC/OEC	-	3	3	0	0	3
PRACTICAL									
7	22ITP10	Full Stack Development Laboratory	PCC	-	4	0	0	4	2
8	22ITP11	Mobile Application Development Laboratory	PCC	22ITP05	4	0	0	4	2
				TOTAL	**30**	**19**	**0**	**11**	**22**

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SEMESTER: VII									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22GEA01	Universal Human Values	HSMC	-	2	2	0	0	2
2	E7	Elective(OEC)***	OEC	-	3	3	0	0	3
3	E8	Elective(PEC)	PEC	-	3	3	0	0	3
4	E9	Elective(OEC/PEC)	PEC/OEC	-	3	3	0	0	3
5	E10	Elective(OEC)	OEC	-	3	3	0	0	3
PRACTICAL									
6	22GED02	Internship/Industrial Training	EEC		0	0	0	0	2
				TOTAL	**14**	**14**	**0**	**0**	**16**

SEMESTER: VIII									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
PRACTICAL									
1	22ITD01	Project Work	EEC		20	0	0	20	10
				TOTAL	**20**	**0**	**0**	**20**	**10**

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(A) HSMC,BSC, and ESC Courses

(a) Humanities and Management Sciences (HSMC)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22EYA01	Professional Communication - I	HSMC	-	4	2	0	2	3
2.	22GYA01	தமிழர் மரபு / Heritage of Tamils	HSMC		1	1	0	0	1
3.	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3
4.	22GYA02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	-	1	1	0	0	1
5.	22GEA01	Universal Human Values	HSMC	-	2	2	0	0	2

(b) Basic Sciences (BSC)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22MYB01	Calculus and Linear Algebra	BSC	-	4	3	1	0	4
2.	22PYB01	Semiconductor Physics	BSC	-	3	3	0	0	3
3.	22PYP01	Physics Laboratory	BSC	-	2	0	0	2	1
4.	22MYB03	Statistics and Numerical Methods	BSC	-	4	3	1	0	4
5.	22MYB05	Discrete Mathematics	BSC	-	4	3	1	0	4
6.	22CYB07	Environmental Science and Engineering	BSC	-	3	3	0	0	3

(c) Engineering Sciences (ESC)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22ECC01	Basics of Electronics Engineering	ESC		3	3	0	0	3
2.	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
3.	22ECP01	Basics of Electronics Engineering Laboratory	ESC	-	4	0	0	4	2
4.	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
5.	22ITC01	Data structures using C	ESC	22CSC01	3	3	0	0	3
6.	22ITC02	Python Programming	ESC	-	3	3	0	0	3
7.	22ITC03	Digital Principles and Computer Organization	ESC	-	3	3	0	0	3
8.	22ITP01	Data Structures Laboratory	ESC	22CSP01	4	0	0	4	2
9.	22ITP02	Python Programming Laboratory	ESC	-	4	0	0	4	2
10.	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2
11.	22ITC16	Internet of Things and its Applications	ESC	-	3	3	0	0	3
12.	22ITP09	Internet of Things and its Applications Laboratory	ESC	-	4	0	0	4	2

(d) Employability Enhancement Courses (EEC)

COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
22GED01	Personality and Character Development	EEC	-	0	0	0	1	0
22GED02	Internship/Industrial Training	EEC	-	0	0	0	0	2
22ITD01	Project Work	EEC	-	20	0	0	20	10

(e) PROGRAMME CORE (PCC)									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITC04	Algorithms	PCC	-	3	3	0	0	3
2.	22ITC05	Operating Systems	PCC	-	3	3	0	0	3
3.	22ITC06	Java programming	PCC	-	3	3	0	0	3
4.	22ITC07	Computer Networks	PCC	-	3	3	0	0	3
5.	22ITC08	Design Thinking	PCC	-	3	3	0	0	3
6.	22ITP03	Algorithms Laboratory	PCC	-	4	0	0	4	2
7.	22ITP04	Java Programming Laboratory	PCC	-	4	0	0	4	2
8.	22ITP05	Computer Networks Laboratory	PCC	-	4	0	0	4	2
9.	22ITC09	Theory of Computation	PCC	22MYB05	4	3	1	0	4
10.	22ITC10	Fundamentals of Data Science	PCC	-	3	3	0	0	3
11.	22ITC11	Database Management System	PCC	-	3	3	0	0	3
12.	22ITC12	Agile Methodologies	PCC	-	3	3	0	0	3
13.	22ITC13	Advanced Java Programming	PCC	22ITC06	3	3	0	0	3
14.	22ITP06	Database Management System Laboratory	PCC	-	4	0	0	4	2
15.	22ITP07	Advanced Java Programming Laboratory	PCC	22ITP04	4	0	0	4	2
16.	22ITC14	Artificial Intelligence and Machine learning	PCC	-	3	3	0	0	3
17.	22ITC15	Cloud Computing	PCC	-	3	3	0	0	3
18.	22ITP08	Cloud Computing Laboratory	PCC	-	4	0	0	4	2
19.	22ITC17	Full Stack Development	PCC	-	3	3	0	0	3
20.	22ITC18	Mobile Application Development	PCC	22ITC07	3	3	0	0	3
21.	22ITP10	Full Stack Development Laboratory	PCC	-	4	0	0	4	2
22.	22ITP11	Mobile Application Development Laboratory	PCC	22ITP05	4	0	0	4	2

(f) Mandatory Non-Credit Courses (MC)									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22MAN01	Induction Programme	MC	-	-	0	0	0	0
2.	22MAN02R	Soft/Analytical Skills - I	MC	-	3	1	0	2	0
3.	22MAN03	Yoga - I	MC	-	1	0	0	1	0
4.	22MAN04R	Soft Analytical Skills - II	MC	-	3	1	0	2	0
5.	22MAN05	Yoga - II	MC	-	1	0	0	1	0
6.	22MAN07R	Soft / Analytical Skills - III	MC	-	3	1	0	2	0
7.	22MAN09	Indian Constitution	MC	-	1	1	0	0	0
8.	22MAN08R	Soft / Analytical Skills - IV	MC	-	3	1	0	2	0

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PROGRAMME ELECTIVE COURSES									
VERTICAL I - MACHINE INTELLIGENCE									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX01	Deep Learning	PEC	-	3	3	0	0	3
2.	22ITX02	Knowledge Engineering	PEC	-	3	3	0	0	3
3.	22ITX03	Recommender Systems	PEC	-	3	3	0	0	3
4.	22ITX04	Soft Computing	PEC	-	3	3	0	0	3
5.	22ITX05	Computer vision	PEC	-	3	3	0	0	3
6.	22ITX06	Ethics of AI	PEC	-	3	3	0	0	3
7.	22ITX07	Business Intelligence	PEC	-	3	3	0	0	3
8.	22ITX08	Robotic Process Automation	PEC	-	3	3	0	0	3

VERTICAL II - DATA ANALYTICS									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX11	Pattern Recognition	PEC	-	3	3	0	0	3
2.	22ITX12	Text and Speech Analytics	PEC	-	3	3	0	0	3
3.	22ITX13	Big Data Analytics	PEC	-	3	3	0	0	3
4.	22ITX14	Health care Analytics	PEC	-	3	3	0	0	3
5.	22ITX15	Predictive Analytics	PEC	-	3	3	0	0	3
6.	22ITX16	Image and Video Analytics	PEC	-	3	3	0	0	3
7.	22ITX17	Natural Language Processing	PEC	-	3	3	0	0	3
8.	22ITX18	Augmented Reality / Virtual Reality	PEC	-	3	3	0	0	3
VERTICAL III - CYBER SECURITY									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX21	Fundamentals of Cryptography and Network Security	PEC	22ITC07	3	3	0	0	3
2.	22ITX22	Ethical Hacking	PEC	-	3	3	0	0	3
3.	22ITX23	Cloud Security	PEC	-	3	3	0	0	3
4.	22ITX24	Information Security Management	PEC	-	3	3	0	0	3

5.	22ITX25	Social network security	PEC	-	3	3	0	0	3
6.	22ITX26	Data Privacy and Protection	PEC	-	3	3	0	0	3
7.	22ITX27	E-Commerce Security	PEC	-	3	3	0	0	3
8.	22ITX28	Biometric Security	PEC	-	3	3	0	0	3
VERTICAL IV - INTERNET OF THINGS									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX31	Industrial and medical IoT	PEC	-	3	3	0	0	3
2.	22ITX32	Block chain Technology	PEC	-	3	3	0	0	3
3.	22ITX33	Beyond 5G & IoT Technologies	PEC	-	3	3	0	0	3
4.	22ITX34	Programming for IoT Boards	PEC	-	3	3	0	0	3
5.	22ITX35	Wireless Ad-Hoc and Sensor Networks	PEC	-	3	3	0	0	3
6.	22ITX36	Wearable Computing	PEC	-	3	3	0	0	3
7.	22ITX37	Fog and Edge computing	PEC	-	3	3	0	0	3
8.	22ITX38	Image Processing	PEC	-	3	3	0	0	3
VERTICAL V - WEB DEVELOPMENT									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX41	Cloud Services Management	PEC	-	3	3	0	0	3
2.	22ITX42	UI and UX Design	PEC	-	3	3	0	0	3
3.	22ITX43	Devops	PEC	-	3	3	0	0	3
4.	22ITX44	Principles of Programming Languag	PEC	-	3	3	0	0	3
5.	22ITX45	MEAN Stack Development	PEC	-	3	3	0	0	3
6.	22ITX46	Social and Information Networks	PEC	-	3	3	0	0	3
7.	22ITX47	Web Mining	PEC	-	3	3	0	0	3
8.	22ITX48	Multimedia data compression and storage	PEC	-	3	3	0	0	3

VERTICAL VI - SOFTWARE DEVELOPMENT ENGINEERING									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITX51	Object Oriented Software Engineering.	PEC	-	3	3	0	0	3
2.	22ITX52	Software Defined Networks	PEC	-	3	3	0	0	3
3.	22ITX53	Software Project Management	PEC	-	3	3	0	0	3
4.	22ITX54	Software Testing Tools and Techniques	PEC	-	3	3	0	0	3
5.	22ITX55	Software Quality Assurance	PEC	-	3	3	0	0	3
6.	22ITX56	Service Oriented Architecture	PEC	-	3	3	0	0	3
7.	22ITX57	IT Operations	PEC	-	3	3	0	0	3
8.	22ITX58	Product Life Cycle Management	PEC	-	3	3	0	0	3
MANAGEMENT ELECTIVE									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22GEA02	Principles Of Management	HSBC	-	3	3	0	0	3
2.	22GEA03	Total Quality Management	HSMC	-	3	3	0	0	3
3.	22GEA04	Professional Ethics	HSMC	-	3	3	0	0	3
4.	22GEZ01	Entrepreneurship Development	HSMC	-	3	3	0	0	3

OPEN ELECTIVE COURSES									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1	22ITZ01	Web Technology	OEC	-	3	3	0	0	3
2	22ITZ02	Software Testing	OEC	-	3	3	0	0	3
3	22ITZ03	Developing Mobile Apps	OEC	-	3	3	0	0	3
4	22ITZ04	Fundamentals of Cloud	OEC	-	3	3	0	0	3

***Ratified by Thirteenth Academic Council

MINOR DEGREE – WEB TECHNOLOGIES									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	22ITM01	Fundamentals of Problem Solving	OEC	-	3	3	0	0	3
2.	22ITM02	Java programming Basics	OEC	-	3	3	0	0	3
3.	22ITM03	Database System Concepts	OEC	-	3	3	0	0	3
4.	22ITM04	User Experience	OEC	-	3	3	0	0	3
5.	22ITM05	Web essentials	OEC	-	3	3	0	0	3
6.	22ITM06	Full stack web development	OEC	-	3	3	0	0	3
7.	22ITM07	App development	OEC	-	3	3	0	0	3
8.	22ITM08	Web Application Security	OEC	-	3	3	0	0	3

CREDIT DISTRIBUTION

Semester/ Category	HSMC	BSC	PCC	ESC	EEC	PEC	OEC	Total
1	4	8		10				22
2	4	4		15				23
3		4	21					25
4		3	20					23
5			8	5		9		22
6	3		10			6	3	22
7	2				2	3	9	16
8					10			10
Total	13	19	59	30	12	18	12	163
%	7.97	11.65	36.19	18.40	7.36	11.04	14.72	
AICTE Credits Recommended	16	23	59	29	15	12	9	
%	10	14	36	18	9	7	6	

TOTALCREDITS (13+19+59+30+12+18+12) = 163CREDITS

***Ratified by Thirteenth Academic Council

22EYA01 - PROFESSIONAL COMMUNICATION I *(Common to All Branches)*					
		L	**T**	**P**	**C**
		2	**0**	**2**	**3**
PRE-REQUISITE: NIL					
Course Objective:	• To build essential English skills to address the challenges of communication • To enhance communication employing LSRW skills				

Course Outcomes The student will be able to		**Cognitive Level**	**Weight age of COs in End Semester Examination**
CO1	Communicate effectively in various work environments.	R	20%
CO2	Involve in diverse discourse forms utilizing LSRW Skills.	U	20%
CO3	Participate actively in communication activities that enhance the creative skill.	U	20%
CO4	Associate with the target audience and contexts using varied types of communication.	Ap	20%
CO5	Convey the ideas distinctly both in verbal and non-verbal communication in work culture.	U	20%

UNIT I –INTRODUCTORY SKILLS	**(6+6)**
Grammar – Parts of Speech – Verb (Auxiliaries – Primary & Modal, Main Verb) -**Listening** – Listening toShort Conversations or Monologues - Listening to Experiences – Listening to Descriptions- **Speaking** – Introducing Oneself – Exchanging Personal information - Talking about food and culture - **Reading**– Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting - **Writing** - Seeking Permission for Industrial Visit & In-plant Training	
UNIT II – LANGUAGE ACUMEN	**(6+6)**
Grammar – Word Formation – Tenses (Present Tense) – Synonyms & Antonyms - **Listening** – Listeningto Announcements – Listening to Interviews - Listening and Note-taking - **Speaking** – Talking aboutHolidays & Vacations – Narrating Unforgettable Anecdotes - **Reading** – Skimming – Scanning (Short Textsand Longer Passages) – Critical Reading - **Writing** – Instruction – Process Description	
UNIT III – COMMUNICATION ROOTERS	**(6+6)**
Grammar– Cause and Effect – Tenses (Past Tense) – Discourse Markers - **Listening** – Listening to Telephonic Conversations – Listening to Podcasts - **Speaking** – Talking about neoteric Technologies – Eliciting information to fill a form - **Reading** –Book Reading (Motivational) - Practicing Speed Reading (reading newspaper reports & biographies) - **Writing** – Checklist – Circular, Agenda & Minutes of the Meeting	

UNIT IV - DISCOURSE FORTE	(6+6)
Grammar – Tenses (Future Tense) –Yes/No & WH type questions – Negatives - **Listening** – Listening toTED/ Ink talks -**Speaking** – Participating in Short Conversations - **Reading** – Reading Comprehension (Multiple Choice / Short / Open Ended Questions) - **Writing** - E-Mail Writing.	
UNIT V - LINGUISTIC COMPETENCIES	**(6+6)**
Grammar – Articles – Homophones & Homonyms – Single line Definition – Phrasal Verb - **Listening** – Intensive listening to fill in the gapped text - **Speaking** –Expressing opinions through Situations & Role play - **Reading** – Cloze Texts - **Writing** – Paragraph Writing	
LIST OF SKILLS ASSESSED IN THE LABORATORY	
1. Grammar 2. Listening Skills 3. Speaking Skills 4. Reading Skills 5. Writing Skills	
TOTAL (L:30 , P:30) = 60 PERIODS	

TEXT BOOKS:

1. Shoba K N., Deepa Mary Francis. *English for Engineers and Technologists.* Volume 1, 3rd Edition, Orient Black Swan Pvt. Ltd, Telangana, 2022.

REFERENCES:

1. Koneru, Aruna. *English Language Skills.* Tata McGraw Hill Education (India) Private Limited, Chennai, 2006.
2. Hewings, M. *Advanced English Grammar.* Cambridge University Press, Chennai, 2000.
3. Jack C Richards, Jonathan Hull and Susan Proctor. *Interchange*. Cambridge University Press, New Delhi, 2015 (Reprint 2021).

WEB REFERENCE:

1. https://youtu.be/f0uqUzEf3A8?si=vyzu5KGIfbu35_IQ

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									2	3				
2									2	3				
3									2	3				
4									2	3				
5									2	3				
CO (W.A)									2	3				

22MYB01-CALCULUS AND LINEAR ALGEBRA *(Common to All Branches)*				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**
PRE-REQUISITE: NIL				
Course Objective:	• To understand the mathematical concepts of matrices and analytical geometry in real time problems. • To formulate differential and integral equations to model physical, biological, and engineering systems			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concepts of matrix theory for find solutions to complex problems efficiently.	Ap	20%
CO2	Analyze the geometric configurations and relationships by using Analytical geometry.	An	20%
CO3	Interpret the partial derivatives which involve heat conduction problems modeled by the heat equation.	Ap	20%
CO4	Apply the differential and integral techniques to solve the differential equations and multiple integrals in heat conduction, fluid mechanics and potential theory.	Ap	40%
CO5	Demonstrate the importance of matrix theory, analytical geometry and integral methods using programming tools.	Ap	Internal Assessment

UNIT I - MATRICES	**(9+3)**
Characteristic Equation - Eigen values and Eigen vectors of a matrix - Cayley Hamilton Theorem (excluding proof) and its applications - Quadratic form-Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II – ANALYTICAL GEOMETRY OF THREE DIMENSIONS	**(9+3)**
Equation of plane – Angle between two planes – Equation of straight lines - Coplanar lines –Equation of sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	**(9+3)**
Curvature – Curvature in Cartesian co-ordinates-Centre and Radius of curvature-Circle of curvature-Evolutes and Involutes.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	**(9+3)**
Partial derivatives - Euler's theorem on homogeneous function-Jacobian-Maxima and Minima of functions of two variables-Constrained Maxima and Minima by Lagrange's multiplier method.	
UNIT V - MULTIPLE INTEGRALS	**(9+3)**
Double integration in Cartesian Co-ordinates-Change of order of integration-Area as double integral- Triple integration in Cartesian Co-ordinates-Volume as triple integrals.	
TOTAL (L:45+T:15) :60 PERIODS	

LIST OF PROGRAMS USING MATLAB (Assignment/Online Test**)**:

1. Introduction to MATLAB
2. Matrix operations – Addition, Multiplication, Transpose and Inverse
3. Characteristic equation of a Matrix
4. Eigen values and Eigen vectors of Higher order Matrices.
5. Curve Tracing
6. Determining Maxima and Minima of a function of one variable.
7. Determining Maxima and Minima of a function of two variables.
8. Evaluating double integrals
9. Evaluating triple integrals
10. Finding area between two curves.

TEXT BOOKS:

1. Dr.B.S.Grewal, Higher Engineering mathematics, 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig , Advanced Engineering mathematics , 9th Edition , John Wiley & sons ,2013
3. Veerarajan.T, Engineering Mathematics of semester I & II, 3rd Edition, Tata McGraw Hill. ,2016

REFERENCES:

1. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics -Sem-II", 6th Edition, Laxmi Publications, 2014.
2. Kandasamy.P, Thilagavathy.K, Gunavathy .K, "Engineering Mathematics for first year", 9th Rev.Ed, S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Wiley India, 2007.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		2												
3		2											2	1
4	3													
5	3				2				3			2	2	2
CO (W.A)	**3**	**2**			**2**				**3**			**2**	**2**	**1.5**

22PYB01 - SEMICONDUCTOR PHYSICS *(Common to CSE, CSE (CS), CSE (IoT), IT & AI&DS)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: Nil					
Course Objective:	• To expose the concepts of conducting materials and electrical properties of semiconductors. • To expand familiarity in the field of photo detectors and new engineering materials				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the properties of intrinsic semiconductor in photovoltaic cells.	Ap	20%
CO2	Compare various types of semiconducting materials to fabricate laptop circuits	An	20%
CO3	Implement the principles of laser in engineering and medical applications.	Ap	20%
CO4	Analyze proficient in photo doctors in device fabrications.	An	20%
CO5	Examine new engineering materials to assess their performance in electronic applications.	Ev	20%

UNIT I -INTRODUCTION TO CONDUCTING MATERIALS	(9)
Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, expression – Wiedemann – Franz law- Success and failure – electrons in metals - Fermi- Dirac statistics – Density of energy states- - Particle in a three-dimensional box- degenerate states -Energy bands in solids- - Electron effective mass- concept of hole.	
UNIT II -ELECTRICAL PROPERTIES OF SEMICONDUCTORS	(9)
Elemental and compound semiconductors - Intrinsic semiconductor – carrier concentration derivation – variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors (qualitative) – variation of Fermi level with temperature and impurity concentration – Hall effect –determination of Hall coefficient – Applications	
UNIT III -SEMICONDUCTOR LASER	(9)
Population of energy levels – Einstein's A and B coefficients derivation -Resonant cavity – Types of Semiconductor lasers: homo junction and hetero junction- Determination of particle size using laser - Holography – construction – reconstruction – Engineering applications of lasers -Medical field (Surgery).	
UNIT IV -PHOTO DETECTORS	(9)
Classification of optical materials- Carrier generation and recombination processes- Absorption, emission and scattering of light in metals, insulators and semiconductors (concept only)- Formation of P-N junction - Barrier potential and depletion layer – P-N junction diode-Solar cell–LED–organic LED- Laser diode – optical data storage technique.	

UNIT V -ADVANCED NEW ENGINEERING MATERIALS	(9)
Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): Characteristics, properties of NiTi alloy, application. Nano materials: Properties - Preparation – Pulsed laser deposition – chemical vapour deposition of nano particles and applications. Carbon nano tubes: fabrication – arc method – pulsed laser deposition –structure – properties and application.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. R. A. Serway and J.W. Jewett, "Physics for Scientists and Engineers", Ninth Edition. Cengage Learning, 2018.
2. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017.
3. V.Rajendran, — Engineering Physicsll, Tata McGraw-Hill. New Delhi.2019

REFERENCES:

1. Raghavan V, "Materials and Engineering", Prentice-Hall of India, New Delhi, 2013.
2. Dattuprasad and Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2016.
3. B. Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small System" CRC Press, 2014.

WEB LINKS

1. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf.
2. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/
3. https://zenodo.org/record/243407#.ZEgPZXZBzIU
4. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	-	-	-	-	2	2	-	-	-	-	2	-	-
CO (weighted average)	**3**	**2**	**2**			**2**	**2**					**2**		

22ECC01 BASICS OF ELECTRONICS ENGINEERING *(Common to AI&DS, CSE, CSE(CS), CSE(IOT) and IT Branches)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE-REQUISITE: NIL				
Course Objective:	• To understand the basics of Electrical circuits and functions of transducers and measuring instruments. • To understand the working of electronic devices. • To analyze the DC and AC circuits using Network theorems.			

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the Ohm's law and Kirchhoff's law and investigates the behavior of electric circuits by analytical techniques.	Ap	30%
CO2	Apply the principles of operation of basic measuring and electronic instruments for specific measurements	Ap	30%
CO3	Apply logic design concepts to construct digital circuits.	Ap	20%
CO4	Analyze given electrical circuit through the Network theorems in DC to arrive at a suitable solution.	An	20%
CO5	Apply theoretical knowledge to present solutions to real-time problems involving circuits and demonstrate teamwork.	U	Internal Assessment

UNIT I - UNIT I - BASIC CIRCUITS ANALYSIS	**(9)**
Current, Voltage, Power – Nodes, Paths, Loops and Branches – Ohm's Law – Kirchhoff's laws – Single loop circuit – Series and parallel connected independent sources – Resistors in series and Parallel – Current and voltage division.	
UNIT II - NETWORK THEOREMS FOR DC CIRCUITS	**(9)**
Source transformation – Mesh Analysis-Node Analysis – Thevenin's and Norton Theorem – Superposition Theorem – Maximum power transfer theorem.	
UNIT III - SEMICONDUCTOR DEVICES	**(9)**
PN junction diode, Characteristics – Diffusion and Drift Current – Zener diode, Characteristics – BJT: PNP and NPN, CE Configuration of BJT – JFET – MOSFET – UJT.	
UNIT IV - RECTIFIERS, FILTERS AND AMPLIFIERS	**(9)**
Transformers: Construction & Types – Rectifiers: Half Wave, Full Wave and Bridge – Filters: Induction, Capacitor, LC – Operational Amplifiers – Applications of Amplifier.	
UNIT V -TRANSDUCERS, MEASURING INSTRUMENTS AND DIGITAL CIRCUITS	**(9)**
LED – Piezo electric Transducers – LCD – Moving Coil and Moving Iron Instrument – CRO – Logic Gates: AND, OR, NOT and Universal Gates: NAND, NOR – Flip Flop: SR, JK.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis," 8 th ed., Tata McGraw Hill publishers, New Delhi, 2013. 2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGrawHill 4th ed. 2017.
REFERENCES:
1. Gupta.J.B, "Electronic Devices and Circuits," S. K. Kataria & Sons, 2013. 2. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 2018. **3.** Nageswara Rao.T, "Circuit Theory", A.R. Publications, Chennai, 2018.

Mapping of COs with POs / PSOs

COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												1	
2	3												1	
3	3													1
4		3												1
5			1			2			2					
CO	**3**	**3**	**1**			**2**			**2**				**1**	**1**

22CSC01 - PROBLEM SOLVING AND C PROGRAMMING *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective: To equip students with the essential skills and knowledge to solve computational problems using the C programming language.					
Course Outcomes The student will be able to		**Cognitive Level**		**Weightage of COs in End Semester Examination**	
CO1	Apply basic syntax and semantics of C language to write clear and structured code.	Ap		20%	
CO2	Make use of both conditional statements and iterative control structures for developing applications.	Ap		20%	
CO3	Apply knowledge of arrays and strings to solve computational problems.	Ap		20%	
CO4	Identify modular solutions that integrate problem-solving techniques to solve complex computational problems.	An		20%	
CO5	Analyze the performance implications using pointers and to manage file operations efficiently.	An		20%	

UNIT I -PROBLEM SOLVING AND C PROGRAMMING BASICS	**(9)**
General Problem Solving: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms **Basics of C Programming**: Introduction to C - Structure of C program - Programming Rules – Compilation – Errors - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions.	
UNIT II - DECISION CONTROL STATEMENTS	**(9)**
Managing Input and Output operations, Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements.	
UNIT III - ARRAYS AND STRINGS	**(9)**
Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions.	
UNIT IV - FUNCTIONS	**(9)**
Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes.	
UNIT V - POINTERS AND FILE MANAGEMENT	**(9)**
Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS:

1. Ashok N. Kamthane, “Programming in C”, 2nd Edition, Pearson Education, 2013.
2. Sumitabha Das, “Computer Fundamentals and C Programming”, 1st Edition, McGraw Hill, 2018.

REFERENCES:

1. R. G. Dromey, “How to Solve it by Computer”, Pearson Education India; 1st Edition, ISBN10: 8131705625, ISBN-13: 978-8131705629
2. Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th Edition, India, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645
3. Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.
4. ReemaThareja., “Programming in C ”, 2nd Edition, Oxford University Press, New Delhi, 2018.
5. Balagurusamy E., "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3												3	
3	3											3	3	
4		3										3	3	
5		3											3	2
CO (W.A)	3	3										3	3	2

22ECP01- BASICS OF ELECTRONICS ENGINEERING LABORATORY *(Common to AI&DS, CSE, CSE(CS), CSE(IOT) and IT Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE-REQUISITE : NIL					
Course Objective:	• To examine the basics of Semiconductor Devices and its characteristics. • To learn and practice with measurement of Electrical circuits and Amplifiers. • To design a digital circuit using various basic logic gates.				
Course Outcomes The Student will be able to		**Cognitive Level**			
CO1	Apply working principles and operations of Semiconductor Devices and plot the characteristics.	Ap			
CO2	Apply the knowledge of network theorems and basic laws and investigate the behavior of electric circuits.	An			
CO3	Apply the concepts of Boolean Algebra and verify the output of logic gates.	E			
CO4	Analyze the characteristics of Semiconductor Devices and calculate the required parameters.	Ap			
CO5	Involve in team learning, communicate effectively and maintain record for the experiments.	Ap			

LIST OF EXPERIMENTS:

(Cycle- I)

1. Plot the V-I Characteristics of PN junction diode and also find the forward and reverse resistance
2. Plot the V-I Characteristics of Zener diode and also find the forward and reverse resistance
3. Plot the Input-Output characteristics of Common Emitter Configuration (CE) using BJT
4. Find the Characteristics of FET and also plot the drain and transfer characteristics
5. Plot the V-I Characteristics of UJT
6. Construct the Half wave Rectifier & Full wave Rectifier and plot the graph

(Cycle- II)

1. Verification Kirchoff's Voltage Law (KVL), Kirchoff's Current Law (KCL)
2. Verification of Thevenin's Theorem
3. Verification of Norton's Theorem
4. Verification logic gates

TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3													
2	3													
3	3													
4		3												
5						1			2	2				
CO (W.A)	**3**	**3**				**1**			**2**	**2**				

22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY *(Common to All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE-REQUISITE: NIL					
Course Objective: To develop programs to solve basic problems by understanding basic concepts in C language					
Course Outcomes The student will be able to		**Cognitive Level**			
CO1	Formulate the algorithms for simple problems	Ap			
CO2	Apply the concept of pointers of different types	Ap			
CO3	Apply and manipulate data with arrays, strings and structures	Ap			
CO4	Apply the concept of functions and dynamic memory allocation	Ap			
CO5	Analyse and correct logical errors encountered during execution	An			

C-Programming:

1. Draw the flowchart for the following using Raptor tool.
    a) Simple interest calculation
    b) Greatest among three numbers
    c) Find the sum of digits of a number
2. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures)
3. Programs for demonstrating repetitive control statements like 'for', 'while' and 'do-while' (Iterative structures)
4. Programs for demonstrating one-dimensional and two-dimensional numeric array
5. Programs to demonstrate modular programming concepts using functions
6. Programs to implement various character and string operations with and without built-in library functions.
7. Programs to demonstrate the use of pointers
8. Programs to illustrate the use of user-defined data types
9. Programs to implement various file management.
10. Program Using Dynamic memory allocation functions

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
Hardware: • LAN System with 33 nodes (OR) Standalone PCs – 33 Nos. • Printers – 3 Nos. **Software:** • RAPTOR Tool • Compiler – C
TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3												2	
3	3												2	
4	3												2	
5		3			2							2	3	
CO (W.A)	3	3			2							2	2.4	

22PYP01 - PHYSICS LABORATORY (Common to All Branches)				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

PRE-REQUISITE : Nil

Course Objective:	• To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory. • To introduce different experiments to test basics of physics concepts applied in optics and electronics

Course Outcomes The Student will be able to		**Cognitive Level**
CO1	Examine the effects of material type and loading conditions on the results of the non-uniform bending experiment.	An
CO2	Utilize principles of light interaction to determine the particle size of materials using laser diffraction techniques.	Ap
CO3	Evaluate the accuracy of the wavelength of different colors with the accepted values in the literature	Ev
CO4	Measure the effectiveness of the solar cell based on its V-I characteristics.	Ev
CO5	Analyze the principles underlying the Air wedge method for the determination of the thickness of a thin wire,	An

List of Experiments

1. Determination of Young 's modulus by non-uniform bending method
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of V-I characteristics of solar cell.

TOTAL (P:30) : 30 PERIODS

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Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
4	3	-	-	-	-	-	-	-	-	-	-	2	-	-
5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO (weighted average)	**3**	**3**										**2**		

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22MAN01 INDUCTION PROGRAMME
(For Common to All Branches)

L	T	P	C
-	-	-	-

PRE REQUISITE: NIL

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real-life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would

be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

REFERENCES:

1.Guide to Induction program from AICTE

22MAN03 - YOGA – I *(Common To All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**I**	**0**
PRE-REQUISITE : NIL					
Course Objective:	• To make students in understanding the importance of yoga in shaping mental and physical wellness. • To provide awareness about the significance of leading a peaceful life by following yoga exercises and principles. • To develop mental wellbeing through meditation and breathing exercises. • To strengthen the body through physical exercises. • To inculcate the knowledge about different types of Asanas and their benefits				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Understand the importance of yoga for physical and mental goodness.	U	Internal Assessment
CO2	Perform the yoga exercises for hand, leg, eye and sun salutation etc.	Ap	
CO3	Learn and practice meditation techniques for keeping good mental health	Ap	
CO4	Develop their body by performing yoga exercises.	Ap	
CO5	Demonstrate different types of yoga Asanas for improving their personal fitness.	Ap	

UNIT I – INTRODUCTION TO YOGA	**(3)**
Meaning and Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra.	
UNIT II - YOGA AND LIFE STYLE	**(3)**
Asanas as Preventive measures – Hypertension:Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana – Obesity: Procedure, Beneits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana – Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana - Diabetes: Procedure, Benefits and contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana – Asthema: Procedure, Benfits and contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	
UNIT III – MIND EXERCISES	**(3)**
Naadi sudhi – Thanduvada sudhi – Breathing meditation – Silent meditation – Relax meditation.	

UNIT IV – PHYSICAL EXERCISES (PART– I)	**(3)**
Hand Exercises – Leg Exercises – Eye Exercises – Sun Salutation.	
UNIT V – ASANAS (PART-I)	**(3)**
Asanas –Tadasana – Yegapadhasana – Chakrasana – Udkaddasana – Thirikosana – Thandasana – Paschimottanasana.	
TOTAL (L:45) : 15 PERIODS	

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TEXT BOOKS/REFERENCES:
1. Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1								3	2			3		
2								3	2			3		
3								3	2			3		
4								3	2			3		
5								3	2			3		
CO (W.A)								**3**	**2**			**3**		

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22EYA02- PROFESSIONAL COMMUNICATION- II *(Common to All Branches)*				
	L	**T**	**P**	**C**
	2	**0**	**2**	**3**

PRE-REQUISITE : 22EYA01

Course Objective:	• To enhance the students with necessary English language skills • To enable students to communicate effectively in an academic setting

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Frame sentences both in written and spoken forms with accuracy and fluency.	R	20%
CO2	Use linguistic structures to read and understand well-structured texts encountered in academic or social contexts.	U	20%
CO3	Gain essential competency to express one's thoughts orally and in writing in a meaningful way.	U	20%
CO4	Attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing.	Ap	20%
CO5	Perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation.	U	20%

UNIT I – LANGUAGE RUDIMENTS	**(6+6)**
Grammar – Active and Passive Voice – Impersonal Passive Voice – Numerical Expressions - **Listening** – Listening for Specific Information and Match / Choose / Fill in the texts - **Speaking** – Describing a Person - Making Plans -**Reading** – Intensive Reading -**Writing** – Job Application with Resume	
UNIT II - RHETORIC ENHANCERS	**(6+6)**
Grammar – Reported Speech – Infinitive and Gerund - **Listening** – Listening to Iconic Speeches and making notes - Listening news / documentaries - **Speaking** –Talking over Phone – Narrating Incidents - **Reading** – Extensive Reading (Motivational Books) - **Writing** – Recommendation	
UNIT III – TECHNICAL CORRESPONDENCE	**(6+6)**
Grammar – If Conditionals – Blended Words - **Listening** – Listening to business conversation on audio and video of Short Films, News, Biographies - **Speaking** – Synchronous communication and Asynchronous communication - Opportunities and threats in using digital platform- **Reading** - Finding key information in a given text - **Writing** –Netiquettes- Inviting Dignitaries - Accepting & Declining Invitation	
UNIT IV - CORPORATE COMMUNICATION	**(6+6)**
Grammar – Concord – Compound Words - **Listening** – Listening to Roles and Responsibilities in Corporate - Listening to technical videos - **Speaking** – Introduction to Technical Presentation - Story Telling - **Reading** – Reading and Understanding Technical Articles - **Writing** – Report Writing (Accident, Survey and feasibility)	

UNIT V - LANGUAGE BOOSTERS	(6+6)
Grammar - Idiomatic Expressions – Relative Clauses – Confusable words - **Listening** – Listening to different kinds of Interviews - Listening to Group Discussion - **Speaking** – Group Discussion - **Reading** – Reading and Interpreting Visual Materials - **Writing** – Analytical Paragraph Writing	

LIST OF SKILLS ASSESSED IN THE LABORATORY

1. Grammar.
2. Listening Skills.
3. Speaking Skills.
4. Reading Skills
5. Writing Skills

TOTAL (L:30 , P:30) = 60 PERIODS

TEXT BOOKS:

1. Sudharshana, N.P and Saveetha.C, "English for Technical Communication", Cambridge University Press, New Delhi, 2016 (Reprint 2017).

REFERENCES:

1. Rizvi, M Ashraf, "Effective Technical Communication", Second Edition, McGraw Hill Education India Pvt Ltd, 2017.
2. Rodney Huddleston, Geoffrey K. Pullum and Brett Reynolds, "A Student's Introduction to English Grammar", Second Edition, Cambridge University Press, New Delhi, 2022

WEB REFERENCE:

1. http://youtu.be/URtdGiutVew

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									2	3				
2									2	3				
3									2	3				
4									2	3				
5									2	3				
CO (W.A)									**2**	**3**				

22MYB03 – STATISTICS AND NUMERICAL METHODS *(Common to AGRI, AI&DS , CSE,IT,IOT,CS(Cyber security)CIVIL.CHEMICAL, MECH Branches)*				
	L	**T**	**P**	**C**
	3	**I**	**0**	**4**
PRE-REQUISITE: NIL				
Course Objective:	• To understand the concept of testing of hypothesis for small and large samples and design of experiments. • To provide adequate knowledge in numerical techniques to solving ordinary differential equations and numerical integration which plays an important role in engineering and technology disciplines.			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Interpret the principles and techniques in experimental design to solve the variance	Ap	20%
CO2	Apply the fundamental numerical techniques used to solve various types of mathematical problems on solution of equations, interpolation and numerical integration.	Ap	40%
CO3	Determine the statistics based on the data and related to the testing of hypothesis.	An	20%
CO4	Solve the real-world problems using numerical methods for IVPs, demonstrating their applicability and limitations.	Ap	20%
CO5	Demonstrate the importance of interpolation and approximation techniques to solve real-world problems in various disciplines of Engineering using modern tools.	Ap	Internal Assessment

UNIT I - TESTING OF HYPOTHESIS	**(9+3)**
Sampling Distributions-Tests for single mean, difference of means (Large and Small samples) Using z, t - distribution, F – distribution- Chi-square - Test for independence of attributes and Goodness of fit.	
UNIT II - DESIGN OF EXPERIMENTS	**(9+3)**
Analysis of variance- Completely randomized design - Randomized block design - Latin square design.	
UNIT III - SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	**(9+3)**
Solution of algebraic and transcendental equations - Fixed point iteration method - Newton Raphson method- Solution of linear system of equations Gauss elimination method – Iterative methods of Gauss Jacobi and Gauss Seidel Methods – Eigen values of a matrix by Power method.	
UNIT IV - INTERPOLATION AND APPROXIMATION	**(9+3)**
Lagrange's and Newton's divided difference interpolations - Newton's forward and backward difference interpolation - Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules - Romberg's Methods.	

UNITV - NUMERICAL DIFFERENTIATION AND INTEGRATION	(9+3)
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3													
3		2											3	
4	3													
5	3				2				3			2	3	
CO (W.A)	3	2			2				3			2	3	

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22ITC01 –DATA STRUCTURES USING C (*Common to 22AIC01, 22CSC02, 22CCC01, 22CIC01)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: 22CSC01					
Course Objective:	● To develop skills to apply appropriate data structures in problem solving. ● To apply abstract data types (ADTs), recursion, algorithms for searching and sorting, and basic algorithm analysis.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply pointer and array concepts in functions.	Ap	20%
CO2	Solve problems using various implementations of linked list.	Ap	20%
CO3	Make use of ADTs like stack and queue for solving real world problems	Ap	20%
CO4	Analyze the tree traversal algorithms for various non-linear data structures.	An	20%
CO5	Analyze appropriate graph algorithms for computing problems	An	20%

UNIT I - POINTERS USING ARRAYS AND STRINGS	**(9)**
Pointers : Introduction – Pointers and arrays– passing an array to a function– returning an array from function – NULL pointers –Array of pointers – Pointer-to-pointer – Dangling Pointer. Function pointers: calling a function using function pointer- Using pointer as a function argument	
UNIT II - LIST	**(9)**
Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT	
UNIT III - STACKS AND QUEUES	**(9)**
Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressionsInfix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues	
UNIT IV - TREE	**(9)**
Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap.	

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UNIT V - GRAPHS	(9)
Definitions – Representation of Graphs – Types of Graph – Graph Traversal: Depth-First Search (DFS) – Breadth-First Search (BFS) – Topological Sort – Applications of DFS: Bi-connectivity – Euler Circuits – Finding Strongly Connected Components – Applications of BFS: Bipartite Graph.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Sumitabha Das, "Computer Fundamentals &C Programming", McGraw Hill Education (India) Private Limited, 1st Edition, 2018.
2. Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.

REFERENCES:

1. Yashavant Kanetkar, "Pointers in C", BPP Publications, 4th Edition, 2017.
2. PradipDey, Manas Ghosh, "Programming in C", Oxford Higher Education, 2nd Edition, 2016.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3											3	3	
2	3											3	3	
3	3											3	3	
4		3										3	3	3
5		3										3	3	3
CO (W.A)	3	3										3	3	3

*Ratified by Eleventh Academic Council

22ITC02- PYTHON PROGRAMMING *(Common to 22AIC02, 22CSC03, 22CCC02, 22CIC02)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: NIL

Course Objective:	• To develop the logical thinking abilities and to propose novel solutions for real world problems through programming language constructs.

Course Outcomes		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the knowledge of syntax and semantics of the Python programming to develop different applications	Ap	20%
CO2	Apply control statements and operators to solve basic programming problems	Ap	20%
CO3	Make use of string,list, dictionaries, tuples, and sets data structures for developing applications	Ap	20%
CO4	Develop modular code using functions and manage file operations efficiently	C	20%
CO5	Perform data manipulation with NumPy arrays	C	20%

UNIT I - INTRODUCTION TO PYTHON	**(9)**
Introduction to python: Features - Execution of python program – Flavors of Python – Comments - Data Types: Built-in data types– Sequences – Set - Literals– Operators – Input and Output Statements - Control Statements if – if-else –if-else-if – while-For –Nested loops – the else suite - Break – Continue - pass - assert – return.	
UNIT II - STRINGS	**(9)**
Arrays: One Dimensional arrays - Multi Dimensional arrays - Strings and Characters: Creating - Length - Indexing - Slicing - Repeating - Concatenation - Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing - Splitting and Joining Strings - Changing Case - Checking Starting and Ending of a String – String Formatting - Working with Characters – Sorting - Searching Strings - Finding Number- Inserting sub string into a string.	

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UNIT III - LISTS , TUPLES AND DICTIONARIES	(9)
Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a tuples. Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas - Converting Lists and Strings into Dictionary - Passing Dictionaries to Functions - Ordered Dictionaries.	
UNIT IV - FUNCTIONS AND FILES	**(9)**
Functions: Defining – Calling – Returning - Pass by Object Reference – Formal, Actual, Positional, Keyword, Default & Variable Length Arguments - Local and Global Variables - Recursive Functions - Lambdas - Function Decorators. Files - Types of Files - Opening & Closing a File - Working with Text Files Containing Strings - Working with Binary Files - The with Statement - The seek() and tell() Methods - Random Accessing of Binary Files - Random Accessing of Binary Files using mmap - Zipping and Unzipping Files - Working with Directories.	
UNIT V - MODULES AND FRAMEWORKS	**(9)**
Modules: Importing module –Features – Built in functions. - Python Environment and Frameworks: NumPy: NumPy Arrays – Computation on NumPy Arrays – Aggregation – Sorting Arrays – Structured Arrays.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 2021 Edition.
2. Jake Vander Plas, "Python Data Science Handbook Essential Tools for Working with Data", 1st Edition O'Reilly Publishers, 2016.

REFERENCES:

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2018.
2. Wesley J. Chun, "Core Python Programming", Pearson Education, 2013.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3											3	
2	3	3											3	
3	3	3	3										3	3
4			3		3								3	3
5			3		3								3	3
CO (W.A)	**3**	**3**	**3**		**3**								**3**	**3**

*Ratified by Eleventh Academic Council

22ITC03- DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION *(Common to 22AIC03, 22CSC04, 22CCC03,22CIC03)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To make students familiar with the Principles and the Implementation of Computer Arithmetic, Memory System and I/O organization				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the fundamentals of computer systems and analyze the execution of instruction.	Ap	20%
CO2	Analyze and design sequential and combinational logic circuits.	An	40%
CO3	Summarize the different types of control design and identify hazards.	Ap	20%
CO4	Use memory mapping techniques, interconnection standards and identifies different ways of communication with I/O devices and interfaces.	An	20%
CO5	Make an effective oral presentation on concepts related to computer organization and design.	An	Internal Assessment

UNIT I - COMBINATIONAL LOGIC	**(9)**
Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder –Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexer and Demultiplexers.	
UNIT II - SYNCHRONOUS SEQUENTIAL LOGIC	**(9)**
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis of clocked sequential circuits – Shift Registers – Counters – Mod Counter –Up/Down Counter.	
UNIT III - COMPUTER FUNDAMENTALS	**(9)**
Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Design of Fast Address – Multiplication of Positive Numbers – Signed Operand Multiplication – Fast multiplication.	
UNIT IV - PROCESSOR	**(9)**
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards.	

UNIT V - MEMORY AND I/O DEVICES	(9)
Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping Techniques – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.	
TOTAL (L:45): 45 PERIODS	

*Ratified by Eleventh Academic Council

TEXT BOOKS:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

REFERENCES:

1. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3											3	
2		3	3										3	
3				3										3
4					3								3	
5										3				
CO (W.A)	**3**	**3**	**3**	**3**	**3**					**3**			**3**	**3**

*Ratified by Eleventh Academic Council

22ITP01 –DATA STRUCTURES LABORATORY *(Common to 22AIC01, 22CSC02, 22CCC01, 22CIC01)*				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**
PRE-REQUISITE : 22CSP01				
Course Objective:	• To understand the fundamental concepts of data structures, including arrays, linked lists, stacks, queues, trees, and graphs.			

Course Outcomes The students will be able to		**Cognitive Level**
CO1	Applying pointers and implement array operations	Ap
CO2	Analyze different steps on linked lists.	An
CO3	Capable of working with stack and queue principles.	An
CO4	Cable to creating and modifying a variety of tree operations.	C
CO5	Possible for executing numerous graph functions	Ap

LIST OF EXPERIMENTS:

1. Pointer using 1D, 2D array
2. Implementation of singly linked list and its operations
3. Implementation of doubly linked list and its operations
4. Implementation of circular linked list and its operations
5. Implementation of Infix to postfix conversion using stack ADT
6. Implement the application for evaluating postfix expressions using array of stack ADT
7. Implementation of reversing a queue using stack
8. Binary Search Tree
9. AVL Tree
10. Priority Queues (Heaps)
11. Implementation of Graph Traversals(BFS, DFS)

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.

Software:

Compiler – C

TOTAL (P:60) : 60 PERIODS

*Ratified by Eleventh Academic Council

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3									3		3
2	3	3		3										3
3			3										3	
4		3		3			3					3		
5			3	3					3			3	3	
CO (W.A)	3	3	3	3			3		3			3	3	3

*Ratified by Eleventh Academic Council

22ITP02 - PYTHON PROGRAMMING LABORATORY *(Common to 22AIP02, 22CSP03, 22CCP02, 22CIP02, and 22ITP02)*				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

PRE-REQUISITE : NIL

Course Objective:	Gain proficiency in Python programming by applying fundamental concepts and techniques in practical exercises.

	Course Outcomes	**Cognitive Level**
CO1	Apply the knowledge of python programming concepts to solve basic computational problems.	AP
CO2	Implement functions and file handling problems using python.	AP
CO3	Develop GUI applications using python framework.	C
CO4	Perform data manipulation using NumPy	AP
CO5	Design a python program for given requirement.	C

List of Exercises:

1. Programs for demonstrating the use of different types of operators.
2. Programs for demonstrating control statements.
3. Programs to implement various string operations.
4. Programs for demonstrating the following
   i. Lists
   ii. Tuples
   iii. Dictionaries
5. Programs to demonstrate concepts using functions
6. Programs to implement applications using File handling
7. Programs to demonstrate modules.
8. Programs to implement applications using regular expression.
9. Program to demonstrate GUI.
10. Perform data manipulation using NumPy.

TOTAL (P:60) = 60 PERIODS

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 30 nodes (OR) Standalone PCs – 30 Nos,

Software:

OS – Windows / UNIX Clone

Open Source Software – Python

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3												
3			3		3									
4					3									
5			3											3
CO (W.A)	3	3	3		3									3

22MEP01 - ENGINEERING GRAPHICS LABORATORY

(Common to AI & DS, BME, CSE, CSE (IoT), CSE (CS), ECE and IT Branches)

L	T	P	C
0	0	4	2

PRE-REQUISITE: NIL

Course Objective:	• To construct various plane curves drawing by Modeling software with dimensions • To construct the concept of first angle projection of points, lines and plane drawing by Modeling software with dimensions • To develop the projection of solids drawing by Modeling software with dimensions • To solve problems in sectioning of solids and developing the surfaces drawing by Modeling software with dimension. • To apply the concepts of orthographic and isometric drawing by Modeling software with dimensions

Course Outcomes The student will be able to		**Cognitive Level**
CO1	Apply the concept of Drawing standards in AutoCAD software,	Ap
CO2	Apply the drawing tools in AutoCAD software to create 2D drawing	Ap
CO3	Apply the drawing tools in AutoCAD software to draw the projections of solids	Ap
CO4	Apply the drawing tools in AutoCAD software to draw the Section and Development of surface	Ap
CO5	Apply the drawing tools in AutoCAD software to create 3D drawing	Ap

LIST OF EXPERIMENTS

1. Study of basic tools, commands and coordinate systems (absolute, relative, polar, etc.) used in 2D software.
2. Draw the conic curves and special curves by using drafting software.
3. Draw the front view, top view, side view of objects from the given isometric view.
4. Draw the projections of straight line inclined to both the principal planes.
5. Draw the projections of polygonal surface.
6. Draw the projections of prism, pyramid inclined to anyone of the principal plane.
7. Draw the sectional view and the true shape of the given cylinder and cone.
8. Draw the development of surfaces like prism and pyramid.
9. Draw the isometric projections of cylinder and cone.
10. Draw the isometric projections of Prism and Pyramid.

TOTAL (P:60) = 60 PERIODS

REFERENCES:

1. K.Venugopal and V.Prabhu Raja,―Engineering Graphics‖, New Age International (P) Limited,2022

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3			3										
2	3			3										1
3	3			3										
4	3			3									1	
5	3			3										
CO (W.A)	**3**			**3**									**1**	**1**

22MAN02R - SOFT/ANALYTICAL SKILLS – I (Common to All Branches)					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PREREQUISITE : Nil					
Course Objective:	• To analyze wide range of texts, understand and express interpretations • To learn various methods for faster numerical computations and to develop logical reasoning skills				

	Course Outcomes The Student will be able to	**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Respond to diverse texts, enhancing their comprehensive and expressive capabilities.	U	40%
CO2	Apply various techniques for quicker calculations.	Ap	30%
CO3	Solve mathematical problems by applying logical thinking.	An	30%

UNIT I – VERBAL ABILITY	**(5+10)**
Grammar- Synonyms - Antonyms - Articles - Preposition - **Listening -** IELTS Listening (Beginners) **- Speaking -** Presentation - JAM **- Reading -** Reading Comprehension **- Writing -** E-mail writing.	
UNIT II – APTITUDE	**(5+10)**
Square Root - Squaring of Numbers - Cube root -Cube of Numbers - Number Systems - L.C.M & H.C.F - Simplification - Problems on Numbers - Calendars - Clocks.	
UNIT III - REASONING	**(5+10)**
Odd Man Out & Number Series - Letter Series - Coding and Decoding - Analogy - Mirror and Water Images.	
TOTAL(L:45) = 45 PERIODS	

REFERENCES:

1. Rizvi, M.Ashraf. *Effective Technical Communication.* Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. *Quantitative* Aptitude for Competitive Examinations. S.Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. *How to Prepare for Quantitative Aptitude for the CAT*. Tata McGraw – Hill Publishing, 2022.
4. Praveen R V. *Quantitative Aptitude and Reasoning.* PHI Learning Pvt. Ltd., 2016. .

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1									2	3				
2		2		2										
3		2		2										
CO (W.A)		**2**		**2**					**2**	**3**				

22MAN05 - YOGA – II (*Common To All Branches*)				
	L	**T**	**P**	**C**
	0	**0**	**I**	**0**
PRE-REQUISITE: NIL				

Course Objective:	• To strengthen the body through physical exercises. • To understand the importance of value system and ethics. • To know the life philosophy of yogis and maharishis. • To understand the nature laws, cause and effect theory. • To inculcate knowledge about different types of Asanas and their benefits.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Perform physical exercises like spine exercises, massage and acupressure.	Ap	Internal Assessment
CO2	Learn the human values, ethics, time management and the importance of introspection.	U	
CO3	Analyze various life philosophies of yogi's and rishi's.	An	
CO4	Understand life lessons and nature laws.	U	
CO5	Demonstrate different types of yoga Asanas and improve their personal fitness.	Ap	

UNIT I – PHYSICAL EXCERCISES (PART-II)	(3)
Breathing Exercises – Kapalapathi – Maharasanam (Spine Exerices) – Massage and Acupressure.	
UNIT II – HUMAN VALUE	(3)
Divine power – Life force (Bio magnetism) – Importance of Introspection – Time management – Punctuality – self confidence – mind control.	
UNIT III – PHILOSOPHY OF LIFE	(3)
Basic needs for life – Hunger and thirst – climatic/weather changes – Body wastes – pressure of excretory organs – safety measures – protection from natural disaster – protection from enmity – protection from accidents – ethics – morality – duty – charity – Wisdom of perfection stages – faith – understanding – realization.	
UNIT IV – NATURE'S LAW OF CAUSE AND EFFECT	(3)
Food transformation into seven minerals – Natural actions – pattern – precision – regularity – Required skills – planned work – awareness – introspection.	
UNIT V – ASANAS (PART-II)	(3)
Ustrasana – Vakrasana –Komugasana – Padmasana – Vajrasana – Sukhasana – Yogamudra – mahamudra.	
TOTAL (P:15) : 15 PERIODS	

*Ratified by Eleventh Academic Council

TEXT BOOKS/REFERENCES:
Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1								3	2			3		
2								3	2			3		
3								3	2			3		
4								3	2			3		
5								3	2			3		
CO (W.A)								3	2			3		

*Ratified by Eleventh Academic Council

22GYA01 HERITAGE OF TAMILS *(For Common To All Branches)*				
	L	**T**	**P**	**C**
	I	**0**	**0**	**I**
PRE REQUISITE : NIL				

UNIT I - LANGUAGE AND LITERATURE	**(3)**
Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	**(3)**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	
UNIT III - FOLK AND MARTIAL ARTS	**(3)**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	
UNIT IV - THINAI CONCEPT OF TAMILS	**(3)**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	**(3)**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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

22GYA01 தமிழர் மரபு (அனைத்து பாடப்பிரிவினருக்கும்)				
	L	T	P	C
	1	0	0	1
முன் தேவை: இல்லை				

அலகு 1 மொழி மற்றும் இலக்கியம்	(3)
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை– சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	
அலகு 2 மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை:	**(3)**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்– தேர் செய்யும் கலை– சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	
அலகு 3 நாட்டுப்பறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:	**(3)**
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டாம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	
அலகு 4 தமிழர்களின் திணைக் கோட்பாடுகள்:	**(3)**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளின் சோழர்களின் வெற்றி.	
அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:	**(3)**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் –இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ் புத்தக்களின் அச்சு வரலாறு.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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

22GYA02 TAMILS AND TECHNOLOGY *(For Common To All Branches)*				
	L	**T**	**P**	**C**
	I	**0**	**0**	**I**
PRE REQUISITE : NIL				

UNIT I - WEAVING AND CERAMIC TECHNOLOGY	**(3)**
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	
UNIT II - DESIGN AND CONSTRUCTION TECHNOLOGY	**(3)**
Designing and Structural construction House & Designs n household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	
UNIT III - MANUFACTURING TECHNOLOGY	**(3)**
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.	
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY	**(3)**
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	
UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING	**(3)**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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

22GYA02 தமிழரும் தொழில்நுட்பமும் (அனைத்து பாடப்பிரிவினருக்கும்)				
	L	T	P	C
	1	0	0	1
முன் தேவை: இல்லை				

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	(3)
சங்ககாலத்தில் நெசவுத்தொழில் – பானைத் தொழிலநுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.	
அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:	**(3)**
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ–சாரோசெனிக் கட்டிடக் கலை.	
அலகு 3 உற்பத்தி தொழில் நுட்பம்:	**(3)**
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எக்கு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	
அலகு 4 வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்:	**(3)**
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.	
அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:	**(3)**
அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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

22MYB05 – DISCRETE MATHEMATICS *(Common to CSE,IT,AI&DS,IOT,CS(Cyber security))*				
	L	**T**	**P**	**C**
	3	**I**	**0**	**4**
PRE-REQUISITE: NIL				
Course Objective:	• To understand the basic concepts of logic, properties of set theory and their applications in Algorithms. • To understand the ideas about Lattices and general counting methods involving permutations and combinations.			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concept of logic to solve the problems in Artificial Intelligence.	Ap	20%
CO2	Calculate the applications of predicate logic used in data science.	An	20%
CO3	Solve different properties of injection, surjection, bijection, composition and inverse functions in software engineering.	Ap	20%
CO4	Determine the concepts of lattices, Permutations, Combinations and Mathematical induction in the experience of network theory and analysis of algorithms.	An	40%
CO5	Demonstrate the importance of lattice theory using the modern tools and solve the real time problems in various contexts.	Ap	Internal Assessment

UNIT I - PROPOSITIONAL CALCULUS	**(9+3)**
Propositions-Logical connectives-Compound propositions-Conditional and biconditional propositions-Truth tables-Tautologies and Contradictions-Logical Equivalences and implications – De morgan's Laws-Normal forms-Rules of inference-Arguments-Validity of arguments.	
UNIT II - PREDICATE CALCULUS	**(9+3)**
Predicates-Statement Function-Variables-free and bound variables-Quantifiers-Universe of discourse-Logical equivalences and implications for quantified statements-Theory of inference-The rules of universal specification and generalization-Validity of arguments.	
UNIT III - SET THEORY AND FUNCTIONS	**(9+3)**
Set Operations-Properties-Power set-Relations-Graph and matrix of a relation-Partial Ordering-Equivalence relation-Functions-Types of functions-Composition of relation and functions-Inverse functions.	
UNIT IV COMBINATORICS	**(9+3)**
Basics of counting - Counting arguments - Pigeonhole Principle - Permutations and Combinations- Recursion and recurrence relations - Generating Functions - Mathematical Induction – Inclusion and Exclusion.	
UNIT V - LATTICES	**(9+3)**
Posets-Lattices as posets-Properties of lattices-Lattices as Algebraic systems – Sub lattices - Direct product and Homomorphism.	
TOTAL (L:45+L:15) : 60 PERIODS	

TEXT BOOKS:

1. Tremblay J.P and Manohar R, Discrete Mathematical Structures with Applications to Computer Science‖, Tata McGraw-Hill, New Delhi, Reprint 2010.
2. Veerarajan.T, —Discrete Mathematics with Graph Theory and Combinatorics, 4th ed., Tata McGraw Hill, New Delhi, 2008.
3. Kenneth H.Rosen, —Discrete Mathematics and its Applications‖, 5th ed., Tata McGraw- Hill publications, New Delhi 2007.

REFERENCES:

1. Venkatraman M.K.,Discrete Mathematics, the National Publishing Company, Chennai, 2007.
2. S.Santha, Discrete Mathematics with Combinatorics and Graph Theory, 2010 Cengag Learning India Pvt. Ltd.
3. Swapan Kumar Sarkar,A Text Book of Discrete Mathematics,S. Chand & Company Ltd., New Delhi.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		2												
3	3													
4		2												
5	3				2				3			2	3	
CO (W.A)	3	2			2				3			2	3	

22ITC04 - **ALGORITHMS** ***(Common to 22AIC06, 22CCC04,22CIC04 and 22CSC05)***					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: 22CSC02					
Course Objective:	To develop problem-solving skills through algorithms and prepare students to apply the skills in various domains such as software development, research, and engineering.				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the time and space complexities of algorithms using asymptotic notations	An	20%
CO2	Apply algorithmic concepts and techniques to design and develop efficient solutions for real-world problems	Ap	40%
CO3	Apply the knowledge of complexity classes P, NP and NP-Completeness problem	An	20%
CO4	Design efficient algorithms to solve graph problems	Ap	20%
CO5	Optimized the existing algorithms by reducing the lines of code	An	Internal mode

UNIT I - INTRODUCTION	**(9)**
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.	
UNIT II - BRUTE FORCE AND DIVIDE-AND-CONQUER	**(9)**
Brute Force – Computing an – String Matching - Selection Sort and Bubble Sort – Sequential Search - Closest-Pair and Convex-Hull Problems - Exhaustive Search: Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort –Closest-Pair and Convex - Hull Problems.	
UNIT III - DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	**(9)**
Dynamic Programming: Computing a Binomial coefficient – Warshall's and Floyd's Algorithm – Optimal Binary Search trees - 0/1 Knapsack Problem. Greedy Technique: Prim's algorithm and Kruskal's Algorithm - Huffman Trees.	

UNIT IV - ITERATIVE IMPROVEMENT AND LIMITATIONS OF ALGORITHM POWER	(9)
Iterative Improvement - The Simplex Method - The Maximum-Flow Problem- Maximum Matching in Bipartite Graphs. Limitations of Algorithm Power: Lower bound arguments – Decision trees – P, NP and NP complete Problems.	
UNIT V - STATE SPACE SEARCH ALGORITHMS	**(9)**
Backtracking: N Queen's problem – Hamiltonian Circuit problem – Subset problem - Graph coloring problem. Branch and Bound: Solving 15-Puzzle problem - Assignment problem – Knapsack Problem – Travelling Salesman Problem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 3rd ed.., 2017.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.
2. S. Sridhar, "Design and Analysis of Algorithms ", Oxford university press, 2014.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											3	3
2	3												3	
3		3											3	
4	3												3	
5			3	3					3				3	3
CO (W.A)	**3**	**3**	**3**	**3**					**3**				**3**	**3**

22ITC05- OPERATING SYSTEMS (Common to *22AIC08, 22CSC08, 22CIC07)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE-REQUISITE: NIL				
Course Objective:	• To provide understanding about the fundamental concepts, design principles, and functionalities of operating systems.			

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the different concepts and functionalities of operating system	Ap	20%
CO2	Analyze the efficient scheduling algorithms in process management	An	30%
CO3	Develop solutions using the paging and virtual memory management strategies	Ap	40%
CO4	Manage concurrent access to shared resources in operating systems	An	10%
CO5	Collaborate and compare the various file system structures	An	Internal Assessment

UNIT I - FUNDAMENTALS	**(9)**
Introduction - System Architecture - Operating System Structure - Operations - Process Management - Memory Management - Storage Management - System Structure - User Operating System Interface - System Calls - Types - System Programs - Operating System Design and Implementation - Virtual machines.	
UNIT II - PROCESS MANAGEMENT	**(9)**
Process Concept - Process Scheduling - Operations on Processes- Inter Process Communication - Shared Memory and Message Passing Systems - CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Threads Overview - Thread Scheduling.	
UNIT III - PROCESS SYNCHRONIZATION	**(9)**
Synchronization: The Critical-Section Problem - Peterson's solution - Hardware support for Synchronization - Mutex – Semaphores - Deadlocks: Deadlock Characterization - Methods for handling deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.	
UNIT IV - MEMORY MANAGEMENT	**(9)**
Main Memory - Swapping - Contiguous Memory Allocation - Paging - Segmentation - Virtual Memory - Demand Paging - Copy on Write - Page Replacement - Allocation of Frames - Thrashing,	

UNIT V - SECONDARY STORAGE MANAGEMENT	(9)
Secondary Storage Structure - Disk Structure - Disk Attachment - Disk Scheduling - Disk Management - Swap Space Management - File System - File Concepts: Access Methods - Directory Structure - File System Mounting - File System Implementation - Structure – Implementation - Directory Implementation - Allocation Methods - Free Space Management - I/O Systems - I/O Hardware - Application I/O Interface - Kernel I/O Subsystem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

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

REFERENCES:

1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
2. Andrew S. Tanenbaum, "Modern Operating Systems", 4th Edition, Prentice Hall of India Pvt., 2016.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) / Programme Specific Outcomes (PSOs)

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3												
3			2										2	
4				3	2									3
5								2	2					
CO (W.A)	**3**	**3**	**2**	**3**	**2**			**2**	**2**				**2**	**3**

22ITC06 - JAVA PROGRAMMING *(Common to 22AIC04 ,22CSC07, 22CCC06 and 22CIC06)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: Nil

Course Objective:	• To understand object-oriented programming concepts, and apply them in solving problems. • To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concepts of classes and objects to solve simple problems using Java	Ap	20%
CO2	Analyse how oops concepts like inheritance, polymorphism improves code organization and enhances flexibility.	An	20%
CO3	Build interactive applications using applets and swing	An	20%
CO4	Conduct practical experiments for demonstrating exception handling, multithreaded applications with synchronization.	An	40%
CO5	Build the Java Project for engineering applications and make an individual study being member of team.	An	Internal Assessment

UNIT I - INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	(9)
Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Strings, Packages - JavaDoc comments.	
UNIT II - INHERITANCE AND INTERFACES	(9)
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods-Keywords: Static-final-this- final methods and classes – Method overloading-Method overriding-Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces	

UNIT III - EXCEPTION HANDLING AND I/O	(9)
Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing File	
UNIT – IV –THREADS	(9)
Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads — Thread Priorities – Synchronization – Inter thread Communication – Suspending, Resuming, and Stopping Threads – Using Multithreading.	
UNIT – V EVENT DRIVEN PROGRAMMING	(9)
Graphics programming - Frame – Components Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019 for Units I, II, III, IV.
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015 for Unit V.

REFERENCES:

1. Cay. S. Horstmann, Gary Cornell, "Core Java-JAVA Fundamentals", Prentice Hall, 10th ed., 2016.
2. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.3. SCJP Sun Certified Programmer for Java 6 Study Guide. 6th edition, McGrawHill.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	3
2		3												3
3			3		3								3	
4				3										
5					3				3		2	3		3
CO (W.A)	3	3	3	3	3				3		2	3	3	3

22ITC07 COMPUTER NETWORKS *(Common to 22AIC12, 22CSC06, 22CCC05 and 22CIC09)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	Develop expertise in networking fundamentals, protocols, security mechanisms, and network management for effective operational efficiency.				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the fundamental concepts of communication in networking technologies.	Ap	30%
CO2	Analyze network performance metrics and optimize network configurations.	An	20%
CO3	Develop solutions for network routing algorithms and traffic management strategies.	Ap	30%
CO4	Manage network security protocols and evaluate their effectiveness in protecting network resources.	An	20%
CO5	Collaborate to design and deploy network infrastructures and services	C	Internal Assessment

UNIT I - INTERNET AND DATA COMMUNICATIONS	**(9)**
Internet – Network Edge – Network of Networks – Data communication Components – Data representation and Data flow –Networks – Protocols and Standards – OSI model – TCP/IP protocol suite – Physical Layer: Multiplexing – Transmission Media.	
UNIT II - DATA LINK LAYER	**(9)**
Framing – Error Control: Introduction – Block coding – Linear block codes – Cyclic codes – Checksum – Media Access Control: Random Access – CSMA/CD, CDMA/CA – Controlled Access – Wired LANs – Wireless LANs.	
UNIT III - NETWORK LAYER	**(9)**
IPV4 – IPV6 – ICMP – Transition from IPV4 to IPV6 – Routing Algorithm: Distance-Vector Routing, Link-State Routing, Path-Vector Routing – Unicast Routing protocols – Multicast Routing protocols.	
UNIT IV - TRANSPORT LAYER	**(9)**
Process to Process Communication – User Datagram Protocol – Transmission Control Protocol – SCTP – Congestion Control – Quality of Service.	
UNIT V - APPLICATION LAYER	**(9)**
Domain Name System – Standard Application: WWW and HTTP, FTP, Electronic Mail, TELNET – Firewalls – Network Management System – SNMP.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Behrouz A. Forouzan, "Data communication and Networking with TCP/IP Protocol Suite", 6th Edition, McGraw–Hill, 2022

REFERENCES:

1. William Stallings, "Data and Computer Communication", 8th Edition, Pearson Education, 2017.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson Education, 2020.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3										3	
4		3	3							3				3
5					3			3				3		3
CO (W.A)	**3**	**3**	**3**		3			**3**		**3**		**3**	3	**3**

22ITC08 DESIGN THINKING *(Common to 22CIX41)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To expose the student with state-of-the-art perspectives, ideas, concepts, and solutions related to the design and execution of projects using design thinking principles				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply design thinking and its different phases for business process.	Ap	20%
CO2	Empathize with user situations and be able to define clear problem statement	An	20%
CO3	Create prototypes for clear understanding of the problem statement and Use the different ideation methods.	Ap	20%
CO4	Implement Plan through engage and evolve phase that will deliver/achieve the Big Idea/solution deduced from earlier phases	An	40%
CO5	Conceive, organize, lead and implement projects in interdisciplinary domain and address social concerns with innovative approaches	C	Internal Assessment

UNIT I – Introduction to design thinking	(9)
Introduction – Need for design thinking – Design and Business – The Design Process — Phases in design thinking process – Five stage mode- Design Brief –Visualization – Four Questions, Ten Tools – Explore – STEEP Analysis – Strategic Priorities – Activity System – Stakeholder Mapping – Opportunity Framing.	
UNIT II - Empathize phase	(9)
Visualization – Mind Mapping – Empathize – Empathize with the users - Steps in empathize phase – Developing empathy towards people –Observations – Need Finding – User Personas.	
UNIT-III Ideate phase and Prototype phase	(9)
What is ideation – Need for ideation – Uses of ideation – Ideation Methods- Brainstorming-Rules for brainstorming -Ideation games - Six Thinking Hats –Doodling – Use of doodling in expressing creative ideas- Idea refinement. Prototyping- Guidelines for prototyping –Types of prototyping- Importance of prototyping in design thinking.	
UNIT IV – Engage phase	(9)
Assumption Testing-Rapid Prototyping – Engage – Story telling – Characteristics of good stories – Reaching users through stories-Storyboarding-Characteristics of good stories-Value proposition- Guidelines to write value proposition	
UNIT V – Evolve phase	(9)
Customer Co-Creation Learning Launch – Leading Growth and Innovation – Evolve– Concept Synthesis – Strategic Requirements – Evolved Activity Systems– Quick Wins Agile Methodology – Complementing agile with design thinking	
TOTAL= 45 PERIODS	

TEXT BOOKS:
1. Lee Chong Hwa "Design Thinking The Guidebook", Design Thinking Master Trainers of Bhutan, 1st Edition, 2017 2. Eli Woolery, Design Thinking Handbook, Invision, 2019 3. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires, 1stEdition, HarperCollins, 2009
REFERENCE:
1. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Growth FieldBook: A Step-by-Step Project Guide", Columbia University Press, 2014

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) / Programme Specific Outcomes (PSOs)

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3												3	
2		3											3	
3			3		3								3	
4				3										2
5					3	3					2	2		2
CO (W.A)	**3**	**3**	**3**	**3**	**3**	**3**					**2**	**2**	**3**	**2**

22ITP03 ALGORITHMS LABORATORY *(Common to 22AIP05, 22CSP04, 22CCP03 and 22CIP03)*				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

PRE-REQUISITE: NIL

Course Objective:	To learn and apply important algorithmic design paradigms and methods of analysis.

Course Outcomes The students will be able to		**Cognitive Level**
CO1	Implement basic algorithms such as brute force, string matching, sorting, and sequential search.	Ap
CO2	Apply algorithmic thinking to break down problems into manageable steps.	Ap
CO3	Apply dynamic programming techniques to solve complex computational problems.	Ap
CO4	Apply the greedy approach used in algorithm for finding minimum spanning trees in weighted undirected graphs.	Ap
CO5	Implement backtracking algorithms to solve a variety of combinatorial problems efficiently.	Ap

LIST OF EXPERIMENTS:

1. Given a text txt [0...n-1] and a pattern pat [0...m-1], write a function search (char pat [ ], char txt [ ]) that prints all occurrences of pat [ ] in txt [ ]. You may assume that n > m.
2. Sort a given set of elements using the Insertion sort, Selection sort and Bubble sort
3. Implementation of Linear Search.
4. Implementation of Recursive Binary Search
5. Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
6. Develop a program to sort the numbers using Merge and Quick sort .
7. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
8. Compute the transitive closure of a given directed graph using Warshall's algorithm.
9. Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
10. Implement N Queens problem using Backtracking.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:
LAN System with 30 nodes (OR) Standalone PCs – 30 Nos,.
Software:
C/C++/JAVA/ Python

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3										3	
2	3		3											
3	3		3				3							
4	3		3			3	3							
5	3		3											
CO (W.A)	**3**		**3**			**3**	**3**						**3**	

22ITP04 JAVA PROGRAMMING LABORATORY *(Common to 22AIP03, 22CSP06, 22CCP05 and 22CIP05)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: Nil

Course Objective:	To learn Java Programming concepts and develop applications based on Java.

	Course Outcomes The Student will be able to	**Cognitive Level**
CO1	Apply the concepts of Java to solve problems	Ap
CO2	Analyse the efficiency of using appropriate programming constructs.	An
CO3	Demonstrate the usage of different programming structures through example programs	Ap
CO4	Develop simple applications using swing.	C
CO5	Engage in independent study and learn to use Java for real time applications.	An

LIST OF EXPERIMENTS:

1. Write simple Java programs using operators, arrays and control statement
2. Programs using Static, final and this keywords.
3. Demonstrate the concepts of inheritance
4. Programs illustrating overloading and overriding methods in Java
5. Programs to use packages and Interfaces in Java.
6. Implement exception handling and creation of user defined exception.
7. Implement program to demonstrate multithreading and inter thread communication.
8. Write a program to perform file operations.
9. Develop applications using swing layouts

HARDWARE OR SOFTWARE REQUIREMENT:

HARDWARE:

1. LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
2. Printers – 3 Nos.

SOFTWARE:

1. Java / Equivalent Compiler

TOTAL L:60 PERIODS

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) / Programme Specific Outcomes (PSOs)

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3												3	
2		3											3	
3		3			2									3
4			3		3								3	
5									3			3		
CO (W.A)	**3**	**3**	**3**		**3**				**3**			**3**	**3**	**3**

22ITP05 - COMPUTER NETWORKS LABORATORY *(Common to 22CCP04, 22CIP06 and 22CSP05)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE-REQUISITE: NIL					
Course Objective: Acquire expertise in network infrastructure through tasks such as cable crimping, LAN setup, TCP/IP configuration, socket communication, protocol simulations, and network topology design.					
Course Outcomes The students will be able to					**Cognitive Level**
CO1	Identify and implement RJ45 cable crimping for straight-through, standard, and crossover cables.				Ap
CO2	Develop and execute a program to transfer files between nodes using socket connections.				C
CO3	Implement the sliding window protocol with varying frame sizes to observe efficiency and throughput.				Ap
CO4	Apply the routing protocol for displaying the routing table.				Ap
CO5	Develop a client application that interacts with a DNS server to resolve domain names into IP addresses.				C

LIST OF EXPERIMENTS:

1. Study of Color coding Jack RJ45 and do the following Cabling works in a network
   a. Cable Crimping
   b. Standard Cabling
   c. Cross Cabling and
   d. Establish a LAN connection using three systems using any topology.
2. Configure IP Address in a system in LAN (TCP/IP Configuration) and Implement the client server communication using socket connection
3. Write a program for transferring a file between nodes in a network.
4. Perform CRC computation
5. By varying the number of frames, design the Sliding Window Protocol
6. Simulation of ARP/RARP
7. Display the routing table for the nodes in a network using Distance Vector Routing (DVR) algorithm.
8. Write a program for downloading a file from HTTP server
9. Develop a client that contacts a given DNS server to resolve a given host name.
10. Configure a Network topology using Packet tracer software
11. Study of Network simulator (NS) and Simulation of any one of routing protocol using NS2.

TOTAL (P:60) : 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 60 STUDENTS SOFTWARE :

HARDWARE:
Standalone desktops 60 Nos., Jack RJ45 connectors
SOFTWARE:
C / C++ / Java / Equivalent Compiler
Network simulator like Ethereal / NS2 / NS3 / Glomosim /OPNET/ 60 Equivalent.

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2			3											
3	3	3											3	
4	3												3	
5			3										3	
CO (W.A)	3	3	3										3	

22MAN04R - SOFT/ANALYTICAL SKILLS – II (Common to All Branches)					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PREREQUISITE : Nil					
Course Objective:	• To develop comprehensive English language skills • Toenhance logical reasoning skills and enhance problem-solving abilities				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Comprehend grammar, analyze texts, understand spoken language, articulate ideas in speech, and produce well-structured written compositions.	U	40%
CO2	Analyze quantitative aptitude problems and find solutions.	Ap	30%
CO3	Demonstrate the ability to solve problems through logical reasoning.	An	30%

UNIT I – VERBAL ABILITY	**(5+10)**
Grammar - One Word Substitutions - Phrasal Verbs - **Listening** - IELTS Listening (Intermediate) - **Speaking** - Group Discussion - **Reading** - Reading Newspaper / Articles -**Writing** - Proverb Expansion.	
UNIT II – APTITUDE	**(5+10)**
Ratio and Proportion - Allegation and Mixture - Partnership - Average - Problems on Ages - Percentage - Profit and Loss - Height and Distance.	
UNIT III - REASONING	**(5+10)**
Blood Relationship - Direction Sense - Paper Cutting and Folding - Logical Arrangements and Ranking - Venn Diagram.	
TOTAL(L:45) = 45 PERIODS	

REFERENCES:

1. Rizvi, M.Ashraf. *Effective Technical Communication.* Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. *Quantitative* Aptitude for Competitive Examinations. S.Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. *How to Prepare for Quantitative Aptitude for the CAT*. Tata McGraw – Hill Publishing, 2022.
4. Praveen R V. *Quantitative Aptitude and Reasoning.* PHI Learning Pvt. Ltd., 2016.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1									2	3				
2		2		2										
3		2		2										
CO (W.A)		**2**		**2**					**2**	**3**				

** Ratified by Twelfth Academic Council

22MAN09 - INDIAN CONSTITUTION (Common to All Branches)				
	L	**T**	**P**	**C**
	I	**0**	**0**	**0**
PRE-REQUISITE: NIL				

Course Objective:	• To educate students to learn about the Constitutional Law of India. • To motivate students to understand the role of Union Government. • To make students to understand about State Government. • To understand about District Administration, Municipal Corporation and Zila Panchayat. • To encourage students to Understand about the election commission.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Gain Knowledge about the Constitutional Law of India.	U	Internal Assessment
CO2	Know the Union Government and role of President and Prime Minister.	R	
CO3	Gain knowledge about State Government and role of Governor, Chief Minister.	U	
CO4	Understand the District Administration, Municipal Corporation and Zila Panchayat.	U	
CO5	Understand the role and function of election commission.	U	

UNIT I - THE CONSTITUTION INTRODUCTION	(3)
The History of the Making of the Indian Constitution - Preamble and the Basic Structure, and its interpretation - Fundamental Rights and Duties and their interpretation - State Policy Principles.	
UNIT II - UNION GOVERNMENT	(3)
Structure of the Indian Union - President - Role and Power - Prime Minister and Council of Ministers - Lok Sabha and Rajya Sabha	
UNIT III - STATE GOVERNMENT	(3)
Governor - Role and Power - Chief Minister and Council of Ministers - State Secretariat	
UNIT IV - LOCAL ADMINISTRATION	(3)
District Administration - Municipal Corporation - Zila Panchayat	
UNIT V - ELECTION COMMISSION	(3)
Role and Functioning - Chief Election Commissioner - State Election Commission	
TOTAL (L:15) : 15 PERIODS	

TEXT BOOKS:
1. Rajeev Bhargava, "Ethics and Politics of the Indian Constitution", Oxford University Press, New Delhi, 2008. 2. B.L. Fadia, "The Constitution of India", Sahitya Bhawan; New edition (2017). 3. DD Basu, "Introduction to the Constitution of India", Lexis Nexis; Twenty-Third 2018 edition.
REFERENCES:
1. Steve Blank and Bob Dorf, "The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", K & S Ranch ISBN – 978-0984999392 2. Eric Ries, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" , Penguin UK ISBN - 978-0670921607 3. Adrian J. Slywotzky with Karl Weber, "Demand: Creating What People Love Before They Know They Want It", Headline Book Publishing ISBN - 978-0755388974 4. Clayton M. Christensen, "The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business", Harvard business ISBN: 978-142219602.
REFERENCES: Web link
1. https://www.fundable.com/learn/resources/guides/startup 2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/ 3. https://www.finder.com/small-business-finance-tips 4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) / Programme Specific Outcomes (PSOs)

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1						3		3		2		3		
2						3		3		2		3		
3						3		3		2		3		
4						3		3		2		3		
5						3		3		2		3		
CO (W.A)						**3**		**3**		**2**		**3**		

22ITC09 - THEORY OF COMPUTATION *(Common to 22CSC10)*				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

PRE-REQUISITE: 22MYB05

Course Objective:	To improve the performance and profitability of any system by identifying and eliminating the "constraints" that limits its output, throughput, and goal achievement.

Course Outcomes: The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply fundamental concepts of automata theory to model and solve computational problems.	AP	30%
CO2	Analyze efficiency and effectiveness of parsing algorithms in language processing.	An	30%
CO3	Develop solutions for language recognition and generation using formal language constructs.	Ap	30%
CO4	Evaluate and manage complexity in designing Turing machines for computational tasks.	An	10%
CO5	Utilize tools to explore and experiment with formal languages, automata, and abstract machines.	Ap	Internal Assessment

UNIT I - AUTOMATA	**(9+3)**
. Introduction to finite automata(FA) – Central concepts of automata theory – Deterministic finite automata – Non deterministic finite automata – Finite automata with epsilon transitions – Equivalence between epsilon NFA and DFA - Minimization of automata.	
UNIT II - REGULAR EXPRESSIONS	**(9+3)**
Regular expressions(RE) - Manipulation of regular expressions - Equivalence between RE and FA - Inter conversion - Pumping lemma - Closure properties of regular sets – Decision properties of Regular Languages.	
UNIT III - CONTEXT FREE GRAMMAR	**(9+3)**
Context free Grammars (CFG) - Derivation trees - Ambiguity in Context-Free Grammars - Applications of Context Free Grammars - Normal Forms - Chomsky Normal Form (CNF) - Greibach Normal Form (GNF).	
UNIT IV - PUSH DOWN AUTOMATA AND TURING MACHINE	**(9+3)**
Push Down Automata (PDA) – Languages of PDA – Equivalence of PDA's and CFG's - Turing Machine, Programming techniques of Turing Machine – Types of Turing Machine.	

UNIT V - CLASSES OF PROBLEMS	(9+3)
A language that is not Recursively Enumerable – Universal Turing Machine – Rice's Theorem and properties of the Recursively Enumerable Languages – Post's Correspondence Problem (PCP) – The Classes P and NP – An NP Complete Problem.	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOKS:

1. John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman," Introduction to Automata Theory, Languages, and Computation", 3rd ed., Pearson, 2013.
2. John C Martin, "Introduction to Languages and the Theory of Computation", 4th ed., Tata McGraw Hill Publishing Company, New Delhi, 2011

REFERENCES:

1. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009.
2. Lewis H.P. & Papadimitriou C.H.," Elements of Theory of Computation", Prentice Hall of India, 4th ed., 2007.
3. Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", Prentice Hall of India, New Delhi, 3rd ed., 2006.
4. Harry R Lewis, Christos H Papadimitriou, "Elements of the Theory of Computation", Prentice Hall of India/ Pearson Education, New Delhi, 2nd ed., 2015.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3		3									3	
3	3		3										3	
4		3											3	
5	3				3								3	
CO (W.A)	3	3	3	3	3								3	

22ITC10 FUNDAMENTALS OF DATA SCIENCE *(Common to 22CIX42)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	• To understand the data science fundamentals and process and learn to describe the data for the data science process.				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the fundamental knowledge of data science to solve real time problem	Ap	20%
CO2	Analyze and visualize data for knowledge representation.	An	20%
CO3	Demonstrate proficiency in data analysis	Ap	30%
CO4	Conduct experiments of data science concepts in python	An	30%
CO5	Develop solutions for real world problems with standard datasets using data science tools	C	Internal Assessment

UNIT I INTRODUCTION	**(9)**
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 - Data Mining - Data Warehousing – Basic Statistical descriptions of Data	
UNIT II DESCRIBING DATA	**(9)**
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	**(9)**
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	**(9)**
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	**(9)**
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 (L:45) : 45 PERIODS

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III) 3
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCES:

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

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3												
3			3										3	
4			3	3	3									
5			3	3	3				2	2				3
CO (W.A)	3	3	3	3	3				2	2			3	3

22ITC11 DATABASE MANAGEMENT SYSTEM *(Common to 22CSC11, 22CIC10)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To gain knowledge on introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Design ER-models to represent simple database application scenarios	Ap	10%
CO2	Apply the concepts of database management system for various applications.	Ap	30%
CO3	Analyse database concepts for a given problem.	An	20%
CO4	Design conceptual data model for database applications	Ap	20%
CO5	Demonstrate SQL commands to create, manipulate and query data in a database	Ap	20%

UNIT I - DATA BASE SYSTEM CONCEPT	**(9)**
Purpose of Database systems – Views of data – Database Languages - Database design – Database system architecture – Data models – Data Dictionary – Database Administration – Entity-Relationship model – EER Model.	
UNIT II - RELATIONAL DATABASE	**(9)**
Structure of Relational Database – Integrity Constraints – Relational Algebra – Relational Calculus – SQL – Views –Joins – Functions and Procedures – Triggers.	
UNIT III - DATABASE DESIGN	**(9)**
Functional Dependencies – Decomposition: 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 IV - PHYSICAL DATABASE DESIGN AND QUERY PROCESSING	**(9)**
Storage and file structure: RAID – File Organization – Organization of Records in Files – Data dictionary Storage - Indexing, Hashing and Transactions: Ordered indices – B tree index files – B+ Tree index files – Multiple key access – Static and Dynamic Hashing – Bitmap indices — Query Processing	
UNIT V -TRANSACTION PROCESSING	**(9)**
Transactions: Desirable properties of Transactions – Serializability – Concurrency Control: Lock-Based Protocols – Timestamp-Based Protocols – Validation-Based Protocols – Recovery systems.	
	TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", 7th ed., McGraw Hill, 2020.

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", 7th ed., Pearson Education/Addison Wesley, 2017.
2. Date C.J., Kannan A. and Swamynathan S., "An Introduction to Database Systems", 8th Edition, Pearson Education, New Delhi, 2013.

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2	3													
3		3											3	
4			3											
5			3		3								3	3
CO (W.A)	3	3	3		3								3	3

22ITC12 – AGILE METHODOLOGIES					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: NIL					
Course Objective:	Estimate in an incremental and iterative fashion using practical techniques Apply agile principles to a range of decision possibilities.				
Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**		
CO1	Analyze the ethical considerations and team dynamics	**An**	20%		
CO2	Apply scrum practices in project management	**Ap**	30%		
CO3	Interpret and utilize agile metrics for informed decision-making	**An**	30%		
CO4	Conduct Effective Requirements Engineering in Agile	**An**	20%		
CO5	Apply agile testing practices to ensure high product quality.	**Ap**	Internal Assessment		

UNIT I AGILE METHODOLOGY	**(9)**
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values	
Unit – II AGILE PROCESSES	**(9)**
Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.	
Unit – III AGILITY AND KNOWLEDGE MANAGEMENT	**(9)**
Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).	
Unit – IV AGILITY AND REQUIREMENTS ENGINEERING	**(9)**
Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.	
Unit – V AGILITY AND QUALITY ASSURANCE	**(9)**
Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.	
	TOTAL (L:45) : 45 PERIODS

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Sciencell, Springer, 2009.

REFERENCES:

1. Craig Larman, —Agile and Iterative Development: A Manager_s Guidell, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Managementll, Butterworth-Heinemann, 2007.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3										2			3
2			3		3			2	2		2			
3	3										2		3	3
4	3							2		2				
5			3		3						2			3
CO (W.A)	3		3		3			2	2	2	2		3	3

22ITC13 ADVANCED JAVA PROGRAMMING *(Common to 22CSC12 and 22CCC14)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: 22ITC06					
Course Objective:	Be able to put into use the advanced features of the Java language to build and compile robust enterprise grade applications				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concepts of collections for high-performance implementations of data structures.	Ap	20%
CO2	Analyse how to use HTML and CSS in front end deign and JavaScript for responsive pages.	An	40%
CO3	Design web application based on client and server-side technologies and backend connectivity.	Ap	20%
CO4	Demonstrates the benefits of XML in data sharing.	An	20%
CO5	Implement mini project for any given web application using advanced web development concepts.	An	Internal Assessment

UNIT I WRAPPER CLASSES AND COLLECTIONS	(9)
Wrapper Classes: Autoboxing, Unboxing and Cloneable Interface **I/O Streams:** Introduction to I/O, I/O Operations, Object Serialization **Collection Framework:** Introduction to Collection, List, Array Lists, Linked Lists, Sorting Lists, Using Iterators, Generics, Set, Map, HashMap, Sorted Maps, Using Custom Objects, Map	
UNIT II HTML & CSS	(9)
HTML : Introduction to HTML and its elements, Basic Tags, Basic Elements, Formatting Tags, Layout tags and Semantic Tags, Tables, Forms and Frames, Style and div tags, Introduction to HTML5 **CSS:** Introduction to CSS, Styles and Style sheets, Formatting with CSS, Links and Lists, CSS Box Model, CSS3.	
UNIT III JAVASCRIPT	(9)
JAVASCRIPT: Introduction to JavaScript, variables, Data Types, JS Functions, JS Strings, JS Events, JS Objects, Arrays, Event Handling JS Validations, JS Regular Expressions.	

UNIT IV SERVLETS AND DATABASE CONNECTIVITY	(9)
SERVLETS: Introduction to Servlets, Servlet Lifecycle, Servlet-Get and Post Requests, Servlet Config and Servlet Context, Servlet-Cookies and Session Management. **RDBMS / SQL / JDBC:** Introduction to RDBMS, Oracle 11g Introduction, Select Statement, Restricting and Sorting Data, DML, DDL, Introduction to JDBC, Establishing Connection, Executing Query and Processing Results, Meta data & Prepared Statement, Using Callable Statement and Transactions.	
UNIT V JSP and XML	(9)
JSP : overview-Basic JSP Architecture-Lifecycle-JSP in Eclipse-JSP scripting elements-Directives-Actions-Implicit objects **XML:** Introduction to XML, Document Type Definition, XML Namespaces, XML Schema, XSLT.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Java: The Complete Reference, 10th, Herbert Schildt, McGraw-Hill
2. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson, Pearson Education, 2007

REFERENCES:

1. ThomasA. Powell,"TheComplete Reference HTML &CSS",New Riders, 5th ed., 2017.
2. SteveSuehring,"JavaScript– Step by Step", PHI, 2nd ed.,2011.
3. https://www.w3schools.com
4. https://www.tutorialspoint.com/jsp

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3												3
3			3										3	
4			2		3									3
5					2				2	2	2			
CO (W.A)	3	3	3		3				2	2	2		3	3

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22CYB07 ENVIRONMENTAL SCIENCE AND ENGINEERING *(Common to AI&DS, CSE, CSE-CS, CSE-IOT and IT)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: NIL

Course Objective:	• To impart knowledge on ecosystem, biodiversity, environmental pollution and familiarize about sustainable development, carbon credit and green materials. • To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Illustrate the values and conservation methods of biodiversity	Ap	20%
CO2	Predict the causes, effects of environmental pollution and contribute the preventive measures to the society.	An	20%
CO3	Produce the renewable and non-renewable resources and preserve them for future generations.	Ap	20%
CO4	Inspect the different methods of management of e-waste and apply them for suitable technological advancement and societal development.	An	20%
CO5	Evaluate the recycling of battery, cell phone , laptop and PCB	E	20%

UNIT I - ENVIRONMENT AND BIODIVERSITY	**(9)**
Environment - scope and importance - Eco-system- Structure and function of an ecosystem-types of biodiversity- genetic - species and ecosystem diversity– Values of biodiversity - India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity - habitat loss - poaching of wildlife - man-wildlife conflicts – endangered and endemic species of India – Conservation of biodiversity - In-situ and ex-situ.	
UNIT II - ENVIRONMENTAL POLLUTION	**(9)**
Pollution – Causes - Effects and Preventive measures of Water – Soil - Air - Noise Pollution - Solid waste management - methods of disposal of solid waste – various steps of Hazardous waste management - E-Waste management - Environmental protection – Air acts – water acts.	
UNIT III - RENEWABLE SOURCES OF ENERGY	**(9)**
Energy management and conservation -New Energy Sources - Different types new energy sources – Hydrogen energy – Geothermal energy - Solar energy – wind energy – biomass energy - Applications of Hydrogen energy - Ocean energy resources -Tidal energy conversion.	
UNIT IV – E- WASTE AND ITS MANAGEMENT	**(9)**
E-waste – sources of e-waste – hazardous substance in e-waste – chlorinated compounds – heavy metals - need for e-waste management – management of e-waste – Inventory management – production process – modification- Disposal treatment of e –waste – Incineration –acid baths – landfills.	

UNIT V – BATTERIES AND RECYCLING OF E-WASTE	(9)
Battery – types – Lifecycle - Mobile battery life cycle – Laptop battery life cycle – battery maintenance – process of recycling battery – lead acid battery – lithium ion battery – benefits of recycling battery – recycling of computing devices - mobile phones - PCB and servers.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Dr. A.Ravikrishan, Envrionmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt.Ltd., Chennai,15thEdition, 2023.
2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.

REFERENCES:

1. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

WEB LINK :

1. http://www.jnkvv.org/PDF/08042020215128Amit1.pdf
2. https://www.conserve-energy-future.com/types-of-renewable-sources-of-energy.php
3. https://ugreen.io/sustainability-engineering-addressing-environmental-social-and-economic-issues/
4. https://www.researchgate.net/publication/326090368_E-_Waste_and_Its_Management
5. https://www.ewaste1.com/how-to-reduce-e-waste/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		2												
2			2				3							
3	2							2						
4							3							
5						3			2			2		
CO (W.A)	2	2	2			3	3	2	2			2		

22ITP06 DATABASEMANAGEMENT SYSTEM LABORATORY *(Common to 22CSP07, 22CIP07)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE-REQUISITE : NIL					
Course Objective:	To provide practical experience in designing, implementing, and managing databases using database management system concepts.				
Course Outcomes The students will be able to		**Cognitive Level**			
CO1	Analyse database concepts for a given problem.	An			
CO2	Demonstrate SQL commands to create, manipulate and query data in a database.	Ap			
CO3	Design SQL queries and conceptual data models for database applications.	Ap			
CO4	Construct front end tools to design forms, reports and menus	C			
CO5	Develop the solutions using database concepts for real time requirements	C			

LIST OF EXPERIMENTS

1. Structured Query Language : Creating Database
   - Creating a Table
   - Specifying Relational Data Types
   - Specifying Constraints
   - Creating Indexes

2. Table and Record Handling
   - INSERT statement
   - Using SELECT and INSERT together
   - DELETE, UPDATE, TRUNCATE statements
   - DROP, ALTER statements

3. Retrieving Data from a Database
   - The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause
   - Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause
   - Using Aggregate Functions Combining Tables Using JOINS Sub queries

4. Database Management
   - Creating Views
   - Creating Column Aliases
   - Creating Database Users Using GRANT and REVOKE

High level language extension with Triggers

Database design using E-R model and Normalization

Design and implementation of Payroll processing system

Design and implementation of Banking system

Design and implementation of Library Information System

Design and implementation of Student Evaluation System

TOTAL (P: 60) = 60 PERIODS

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
HARDWARE: 33 nodes with LAN connection or Standalone PCs **SOFTWARE:** 1. MYSQL 8.0 2. Visual Basic 6.0

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											2	
2	3												3	2
3			3										3	
4					3								3	
5			3				3		3		3	3	3	
CO (W.A)	3	3	3		3		3		3		3	3	3	2

22ITP07 ADVANCED JAVA PROGRAMMING LABORATORY *(Common to 22CSP08 and 22CCP09)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: 22ITP04					
Course Objective:	To use advanced client and server-side technologies to develop a web application.				

Course Outcomes The Student will be able to		**Cognitive Level**
CO1	Apply Advanced Java concepts to solve real-world problems.	Ap
CO2	Design and develop user-centric web applications focused on social and environmental issues.	C
CO3	Integrate front-end and back-end components effectively with databases and external services	Ap
CO4	Use web designing and scripting technologies to develop web applications.	An
CO5	Demonstrate teamwork and problem-solving skills in project development.	An

LIST OF EXPERIMENTS :

1. Practice programs on Java Collections Frameworks
2. Programs to convert primitive types to wrapper objects and vice versa
3. Programs with HTML and CSS
4. Programs with JavaScript.
5. Use JDBC connectivity and create Table, insert and update data.
6. Write a program in Java to create a Cookie and set the expiry time of the same.
7. Write a program in Java to create Servlet to count the number of visitors to a web page.
8. Write a program in Java to create a form and validate a password using Servlet.
9. Programs for creating web applications using JSP.
10. Programs on XML.

TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3				3								3	
2		3			3	3	3						3	
3			3		3									3
4					3								3	
5								3	3	3	2			
CO (W.A)	**3**	**3**	**3**		**3**	**3**	**3**	**3**	**3**	**3**	**2**		**3**	**3**

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22MAN07R - SOFT/ANALYTICAL SKILLS – III (Common to All Branches)				
	L	**T**	**P**	**C**
	1	**0**	**2**	**0**
PREREQUISITE : Nil				
Course Objective:	• To improve language proficiency for personal or professional reasons • To enhance students' mathematical problem-solving and critical thinking skills			

	Course Outcomes The Student will be able to	**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Demonstrate effective communication skills by listening actively, speaking clearly, reading critically, and writing coherently in contexts.	U	40%
CO2	Develop proficiency in applying mathematical concepts of time, speed, distance, and financial calculations involving simple and compound interest.	Ap	30%
CO3	Analyse logical reasoning skills through various forms of statements.	An	30%

UNIT I – VERBAL ABILITY	**(5+10)**
Grammar - Concord - Relative Clause - **Listening** - IELTS Listening (Advanced) and Gap Filling - **Speaking** - Introducing Others - Formal Conversations - **Reading** - Reading Comprehension - **Writing** - Hints Development.	
UNIT II – APTITUDE	**(5+10)**
Simple and Compound Interest - Time, Speed and Distance - Problems on Trains - Boats and Streams - Chain Rule - Time and Work - Pipe and Cisterns.	
UNIT III - REASONING	**(5+10)**
Seating Arrangements - Syllogism - Statement and Conclusion - Statement and Assumption - Statement and Course of Action.	
TOTAL(L:45) = 45 PERIODS	

REFERENCES:

1. Rizvi, M.Ashraf. *Effective Technical Communication.* Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. *Quantitative* Aptitude for Competitive Examinations. S.Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. *How to Prepare for Quantitative Aptitude for the CAT*. Tata McGraw – Hill Publishing, 2022.
4. Praveen R V. *Quantitative Aptitude and Reasoning*. PHI Learning Pvt. Ltd., 2016.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1									2	3				
2		2		2										
3		2		2										
CO (W.A)		**2**		**2**					**2**	**3**				

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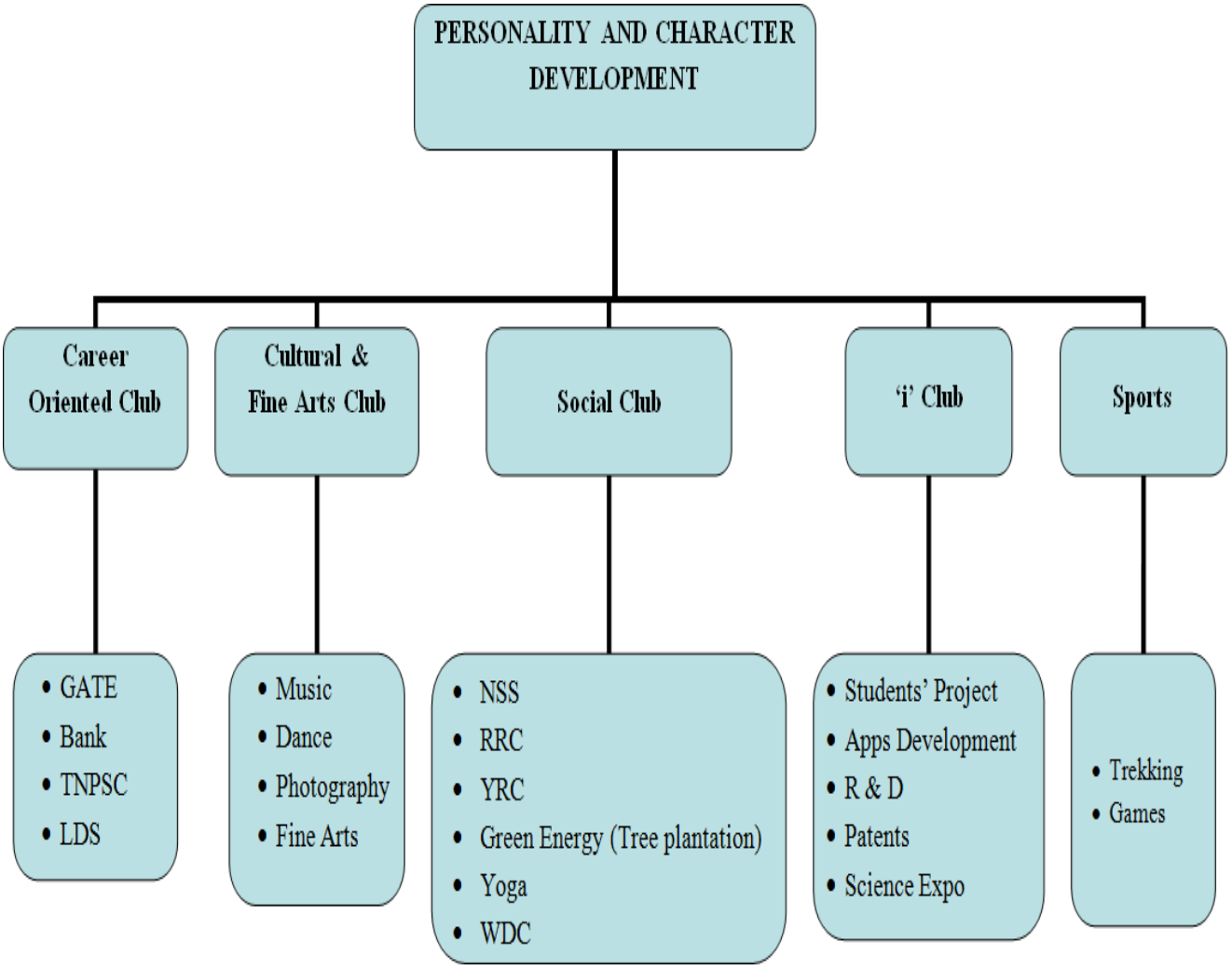
22GED01 PERSONALITY AND CHARACTER DEVELOPMENT

L	T	P	C
0	0	I	0



***LDS - Leadership Development Skills**

OBJECTIVES :				
Career Oriented Club	**Cultural & Fine Arts Club**	**Social Club**	**'i' club**	**Sports**
• To provide support for identifying specific career field of interests and career path • To provide support for preparing for competitive exams	• To bring out the hidden talent of students in music, dance and other fine arts. • To promote photography skill among the students • To develop and enhance the performance of students by participating in various events • To inculcate managerial capabilities such as event management and stage organization	• To create social awareness and develop a sense of social and civic responsibility • To inculcate socially and environmentally sound practices and be aware of the benefits • To encourage the students to workalong with the peoplein rural areas, thereby developing their character, social consciousness, commitment, discipline and being helpful towards the community.	• To inculcate the basic concepts of innovation • To foster the networking between students, build teams, exchange ideas, do projects and discuss entrepreneurial opportunities • To enrich the academic experience, build competencies and relationships beyond the classroom	• To provide opportunities to excel at sports • To promote an understanding of physical and mental well-being through an appreciation of stress, rest and relaxation. • To develop an ability to observe, analyze and judge the performance of self and peers in sporting activities. • To develop leadership skills and nurture the teambuilding qualities. **Trekking:** • To provide opportunities to explore nature and educating about the purityof nature • To improve physical and mental health.

OUTCOMES : At the end of this course, the students will be able to				
• Find a better career of their interest. • Make use of their knowledge during competitive exams and interviews.	• Take part in various events • Develop team spirit, leadership and managerial qualities	• Develop socially responsive qualities by applying acquired knowledge • Build character, social consciousness, commitment and discipline	• Apply the acquired knowledge in creating better solutions that meet new requirements and market needs • Develop skills on transforming new knowledge or new technology into viable products and services on commercial markets as a team	• Demonstrate positive leadership skills that contribute to the organizational effectiveness • Take part an active role in their personal wellness (emotional, physical, and spiritual) that supports a healthy lifestyle • Create inclination towards outdoor activity like nature study and Adventure.

TOTAL [2 x (P: 15)]: 30 PERIODS

(Cumulatively for Two Semesters)

22ITC14 - **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** *(Common to* **22CSC09,22CCC08, 22CIC08)**					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE- REQUISITE: NIL					
Course Objective:	• Learn to design, implement, and evaluate AI/ ML models				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply fundamental concepts of AI and implement basic heuristic techniques.	Ap	30%
CO2	Develop solution for search algorithms, constraint satisfaction and planning problem	Ap	30%
CO3	Analyze the basic concepts of machine learning and preprocess the dataset	An	20%
CO4	Implement supervised learning techniques for complex problems	An	20%
CO5	Collaborate and design neural networks to predict real world problems	E	Internal Assessment

UNIT I -PROBLEM SOLVING	**(9)**
Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP).	
UNIT II - PROBABILISTIC REASONING	**(9)**
Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.	
UNIT III - SUPERVISED LEARNING	**(9)**
Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.	
UNIT IV - ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING	**(9)**
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.	
UNIT V - NEURAL NETWORKS	**(9)**
Artificial Neural Networks – Structures, perceptron, Multilayer perceptron, activation functions, network training, Learning in multilayer networks , Learning neural network structures, Case study: Handwritten digit recognition, Word senses and house prices.	
	TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

REFERENCES:

1. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013.
2. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar, "Foundations of Machine Learning", MIT Press, 2012.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2			3											
3		3			2								3	
4				3										
5						3			2	2				3
CO (W.A)	**3**	**3**	**3**	**3**	**2**	**3**			**2**	**2**			**3**	**3**

22ITC15 CLOUD COMPUTING *(Common to 22AIX41, 22CSX41 and 22CIX44)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	Understand the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concept of virtualization and Experiment with virtualization of hardware resources and Docker.	Ap	40%
CO2	Analyze various cloud programming models and apply them to solve problems on the cloud.	An	20%
CO3	Develop and deploy services on the cloud and set up a cloud environment	An	20%
CO4	Evaluate the security issues related to cloud computing and handle the security threats and construct different cloud delivery design models	An	20%
CO5	Build cloud solutions for the societal problems	An	Internal Assessment

UNIT I CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE	**(9)**
Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.	
UNIT II -VIRTUALIZATION BASICS	**(9)**
Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.	
UNIT III -VIRTUALIZATION INFRASTRUCTURE AND DOCKER	**(9)**
Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories	
UNIT IV -CLOUD DEPLOYMENT ENVIRONMENT	**(9)**
Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack	

UNIT V -CLOUD SECURITY	(9)
Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.

REFERENCES:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: an enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3			3									3	
2	3	3											3	3
3			3											3
4				3									3	
5					3	3								3
CO (W.A)	3	3	3	3	3	3							3	3

22ITC16- INTERNET OF THINGS AND ITS APPLICATIONS
(Common to 22AIC14, 22CIC0 and 22CSC17)

	L	T	P	C
	3	0	0	3

PRE-REQUISITE: NIL

Course Objective:	• To provide an understanding of the technologies and the standards relating to the Internet of Things. • To review about IoT protocols and arduino processor with underlying technologies, limitations, and challenges.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Identify various characteristics and deployment levels of IoT.	Ap	30%
CO2	Analyze the concepts of M2M and IoT architecture.	An	20%
CO3	Implement Various IoT communication protocols like MQTT,CoAP, and HTTP in developing IoT applications.	Ap	20%
CO4	Analyze the functioning ofarduinoboards and various communications technologies to use with it.	An	30%
CO5	Perform in a team to build automation, agriculture and various real time applications using arduino.	Ap	Internal Assessment

UNIT I – INTRODUCTION TO INTERNET OF THINGS	**(9)**
Characteristics of IoT - Physical and Logical Design of IoT - IoT Enabling Technologies - Wireless Sensor Networks - Cloud Computing - Big Data Analytics - Communication Protocols - Embedded Systems-Functional Blocks - Communication Models and APIs - IoT Levels and Deployment Templates – Overview of Microcontroller, Basics of Sensors and Actuators - Examples and Working Principles of Sensors and Actuators.	
UNIT II - M2M AND IOT ARCHITECTURE	**(9)**
Building Architecture - An IoT Architecture Outline - M2M and IoT Technology Fundamentals: Devices and Gateways - Local and Wide Area Networking - Data management, Everything as a Service, M2M and IoT Analytics - Knowledge Management - IoT Reference Model.	
UNIT III - IOT PROTOCOLS	**(9)**
PHY/MAC Layer: 3GPP MTC, IEEE 802.15 – Wireless HART- Z-Wave, BLE- Zigbee - DASH7 – Network Layer: 6LoWPAN - 6TiSCH - RPL - CORPL - CARP - Transport Layer: TCP - MPTCP - UDP-DCCP-Session Layer: HTTP- CoAP- XMPP- AMQP- MQTT.	

UNIT IV - PROGRAMMING USING ARDUINO	(9)
Introduction to Arduino processor- General Block diagram- Working of Analog and Digital I/O pins- Serial(UART), I2C Communications and SPI communication - Arduino Boards: Mega, Due, Zero and 101- Prototyping basics - Technical description - Setting Up Arduino IDE- Introduction to Arduino programming-Case Studies.	
UNIT V - APPLICATIONS OF IOT	**(9)**
Various Real time applications of IoT- Home Automation - Smart Parking - Environment: Weather monitoring system - Agriculture: Smart irrigation – Domain Specific applications - Case Studies.	
	TOTAL (L:45) : 45 PERIODS

TEXT BOOKS:

1. Internet of Things, RMD SundaramShriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons, Second Edition, 2019.
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.
3. Veneri,Giacomo and Antonio capasso "Hands on Industrial Internet of things:create a powerful industrial IoT infrastructure using Industry 4.0, 1st edition, Packet Publishing,Ltd,2018.

REFERENCES:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2	3													
3			3										3	
4					3									3
5									1		1	1		
CO (W.A)	**3**		**3**		**3**				**1**		**1**	**1**	**3**	**3**

22ITP08 CLOUD COMPUTING LABORATORY					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: NIL					
Course Objective:	To experiment with various virtualization tools such as Virtual Box and VMware workstation				

Course Outcomes The Student will be able to		**Cognitive Level**
CO1	Apply large data sets in a parallel environment.	Ap
CO2	Configure various virtualization tools such as Virtual Box, VMware workstation.	An
CO3	Design and deploy a web application in a PaaS environment.	C
CO4	Install and use a generic cloud environment that can be used as a private cloud.	An
CO5	Aware of recent technological advancements in cloud computing through self learning.	An

LIST OF EXPERIMENTS :

1. 1Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applicationsusing python/java.
4. Use GAE launcher to launch the webapplications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not presentingCloudSim.
6. Find a procedure to tansfer the files from one virtual machine to another virtualmachine
7. Find a procedure to launch virtual machine using trystack (Online Openstack DemoVersion)
8. Install Hadoop single node cluster and run simple applications likewordcount

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
Hardware: LAN System with 30 nodes (OR) Standalone PCs – 30 Nos,. **Software:** Open stack , Hadoop SOFTWAREEucalyptus or Open Nebula orequivalent
TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3												3	3
2	3	3			3								3	
3		3	3								2			3
4				3									3	
5												3		3
CO (W.A)	**3**	**3**	**3**	**3**	**3**						**3**	**3**	**3**	**3**

22ITP09- INTERNET OF THINGS AND ITS APPLICATIONS LABORATORY

(Common to 22CSP11 and 22CIP04)

L	T	P	C
0	0	4	2

PRE-REQUISITE: NIL

Course Objective:	To equip students with comprehensive knowledge and hands on experience in designing and developing IoT systems and applications.

	Course Outcomes The student will be able to	**Cognitive Level**
CO1	Apply the knowledge of controlling sensors using arduino.	Ap
CO2	Analyze the given Aduino program to build practical IoT solutions.	An
CO3	Apply Arduino programming techniques to use various sesnors and actuators.	Ap
CO4	Design IoT based system for given application and specifications.	An
CO5	Implement a mini-project to demonstrate the given problem using suitable sensors with Arduino development board.	C

LIST OF EXPERIMENTS

1. Implement a program to Blink LED using Arduino.
2. Implement a program to control intensity light using Arduino.
3. Implement a program for LCD Display using Arduino.
4. Implement a program for Buzzer Indication using Arduino.
5. Implement a program for LDR using Arduino.
6. Implement a program for LM35 Sensor using Arduino.
7. Implement a program for Key Input with LED using Arduino.
8. Implement a program for Servo Motor Control using Arduino.
9. Implement a program for blinking LED using NODEMCU with Blynk.
10. Implement a program for Sensor value logging in Cloud

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 33 STUDENTS:

Hardware:

WiFi UNIT or ESP 8266 UNIT 33, Connecting cable or USB cable 33, Ultrasonic sensor 33, Jumper wires 33,Vibration sensor 33, Touch Sensor 33, Temperature and humidity sensor 33, Raspberry pi 33, HDMI 33,Micro USB power input 33, Breadboard 33, Resistor (47K/1W) 33, LED 33,
Arduino Uno 33, 16 x 2 LCD display 33, ACS712 Voltage sensor 33, 9/12V Battery 33, Center tapped transformer (230/6-0-6V) 33 , Diode (IN4007) 33, Opto-coupler 33

Software:

OS – Windows / UNIX Clone 33
Computer with Arduino IDE software 33

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2			2	2										
3														2
4					3									2
5		2			3				1				3	
CO (W.A)	**3**	**2**	**2**	**2**	**3**				**1**				**3**	**2**

22MAN08R - SOFT/ANALYTICAL SKILLS – IV (Common to All Branches)					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PREREQUISITE : Nil					
Course Objective:	• To enhance the ability to communicate coherently and effectively across contexts • To develop quantitative aptitude and analytical reasoning skills				

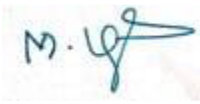
	Course Outcomes The Student will be able to	**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Develop proficiency to communicate accurately, fluently, and appropriately in various academic, professional and social contexts.	U	40%
CO2	Solve quantitative aptitude problems with more confidence.	Ap	30%
CO3	Draw valid conclusions, identify patterns, and solve problems.	An	30%

UNIT I – VERBAL ABILITY	**(15)**
Grammar - Sentence Completion – Sentence Improvement - Error Spotting - **Listening** - TOEFL Listening Practice Tests - **Speaking** – Interview Skills - **Reading** - GRE Reading Passages - **Writing** - Paragraph Writing.	
UNIT II – APTITUDE	**(15)**
Probability - Permutations and Combinations - Data Interpretation on Multiple Charts - Mensuration - Area, Shapes, Perimeter - Races and Games.	
UNIT III - REASONING	**(15)**
Data Sufficiency - Mathematical Operations - Pattern Completion - Cubes - Embedded Images.	
TOTAL(L:45) = 45 PERIODS	

REFERENCES:

1. Rizvi, M.Ashraf. *Effective Technical Communication.* Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. *Quantitative* Aptitude for Competitive Examinations. S.Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. *How to Prepare for Quantitative Aptitude for the CAT*. Tata McGraw – Hill Publishing, 2022.
4. Praveen R V. *Quantitative Aptitude and Reasoning.* PHI Learning Pvt. Ltd., 2016.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1									2	3				
2		2		2										
3		2		2										
CO (W.A)		**2**		**2**					**2**	**3**				



22ITC17 - FULL STACK DEVELOPMENT *Common to 22AIC15,22CIC15 and 22CSC15)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: 22ITC13					
Course Objective:	To provide students with a solid foundation in the front-end and back-end web development fundamentals, integrate with databases and external services, and apply best practices in web development				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply fundamental concepts of MERN stack for Web application development.	Ap	20%
CO2	Analyze and develop web applications using bootstrap, node and Express JS focused on social and environmental issues	An	40%
CO3	Integrate front-end and back-end components effectively with databases and external services.	An	20%
CO4	Implement Full stack application through React framework.	An	20%
CO5	Demonstrate teamwork and problem-solving skills in project development.	C	Internal Assessment

UNIT I - BASICS OF MERN STACK	(9)
MERN Introduction-MERN Components - Need for MERN - Server-Less Hello World - Server Setup - nvm - Node.js npm.	
UNIT II – BOOTSTRAP AND NODE JS BASICS	(9)
Introduction to Bootstrap - Bootstrap Basics - Bootstrap Grids - Bootstrap Themes - Bootstrap CSS - Bootstrap JS. Node.js basics - Local and Export Modules - Node Package Manager - Node.js web server - Node.js File system - Node Inspector - Node.js Event Emitter.	
UNIT III - NODE JS EXPRESS	(9)
Node.js Data Access - Express REST APIs - REST - Resource Based - HTTP Methods as Actions - JSON-Express - Routing - Handler Function – Middleware-Rest API.	
UNIT IV - MONGODB	(9)
MongoDB - MongoDB Basics - Documents -Collections - Query Language - Installation - The Mongo Shell - Schema Initialization - MongoDB Node.js Driver - Reading from MongoDB - Writing to MongoDB.	

UNIT V - REACT	(9)
React Introduction – State - Lifecycle methods - Hooks – useState, useEffect, useContext - Event handling - Forms – controlled components, submission, validation.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

3. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.
4. Bradshaw, S., Brazil, E., & Chodorow, K. (2019). MongoDB: the definitive guide: powerful and scalable data storage. O'Reilly Media.
5. Mardan, A. (2014). Express. js Guide: The Comprehensive Book on Express. js. Azat Mardan.
6. Kogent Learning Solutions Inc. "HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQUERY", Wiley India Pvt. Limited, 2011.
7. Deitel and Deitel and Nieto, "Internet and World Wide Web – How to Program", Prentice Hall, 5th Edition, 2011.
8. Zammetti, F. (2020). Modern Full-Stack Development: Using TypeScript, React, Node. js, Webpack, and Docker. Apress.

REFERENCES:

1. Silvio Moreto, Matt Lambert, Benjamin Jakobus, Jason Marah, "Bootstrap 4–Responsive Web Design" Packt Publishing (6 July 2017)
2. Thomas Powell, "Web Design: The Complete Reference" ,Osborne / McGraw-Hill
3. https://www.w3schools.com/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3				3								3	
2		3	3		3	3	3						3	
3			3		3									3
4				3	3								3	
5					3			3	3	3	3			3
CO (W.A)	3	3	3	3	3	3	3	3	3	3	3		3	3

22ITC18 - MOBILE APPLICATION DEVELOPMENT

(Common to 22CSC18)

	L	T	P	C
	3	0	0	3

PRE-REQUISITE : NIL

Course Objective:	To design and develop mobile apps, integrate services like APIs and databases, to ensure usability and security and to prepare apps for deployment on app stores, focusing on practical skills and industry standards.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze and identify the computing requirements appropriate to a real world problem	An	20%
CO2	Design an Android application using layout, UI components	Ap	20%
CO3	Portray and implement the ethical responsibilities in mobile application development using modern tools	Ap	20%
CO4	Develop a fully functional native mobile app by applying industry's best practices	Ap	20%
CO5	Present their projects and compile thorough reports, demonstrating teamwork and reflective learning.	C	Internal assessment

UNIT I – MOBILE PLATFORM AND APPLICATIONS	**(9)**
Mobile Device Operating Systems - Special Constraints & Requirements - Commercial Mobile Operating Systems - Software Development Kit: iOS, Android, BlackBerry, Windows Phone - MCommerce - Structure - Pros & Cons - Mobile Payment System - Security Issues.	
UNIT II - INTRODUCTION TO ANDROID	**(9)**
Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.	
UNIT III - ANDROID APPLICATION DESIGN ESSENTIALS	**(9)**
Anatomy of Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions. - Activity Lifecycle - Navigation	
UNIT IV - ANDROID USER INTERFACE DESIGN & MULTIMEDIA	**(9)**
User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures.	
UNIT V - ANDROID APIs	**(9)**
Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World – Error Handling – Case studies	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Prasanth Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi-2012 (UNIT – 1)
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", 2nd edition, Pearson Education, 2011 (UNIT 2 – 5)

REFERENCES:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2010.
2. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.
3. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O"Reilly SPD Publishers, 2015.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											2	
2	3													
3	3				2			2					2	
4	3				2								2	3
5		2						3	2	2			2	3
CO (W.A)	**3**	**2.5**			**2**			**2.5**	**2**	**2**			**2**	**3**

22ITP10 - FULL STACK DEVELOPMENT LABORATORY *(Common to 22CSP09)*				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

PRE-REQUISITE : NIL

Course Objective:	To develop full stack applications with clear understanding of user interface, business logic and data storage.

Course Outcomes The Student will be able to		**Cognitive Level**
CO1	Install and develop programs using React JS.	Ap
CO2	Make use of multiple node js modules to implement the application.	An
CO3	Develop responsive and dynamic web pages	C
CO4	Develop responsive and mobile supported applications	C
CO5	Perform database operations using MongoDB and aware of recent technologies in Full Stack through self-learning.	An

LIST OF EXPERIMENTS :

1. Build a Basic React APP that display custom message from users
2. Create a Login form using React JS
3. Write a program to upload Single/Multiple images to cloudinary using Node JS
4. Write a program to create router using Node.js with Express
5. Design a program to create Single Responsive Page using Bootstrap
6. Implement Create and Read Operations in MongoDB.
7. Implement Update and Delete Operations in MongoDB.

TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3												3	
2		3			3								3	
3		3	3											3
4				3	3								3	
5					3				2			3		
CO (W.A)	**3**	**3**	**3**	**3**	**3**				**2**			**3**	**3**	**3**

22ITP11- MOBILE APPLICATION DEVELOPMENT LABORATORY

(Common to 22CSP12)

	L	T	P	C
	0	0	4	2

PRE-REQUISITE : NIL

Course Objective:	To provide hands-on experience in designing, developing, testing, and deploying mobile apps.

	Course Outcomes The student will be able to	**Cognitive Level**
CO1	Analyze and identify the computing requirements appropriate to a real world problem	An
CO2	Design an Android application using layout, UI components using event listeners	C
CO3	Develop Android application with data storage	C
CO4	Develop a native mobile app	C
CO5	Utilize RSS feeds and integrate into web applications	Ap

LIST OF EXPERIMENTS :

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers.
3. Develop an application that uses event listeners.
4. Develop an application that uses adapters, Toast.
5. Develop an application that makes use of databases.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses Camera and writes the image to the storage.
9. Develop a basic SMS receiver application.
10. Implement an application that creates an alert upon receiving a message.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 33 STUDENTS:

Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development, Tools with appropriate emulators and debuggers - 33 Nos.

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3												2
2			3											2
3			3		3	3		3					2	2
4			3						3				2	3
5	3									3	3	3	2	3
CO (W.A)	**3**	**3**	**3**		**3**	**3**		**3**	**3**	**3**	**3**	**3**	**2**	**2.4**

22GEA01 - UNIVERSAL HUMAN VALUES *(Common to all Branches)*					
		L	**T**	**P**	**C**
		2	**0**	**0**	**2**
PRE-REQUISITE: NIL					
Course Objective:	• To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity. • To facilitate the development of a holistic perspective among students towards life and profession. • To highlight plausible implications of holistic understanding in terms of ethical human conduct. • To understand the nature and existence. • To understand human contact and holistic way of living				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Evaluate the significance of value inputs in formal education and start applying them in their life and profession.	E	Internal Assessment
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual.	Ap	
CO3	Analyze the value of harmonious relationship based on trust and respect in their life and profession.	An	
CO4	Examine the role of a human being in ensuring harmony in society and nature.	Ap	
CO5	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	Ap	

UNIT I – Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution	**(6)**
The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution	
UNIT II - Right Understanding (Knowing)- Knower, Known & the Process	**(6)**
The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	

UNIT III - Understanding Human Being	(6)
Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self	
UNIT IV - Understanding Nature and Existence	**(6)**
A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self- awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).	
UNIT V - Understanding Human Conduct, All-encompassing Resolution and Holistic Way of Living	**(6)**
Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All- encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence	
TOTAL (L:30) : 30 PERIODS	

TEXT BOOK:

1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course inHuman Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi

REFERENCES:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers
8. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
9. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (includingHuman Values), Eastern Economy Edition, Prentice Hall of India Ltd.
10. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						2	2	3	2	2		3		
2						2	2	3	2	2		3		
3						2	2	3	2	2		3		
4						2	2	3	2	2		3		
5						2	2	3	2	2		3		
CO (W.A)						**2**	**2**	**3**	**2**	**2**		**3**		

22GED02 – INTERNSHIP / INDUSTRIAL TRAINING				
	L	T	P	C
	0	0	0	2
PRE-REQUISITE : NIL				
Course Objective:	• To obtain a broad understanding of the emerging technologies in Industry • To gain knowledge about I/O models.			

Course Outcomes The student will be able to		**Cognitive Level**
CO1	Engage in Industrial activity which is a community service.	U
CO2	Prepare the project report, three-minute video and the poster of the work.	Ap
CO3	Identify and specify an engineering project/product that can make their life comfortable.	An
CO4	Prepare a business plan for a commercial venture of the proposed project/product together with complying to relevant norms.	Ap
CO5	Identify the community that shall benefit from the project /product.	E

During semester breaks, students are encouraged to engage in industrial training or undergo internship in an industry related to the field of study. The duration of the activity shall be of 4 to 6 weeks. The work carried out in the semester break is assessed through an oral seminar accompanied by a written report. It is expected that this association will motivate the student to develop simple project/product to make their life comfortable and convert new ideas into project/product .

Every student is required to complete 4 to 6 weeks of internship (with about 40 hours per week), during the Summer/Winter semester breaks. The Internships are evaluated through Internship Reports and Seminars during the VI and VIII semesters. The internships can be taken up in an industry, a government organization, a research organization or an academic institution, either in the country or outside the country, that include activities like:

- Successful completion of Internships/ Value Added Programs/Training
- Programs/ workshops organized by academic Institutions and Industries
- Soft skill training by the Placement Cell of the college
- Active association with incubation/ innovation /entrepreneurship cell of the institute;
- Participation in Inter-Institute innovation related competitions like Hackathons
- Working for consultancy/ research project within the institutes
- Participation in activities of Institute's Innovation Council, IPR cell, Leadership
- Talks, Idea/ Design/ Innovation contests
- Internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises
- Development of a new product/ business plan/ registration of a start-up

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1						2								
2										3				
3		2												
4							2	3			2			
5						2			2					2
CO (W.A)		**2**				**2**	**2**	**3**	**2**	**3**	**2**			**2**

22ITD01- Project Work - I					
		L	T	P	C
		0	0	20	10
PRE-REQUISITE :NIL					
Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**		
CO1	Engage in independent study to research literature in the identified area and consolidate the literature search to identify and formulate the engineering problem.	Ap	20 % - First Review (Internal)		
CO2	Prepare the Gantt Chart for scheduling the project , engage in budget analysis, and designate responsibility for every member in the team and identify the community that shall benefit through the solution to the identified research work and also demonstrate concern for environment	Ap, E	20 % - Second Review (Internal)		
CO3	Identify, apply the mathematical concepts, science concepts, and engineering concepts necessary to implement the identified engineering problem, select the engineering tools /components required to reproduce the identified project, design, implement, analyze and interpret results of the implemented project	Ap, An, C	20% - Third Review (External)		
CO4	Engage in effective written communication through the project report, the one-page poster presentation, and preparation of the video about the project and the four page IEEE format of the work and effective oral communication through presentation of the project work and demonstration of the project.	E	20 % - Final Review (External)		
CO5	Perform in the team, contribute to the team and mentor/lead the team, demonstrate compliance to the prescribed standards/ safety norms and abide by the norms of professional ethics and clearly specify the outcome of the project work (leading to start-up/ product/ research paper/ patent)	Ap, An	20% - Final Review (External)		

DESCRIPTION
Project work may be allotted to a single student or to a group of students not exceeding 3 per group. The title of project work is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide. The Head of the department shall constitute a review committee for project work. There shall be three reviews during the semester by the committee to review the progress. Student(s) shall make presentation on the progress made by him / her / them before the committee and evaluation is done as per Rules and Regulations
TOTAL (P: 300) = 300 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1		3										3	3	3
2						3	3				3		3	3
3	3	3	3	3	3								3	3
4								3		3			3	3
5									3		3	3	3	3
CO (W.A)	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

22ITX01 - DEEP LEARNING *(Common to 22AIC13,22CSX01,22CIX13)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To understand and apply deep learning techniques to support real-time applications.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concepts of neural networks and deep learning.	Ap	20%
CO2	Categorize the types of auto encoders in frameworks.	An	20%
CO3	Demonstrate the hardware support and frameworks (Keras - PyTorch) in Boltzmann machines model.	Ap	20%
CO4	Apply the concepts of CNN and RNN.	An	40%
CO5	Build the Recurrent Neural Network to model the sequence data.	C	Internal Assessment

UNIT I –NEURAL NETWORKS	**(9)**
Introduction – Basic Architecture of Neural Networks – Training Neural Network with Backpropagation – Practical Issues in Neural Network Training - Power of Function Composition – Common Neural Architectures – Neural Architectures: Binary Classification Models – Multiclass Models. Introduction to Deep Learning	
UNIT II –AUTOENCODER AND FRAMEWORKS	**(9)**
Introduction to Autoencoder – Features of Autoencoder - Types of Auto Encoder: Vanilla Autoencoder – Multilayer Autoencoder – Stacked Autoencoder – Deep Autoencoder – Denoising Autoencoder - Convolutional Autoencoder – Regularization in Autoencoder – Open Source Frameworks: SciPy – TensorFlow – Keras - PyTorch	
UNIT III – BOLTZMANN MACHINES AND HARDWARE SUPPORT	**(9)**
Boltzmann Machine: Relation to Hopfield Networks. RBM Architecture: Energy Based Model – Gibbs Distribution – Gibbs Sampler – Contrastive Divergence – Example – Types of RBM – Hardware support for Deep Learning.	
UNIT IV – CONVOLUTION NEURAL NETWORKS	**(9)**
Convolution Network – Components of CNN Architecture - Rectified Linear Unit(ReLU)Layer- Exponential Linear Unit (ELU or SELU) - Unique Propertied of CNN - Architectures of CNN – Application of CNN – Case studies: Image Classification using CNN - Visual Speech Recognition using 3D-CNN	

UNIT V – RECURRENT NEURAL NETWORKS	(9)
RNN versus CNN – Feedforward Neural Network versus RNN. - Simple Recurrent Neural Network : training an RNN – Backpropagation Through time (BPTT) – RNN Topology – Challenges with Vanishing Gradients – Bidirectional and Stateful RNNs – Long Short term memory(LSTM) – LSTM Implementation – Gated Recurrent Unit (GRU) – Deep Recurrent Neural Network.- Case studies: Stock Market Prediction Using RNN – Next Word Prediction Using RNN-LSTM.- Tamil Handwritten Character Optical Recognition Using CRNN	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Aggarwal, Charu C, "Neural Networks and Deep learning", 2ndEdition, Springer Cham, 2023.
2. Lovelyn, S., Rose, L. Ashok kumar, D. KarthikaRenuka, Deep Learning using Python, Wiley India Pvt. Ltd., First Edition, 2019.

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courvill, "Deep Learning", 1 st Edition, MIT Press, USA, 2018.
2. Josh Patterson and Adam Gibson,"Deep Learning–A Practitioner"s Approach",1st Edition,O"ReillySeries,August2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3			3									3
3	3		3		3									
4	3												3	
5					3				3	3				
CO (W.A)	**3**	**3**	**3**		**3**				**3**	**3**			**3**	**3**

22ITX02 - KNOWLEDGE ENGINEERING *(Common to 22AIX01,22CSX02 and 22CCX21)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE-REQUISITE : NIL				
Course Objective:	To implement various techniques for knowledge acquisition and representation.			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply knowledge representation with production rules.	Ap	20%
CO2	Implement SLD derivations with horn clauses.	An	20%
CO3	Apply reasoning with inheritance network and default logic.	Ap	20%
CO4	Apply subjective probability with actions and planning.	Ap	20%
CO5	Perform object oriented representation using frames	Ap	20%

UNIT I – INTRODUCTION	**(9)**
Knowledge Representation and Reasoning – Syntax, Semantics, Pragmatics, Explicit and Implicit Belief - Expressing Knowledge – Resolution: Propositional Case-Handling Variables and Quantifiers-Dealing with Computational Intractability	
UNIT II – HORN CLAUSES	**(9)**
Horn Clauses-SLD Resolution-g SLD Derivations-Procedural Control of Reasoning - Rules in Production Systems: Production Rules- Conflict Resolution- Applications and Advantages	
UNIT III – OBJECT-ORIENTED REPRESENTATION	**(9)**
Objects and Frames-Frame Formalism-Frames to Plan a Trip-Beyond the Basics-Structured Descriptions-A Description Language-Meaning and Entailment-Computing Entailments-Taxonomies and Classification	
UNIT IV – INHERITANCE AND DEFAULTS	**(9)**
Inheritance Networks-Strategies for Defeasible Inheritance-A Formal Account of Inheritance Networks-Defaults: Introduction-Closed-World Reasoning-Circumscription-Default Logic-Autoepistemic Logic	
UNIT V – VAGUENESS, UNCERTAINTY AND DEGREES OF BELIEF	**(9)**
Noncategorical Reasoning-Objective Probability-Subjective Probability-Vagueness-Diagnosis-Explanation-Actions-Planning- Tradeoff between Expressiveness and Tractability.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:
1. Ronald J. Brachman, Hector J. Levesque," Knowledge Representation and Reasoning", Morgan Kaufmann, 2004. 2. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, "Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning", Cambridge University Press, First Edition, 2016.
REFERENCES:
1. John F. Sowa," Knowledge Representation: Logical, Philosophical, and Computational Foundations", Brooks/Cole, Thomson Learning, 2000 2. Ela Kumar," Knowledge Engineering", I K International Publisher House, 2018.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3											3	
2		3	3											
3	3												3	
4	3												3	
5	3													
CO (W.A)	**3**	**3**	**3**										**3**	

22ITX03 - RECOMMENDER SYSTEMS *(Common to 22AIX02,22CSX03,22CIX14)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To learn the significance of machine learning algorithms for Recommender systems.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the concepts and applications of recommender systems.	Ap	20%
CO2	Analyze various collaborative filtering models in content based recommendation.	An	20%
CO3	Conduct investigation about the issues in recommender system and experimental setup.	Ap	20%
CO4	Apply Recommendation system properties in IPVT.	Ap	20%
CO5	Implement the knowledge sources and recommendation types.	Ap	20%

UNIT I – INTRODUCTION	**(9)**
Introduction - Recommender Systems Function - Data and Knowledge Sources - Recommendation Techniques - Application and Evaluation - Applications of recommendation systems - Issues with recommender system.	
UNIT II – CONTENT-BASED RECOMMENDATION	**(9)**
High level architecture of content-based systems - Advantages and drawbacks of content based filtering- Item Representation - Learning User Profiles and Filtering - Trends and Future Research - Neighborhood-based Recommendation - Components of Neighborhood Methods.	
UNIT III – COLLABORATIVE FILTERING	**(9)**
Preliminaries: Baseline predictors - The Netflix data - Implicit feedback - Matrix factorization models - Neighborhood models - Enriching neighborhood models - Between neighborhood and factorization - Constraint-based Recommenders.	
UNIT IV – CONTEXT-AWARE RECOMMENDER SYSTEMS	**(9)**
Context in Recommender Systems - Paradigms for Incorporating Context in Recommender Systems - Combining Multiple Approaches – Case Studies - Additional Issues in Context-Aware Recommender Systems- Evaluating Recommender Systems: Experimental Settings - Recommendation System Properties.	

UNIT V – IPVT, MATCHING RECOMMENDATION TECHNOLOGIES	(9)
IPTV Architecture - Recommender System Architecture- Recommender Algorithms- Recommender Services – System Evaluation - Knowledge Sources – Domain - Knowledge Sources - Mapping Domains to Technologies.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Francesco Ricci , Lior Rokach , Bracha Shapira , "Recommender Sytems Handbook", 1st ed, Springer (2011)
2. Charu C. Aggarwal, "Recommender Systems: The Textbook", First Ed., Springer, 2016.

REFERENCES:

1. Manouselis N., Drachsler H., Verbert K., Duval E., "Recommender Systems for Learning", Springer, 1st Edition, 2013.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich, "Recommender Systems: An Introduction", Cambridge University Press (2011), 1st ed.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3												
3	3			3										
4	3												3	
5	3	3												3
CO (W.A)	**3**	**3**		**3**									**3**	**3**

22ITX04 - SOFT COMPUTING (*Common to 22AIX03,22CSX04)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE-REQUISITE :				
Course Objective:	To learn and understand soft computing concepts and Fuzzy inference systems.			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Make use of the soft computing concepts along with its architecture	Ap	20%
CO2	Apply the techniques of back propagation network along with its parameter tuning.	Ap	20%
CO3	Interpret the fuzzy logics to solve the neural network problems	Ap	20%
CO4	Utilize the genetic algorithm techniques to obtain the optimized solution	Ap	20%
CO5	Illustrate the working of hybrid soft computing and to solve real world problems	An	20%

UNIT I –INTRODUCTION	**9**
Introduction to Soft Computing-Soft Computing Constituents-From Conventional AI to Computational Intelligence- Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks - basic models - important technologies – applications.	
UNIT II –NEURAL AND BACKPROPAGATION NETWORK	**9**
Back propagation Neural Networks -single layer artificial neural network- Back propagation learning model for Multilayer Perceptron-Back propagation learning- Neural Networks- Kohonen Neural Network - Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network -Applications-Effect of tuning parameters of Backpropagation neural network- Unsupervised Learning Neural Networks.	
UNIT III-FUZZY LOGIC	**9**
Fuzzy set theory- Introduction to Fuzzy Logic- Fuzzy Sets - Classical Relations and Fuzzy Relations-Fuzzyversus Crisp-crisp set: operations on Crisp sets-Properties of Crisp sets- partition and covering-membership function-basic fuzzy set operations-properties of fuzzy sets-Crisp relations: Cartesian product-other crisp relations.	
UNIT IV – GENETIC ALGORITHMS	**9**
History –Basic Concepts-Creation of offspring-Working principle- Encoding-Fitness Function- Population initialization and selection methods - Evaluation function - Operators - Cross Over - Inversion and Deletion -Mutation Operator- Generational Cycle-Bit-wise Operators -Convergence of Genetic Algorithm.	

UNIT V – HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS	9
Hybrid systems-Neural networks, fuzzy logic and genetic algorithms hybrids-GA Based Weight Determination –Fuzzy backpropagation networks-Simplified fuzzy ARTMAP-Fuzzy associative memories-Soft computing tools-Fuzzy constrains-Fuzzy logic controller.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS

1. S. Rajasekharan& G. A. VijayalakshmiPai, "Neural Networks, Fuzzy Systems and Evolutionary algorithms: synthesis and applications", 2nd Edition, Prentice Hall of India, New Delhi, 2018.
2. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
3. 2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2019.

REFERENCE

1. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3		3								3	
2	3	3			3									3
3			3	3									3	
4		3		3									3	
5				3	3									3
CO (W.A)	**3**	**3**	**3**		**3**								**3**	**3**

22ITX05 - COMPUTER VISION *(Common to 22AIX05,22CSX05,22CIX16,22CCX23)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :NIL					
Course Objective:	To impart knowledge and understanding about the application of algorithms and techniques used to interpret and analyze visual data from the world.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Implement image processing techniques for feature extraction and enhancement in computer vision applications.	Ap	30%
CO2	Analyze object detection and recognition systems using various techniques.	An	20%
CO3	Make use of the optimization technique for image alignment and geometric transformations.	Ap	30%
CO4	Apply deep learning models to synthesize images for advanced photography techniques.	An	20%
CO5	Build an innovative solution for immersive rendering techniques in virtual reality.	C	Internal Assessment

UNIT I –INTRODUCTION	**9**
Introduction-Image Formation: Geometric primitives and transformations-Photometric image formation-The digital camera-Image processing: Point operators-Linear filtering -Fourier transforms -Geometric transformations.	
UNIT II – RECOGNITION &FEATURE DETECTION AND MATCHING	**9**
Instance Recognition-Image Classification-Object detection-Semantic segmentation-Points and patches-Edges and contours-Contour tracking-Lines and vanishing points-Segmentation.	
UNIT III – IMAGE ALIGNMENT AND STITCHING & STRUCTURE FROM MOTION	**9**
Pairwise alignment-Image stitching-Geometric Intrinsic calibration-pose estimation-Two-frame structure from motion-Multi-frame structure from motion-Simultaneous localization and mapping(SLAM):"Enhancing Autonomous Navigation: A Case Study on SLAM Implementation"	
UNIT IV – COMPUTATIONAL PHOTOGRAPHY & DEPTH ESTIMATION	**9**
Photometric calibration-High dynamic range imaging-Super-resolution:"Advancing Image Clarity: A Case Study on Super-Resolution Techniques"-denoising-blur removal-Image matting and compositing-Epipolar geometry-Sparse correspondence-Dense correspondence-Local methods-Global optimization-Multi-view stereo	

UNIT V – 3D RECONSTRUCTION & IMAGE-BASED RENDERING	9
Shape from X-3D Scanning-Surface representation-Point-based representation-Volumetric representation-GAN:Generative Adversarial Networks-Vision Transformation-Light fields and Lumigraphs:"Case study on Immersive Rendering in VR"-Video-based rendering:"Case study on Dynamic Scene Reconstruction Techniques".	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
2. E. R. Davies,"Computer Vision: Principles, Algorithms, Applications, Learning",Cambridge University Press,recent edition,2022.

REFERENCES

1. Simon J.D. Prince,"Computer Vision: Models, Learning, and Inference" ,2nd edition, Cambridge University Press.2012.
2. David A. Forsyth and Jean Ponce,"Computer Vision: A Modern Approach" , published by Prentice Hall,recent edition 2022.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3												
2					3									
3			3											
4				3										
5							3	3	3		3			3
CO (W.A)		**3**	**3**	**3**	**3**		**3**	3	**3**		**3**			**3**

22ITX06 - ETHICS OF AI *(Common to 22AIX06,22CSX06,22CIX17)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To Learn about the Ethical initiatives in the field of artificial intelligence and reach AI standards and Regulations				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply about morality and ethics in AI	Ap	20%
CO2	Evaluate the knowledge of real time application ethics, issues and its challenges.	Ap	20%
CO3	Analysis the ethical harms and ethical initiatives in AI	An	20%
CO4	Apply AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems	Ap	20%
CO5	Apply the societal issues in AI with National and International Strategies on AI	Ap	20%

UNIT I –INTRODUCTION	**9**
Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust.	
UNIT II –ETHICAL INITIATIVES IN AI	**9**
International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles, Warfare and weaponization.	
UNIT III – AI STANDARDS AND REGULATION	**9**
Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems	
UNIT IV – ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS	**9**
Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.	
UNIT V – AI AND ETHICS- CHALLENGES AND OPPORTUNITIES	**9**
Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI. Chat gpt basics, prompt engineering.	
TOTAL= 45 PERIODS	

TEXT BOOKS

1. Y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2. Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES

1. Paula Boddington ,"Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms)" , November 2017
2. Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1								3						3
2	2						2	3						3
3							2	3						3
4	3					2		3						3
5								3						3
CO (W.A)	**2.5**					**2**	**2**	**3**						**3**

22ITX07 - BUSINESS INTELLIGENCE *(Common to 22AIX07,22CSX07,22CCX28)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To understand the effect of Business Intelligence (BI) on an organization				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Use of the knowledge of Business Intelligence in solving problems.	U	20%
CO2	Apply the concepts of Data visualization and Visual analytics.	Ap	20%
CO3	Able to apply data mining tools.	Ap	20%
CO4	Demonstrate the text analytics, text mining and sentiment analysis.	An	20%
CO5	Develop web mining.	C	20%

UNIT I –BUSINESS INTELLIGENCE – INTRODUCTION	**9**
A Frame work for Business Intelligence (BI)- The Architecture of BI - Benefits of business intelligence- Business intelligence VS competitive intelligence and knowledge management. Data Warehousing- Characteristics of Data Warehousing- Data Marts- Data warehousing process- Data warehousing Architectures – Data Integration and the Extraction, Transformation and Load (ETL) Process OLAP Versus OLTP- Data warehousing implementation issues – Real time data warehousing.	
UNIT II – BUSINESS REPORTING, VISUAL ANALYTICS AND BUSINESS PERFORMANCE MANAGEMENT	**9**
Data and Information Visualization – Different types of Charts and Graphs- Emergence of Data visualization and Visual analytics - Performance Dashboard - Balance Score Cards – Dashboards Versus Scorecards - Six Sigma as a performance measurement system.	
UNIT III – DATA MINING – SUPERVISED LEARNING, AND UNSUPERVISED LEARNING	**9**
Data mining concepts and applications – Data mining process – Data mining methods – Classification techniques – Decision trees, Case studies. Cluster Analysis – Partition and Hierarchical methods, Association rule mining –Data mining software Tools - Case studies.	

UNIT IV – TEXT ANALYTICS, TEXT MINING AND SENTIMENT ANALYSIS	9
Text analytics and Text mining concepts and definition – Text Mining Applications - Text mining process – Text mining tools – Sentiment analysis overview – Sentiment analysis applications – Sentiment analysis process, Sentiment Analysis and Speech Analytics.	
UNIT V – WEB MINING	**9**
Web mining overview – Web content and Web structure mining – Search Engines - Search Engine Optimization – Web usage mining – Web analytics maturity model and web analytics tools – Social analytics and social network analysis- Social Media Definitions and Concepts- Social Media Analytics.	
TOTAL = 45 PERIODS	

TEXT BOOKS

1. Ramesh Sharda, Dursun Delen, Efraim Turban, "Business Intelligence and Analytics", Pearson 10th edition, 2018

REFERENCES

1. Ramesh Sharda, Dursun Delen, Efraim Turban, "Business Intelligence, Analytics, and Data Science: A Managerial Perspective", 4th Edition, Pearson, 2017
2. David Loshin Morgan, Kaufman,"Business Intelligence: The Savvy Manager"s Guidell", Second Edition, 2012.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	2				3								3	
3			2		3								3	
4			3		2								3	
5			3		2								3	
CO (W.A)	**3**		**3**		**3**								**3**	

22ITX08 - ROBOTICS PROCESS AUTOMATION *(Common to 22AIX08,22CSX08,22CIX18,22CCX38)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To implement the fundamental concepts of AI in robotics and the major paradigms for achieving it.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Interpret features of an Industrial robot with end effectors	AP	20%
CO2	Identify the characteristics of Autonomy robot and use Hierarchical Paradigm for organizing intelligence in Robots.	AP	20%
CO3	Apply reactive paradigm for AI Robots	AP	20%
CO4	The students able to know the various potential areas of automation and material handling	U	20%
CO5	Design sensor and vision system for robots	An	20%

UNIT I – FUNDAMENTALS OF ROBOTICS	**(9)**
Automation and Robotics, A brief history of Robotics, The robotics market and the future prospects, Robot anatomy, Robot drive systems, Precision of Movement, Robotic sensors, Robot programming and work cell control, Robot applications	
UNIT II – ROBOT TECHNOLOGY	**(9)**
Basic control systems concepts and models, Controllers, Control system analysis, Robot sensors and actuators, Velocity sensors, Actuators, Power transmissions systems, Modeling and control of a single joint robot, Robot motion analysis and control.	
UNIT III –ROBOT END EFFECTORS AND SENSORS	**(9)**
Types of end effectors, Mechanical grippers, other types of gripper, Tools as end effectors, The robot/end effectors interface, Considerations in gripper selection and design, Transducers and sensors, Sensors in robotics, Tactile sensors, Proximity and range sensors	

UNIT IV –MACHINE VISION AND ARTIFICIAL INTELLIGENCE	(9)
Introduction to machine vision, The sensing and digitizing functions in machine vision, Image processing analysis, Training the vision system, Robotic applications, Introduction to AI, Goals of AI research, AI techniques, AI and Robotics	
UNIT V- ROBOT APPLICATIONS IN MANUFACTURING	**(9)**
Material transfer and machine loading/unloading, Processing operations – spot welding, continuous arc welding, spray coating, other processing operations using robots, Assembly and Robotic assembly automation, Designing for robotic assembly, Inspection automation	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. M.P.Groover et al ,"Industrial robotic technology-programming and application" , Mc Grawhill 2008

REFERENCES:

1. Richared D.Klafter,Thomas Achmielewski and Mickael Negin," Robotic Engineering an Integrated approach"prentice hall India- newdelhi-2001
2. S.R. Deb, Dr Sankha Deb ,"Robotics technology and flexible automation" ,Tata McGraw-Hill Education ,2009
3. https://www.robots.com/applications

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1														
2		3												
3	3					3								3
4					3						3			
5			3						3				3	
CO (W.A)	3	3	3		3	3			3		3		3	3

22ITX11 - PATTERN RECOGNITION *(Common to 22AIX11,22CSX11,22CIX21,22CCX24)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE-REQUISITE: NIL				
Course Objective:	• To impart knowledge for solving real-world problems in fields such as computer vision, speech recognition, and bioinformatics. • To enrich the proficiency of the students in evaluating and selecting appropriate pattern recognition models based on performance metrics and domain-specific requirements.			

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply advanced probabilistic models and decision theory concepts to optimize inference.	Ap	30%
CO2	Apply supervised learning algorithms for solving problems.	An	20%
CO3	Interpret unsupervised learning techniques for clustering data.	Ap	30%
CO4	Apply graphical models and sequential data techniques to solve complex problems such as plant disease diagnosis.	Ap	20%
CO5	Evaluate proficiency in designing, training, and optimizing neural networks	E	Internal Assessment

UNIT I – INTRODUCTION	**(9)**
Probability Theory: Probability densities-Bayesian probabilities-The Gaussian distribution-Bayesian curve fitting-Model Selection-The Curse of Dimensionality-Decision Theory: Minimizing the misclassification rate-Minimizing the expected loss-The reject option-Inference and decision-Loss functions for regression-Information Theory.	
UNIT II –PROBABILITY DISTRIBUTION AND LINEAR MODELS FOR REGRESSION	**(9)**
Binary Variables-Multinomial Variables-The Gaussian Distribution-Linear Basis Function Models-Bayesian Linear Regression: Parameter Distribution-Predictive distribution-Bayesian Model Comparison-The Evidence Approximation: Evaluation of the evidence function-Maximizing the evidence function-Effective number of parameters-Limitations of Fixed Basis Functions.	
UNIT III –LINEAR MODELS FOR CLASSIFICATION	**(9)**
Discriminant Functions-Probabilistic Generative Models-Probabilistic Discriminative Models: Logistic regression-Multiclass logistic regression-Probit regression-The Laplace Approximation-Bayesian Logistic Regression:Laplace approximation-Predictive distribution	

UNIT IV –NEURAL NETWORKS AND KERNEL METHODS	(9)
Feed-forward Network Functions-Network Training-Error Backpropagation-The Hessian Matrix-Regularization in Neural Networks-Mixture Density Networks-Bayesian Neural Networks-Constructing Kernels-Radial Basis Function Networks:Nadaraya-Watson model-Gaussian Processes	
UNIT V –GRAPHICAL MODELS AND SEQUENTIAL DATA	**(9)**
Bayesian Networks-Conditional Independence-Markov Random Fields-Inference in Graphical Models-Markov Models-Hidden Markov Models-Case study on Plant Disease Diagnosis in Random Forest - Conditional Mixture Models.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS

1. Christopher M. Bishop "Pattern Recognition and Machine Learning", Springer, Second edition 2021.
2. David G.Stork, PeterE.Hart, and Richard O.Duda"Pattern Classification", published by Wiley in recent edition in 2022.

REFERENCES

1. Sergios Theodoridis and Konstantinos Koutroumbas, "Machine Learning: A Bayesian and Optimization Perspective", Academic Press,2022.
2. David J.C. MacKay,"Information Theory, Inference, and Learning Algorithms" Cambridge University Press, 2003.
3. David Barber," Bayesian Reasoning and Machine Learning",Cambridge University Press, 2012.
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 2016.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1					3									
2		3											3	
3				3									2	
4					3									2
5							2	3	3	2	2			3
CO (W.A)		**3**		**3**	**3**		**2**	**3**	**3**	**2**	**2**		**2.5**	**2.5**

22ITX12 - TEXT AND SPEECH ANALYTICS (*Common to 22AIX12,22CSX12,22CIX22),*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• To understand natural language processing basics. • To apply classification algorithms to text documents, question-answering and dialogue systems to develop a speech recognition system & speech synthesizer.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Examine the foundations of natural language processing and speech analysis	An	20%
CO2	Apply classification algorithms to text documents	Ap	20%
CO3	Analysis question-answering and dialogue systems	Ap	20%
CO4	Apply deep learning models for building speech recognition and text-to-speech systems	Ap	20%
CO5	Evaluate coreference and coherence for text processing	Ap	20%

UNIT I –INTRODUCTION	**(9)**
Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stopwords – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF mode	
UNIT II –TEXT CLASSIFICATION	**(9)**
Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Deep Learning models for text classification– Recurrent Neural Networks (RNN) – Transformers –Text summarization and Topic Models	
UNIT III – QUESTION ANSWERING AND DIALOGUE SYSTEMS	**(9)**
Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -– evaluating dialogue systems	
UNIT IV – TEXT-TO-SPEECH SYNTHESIS	**(9)**
Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility-Roboethics Taxonomy.	

UNIT V – AUTOMATIC SPEECH RECOGNITION	(9)
Named Entity Recognition (NER)-Coreference resolution-Text coherence and cohesion-Advanced sentiment analysis-Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems	
TOTAL= 45 PERIODS	

TEXT BOOKS

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022.

REFERENCES

1. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress,2018.
2. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009.
4. Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'REILLY

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											3	
2	3												3	
3		3												3
4	3				3								3	
5		3			3									3
CO (W.A)	3	3			3								3	3

22ITX13 - BIG DATA ANALYTICS *(Common to 22AIC16,22CSX13,22CIX12,22CCX25)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	● Acquire a deep understanding of big data and NoSQL. ● Develop expertise in map reduce analytics using Hadoop and related tools ● Explore the Hadoop related tools for Big Data Analytics.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Real-world datasets can be analyzed using various big data analytics tools and approaches.	An	20%
CO2	Analyze the effectiveness of numerous NoSQL databases under different loads.	An	20%
CO3	Analyze Hadoop's architecture, notably HDFS, and use this information to develop a distributed computing environment	An	20%
CO4	To address certain data processing issues, use customized mappers and reducers.	Ap	20%
CO5	Analyze data processing jobs and determine a suitable tool (Pig or Hive) based on the task criteria.	An	20%

UNIT I – UNDERSTANDING BIG DATA	**(9)**
Introduction To Big Data – Sudden Hype Around Big Data Analytics - Classification Of Analytics – Top Challenges Facing Big Data –Importance Of Big Data Analytics - Challenges Posed By Big Data - Terminologies Used In Big Data Environments – Basically Available Soft State Eventual Consistency(BASE) – Few Top Analytics Tools	
UNIT II – NOSQL DATA MANAGEMENT	**(9)**
Introduction To Nosql – Types Of Nosql Database – Use Of Nosql In Industry – Nosql Vendors – SQL Vs Nosql – Newsql – Comparison Of SQL,Nosql And Newsql - Introduction To Cassandra - Features Of Cassandra – CQL Data Types – CQLSH – CRUD – Collections – Time To Live(TTL) – Alter Commands – Import And Export – Querying System Tables	
UNIT III – BASICS OF HADOOP	**(9)**
Hadoop – Features Of Hadoop - Versions Of Hadoop – Hadoop Distributions – Hadoop Vs SQL –Cloud Based Hadoop Solution - Hadoop Introduction – RDBMS Vs Hadoop - Hadoop Overview – Use Case Of Hadoop – Hadoop Distributions – Processing Data With Hadoop – Interacting With Hadoop Ecosystem	
UNIT IV – MAP REDUCE APPLICATIONS	**(9)**
Introduction To Map Reduce –The Configuration API – Setting Up The Development Environment – Writing A Unit Test With MRUnit – Running On A Cluster- – Map Reduce Workflows–How Map Reduce Works Anatomy Of Map Reduce Job Run – Failures – Shuffle And Sort – Task Execution– Map Reduce Types And Formats - Input And Output Format – Map Reduce Features	

UNIT V – HADOOP RELATED TOOLS	(9)
Pig – Installing And Running Pig – Comparison With Databases – Pig Latin – User Defined Functions – Data Processing Operators – Hive – HiveQL – Tables – Querying Data – User-Defined Functions –Data Analytics – Multimedia - Streaming of data - Case Study: Analyzing Social Media Data	
TOTAL (L:45):45 PERIODS	

TEXT BOOKS

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 2nd Edition, Wiley, 2019. (Unit 1-4).
2. Tom White, "Hadoop: The Definitive Guide", O'Reilly Media, Inc., Fourth Edition, 2015. (Unit 5).

REFERENCES

1. EMC Education Services,"Data science and Big data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley and Sons, 2015.
2. Alan Gates, " Programming Pig Dataflow Scripting with Hadoop", O'Reilly Media, Inc, 2011.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3		3								3	
2	3	3			3									3
3			3	3									3	
4		3		3									3	
5				3	3									3
CO (W.A)	3	3	3	3	3								3	3

22ITX14 - HEALTH CARE ANALYTICS (*Common to 22Aix14,22CSX14,22CIX24,22CCX26)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	To impart knowledge on health care analytics using machine learning concepts.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply machine learning and deep learning in health care analysis.	Ap	40%
CO2	Identify the appropriate selection of data using feature selection to train a model.	Ap	20%
CO3	Develop a database for clinical support and retrieving data using NoSQL database	An	20%
CO4	Visualize preprocessing data using smart sensors.	An	20%
CO5	Prepare a mini project to predict healthcare and data analysis.	C	Internal Assessment

UNIT I – INTRODUCTION TO HEALTHCARE ANALYSIS	**(9)**
Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, weighted sum approach.	
UNIT II – ANALYTICS ON MACHINE LEARNING	**(9)**
Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves – Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit – Learn : Preprocessing , Feature Selection.	
UNIT III – HEALTH CARE MANAGEMENT	**(9)**
IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.	
UNIT IV – HEALTHCARE AND DEEP LEARNING	**(9)**
Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.	

UNIT V – CASE STUDIES	(9)
Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Chandan K.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.
2. Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.

REFERENCES:

1. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
2. Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition,Wiley, 2016.
3. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3			3									3
3	3		3											
4		3	3		3								3	
5	3				3				3	3				
CO (W.A)	3	3	3		3				3	3			3	3

22ITX15 - PREDICTIVE ANALYTICS *(Common to 22AIC15,22CSX15,22CIX25)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE :					
Course Objective:	Proficient in different predictive modeling approaches, such as regression analysis, classification, and clustering.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the performance of predictive analytics using appropriate metrics and understand the implications of these metrics.	An	20%
CO2	Apply data preparation and rules in predictive analytics to interpret the results in meaningful ways.	Ap	20%
CO3	Analyze and interpret the outputs of predictive models to generate actionable insights	An	20%
CO4	Analyze different predictive models to determine the most suitable model for a given problem based on performance metrics	An	20%
CO5	Apply techniques to collect text data from various sources of text mining	Ap	20%

UNIT I –INTRODUCTION TO PREDICTIVE ANALYTICS	**(9)**
Overview of Predictive Analytics-Setting Up the Problem-Data Understanding-Single Variable Summaries - Data Visualization in One Dimension, Two or Higher Dimensions-The Value of Statistical Significance-Pulling it all together into a Data Audit	
UNIT II –DATA PREPARATION AND ASSOCIATION RULES	**(9)**
Data Preparation-Variable Cleaning-Feature creation-Item sets and Association rules-Terminology-Parameter settings-How the data is organized-Measures of Interesting rules-Deploying Association rules-Problems with Association rules-Building Classification rules from Association rules	
UNIT III – MODELING	**(9)**
Descriptive Modeling-Data Preparation issues with Descriptive modeling-Model Selection-Principal Component analysis-Clustering algorithms-Interpreting Descriptive models-Standard cluster model interpretation	
UNIT IV – PREDICTIVE MODELLING	**(9)**
Decision Trees-Logistic Regression-Neural Network Model-K-Nearest Neighbors-Naive Bayes -Regression Models- Linear Regression-Building Neural Networks using XLMiner-Other Regression Algorithms	

UNIT V – TEXT MINING	(9)
Motivation for Text Mining-A Predictive modeling approach to Text Mining-Structured vs. Unstructured data-Why Text mining is hard-Data Preparation steps-Text mining features-Modeling with Text mining features-Regular Expressions - Web mining - Text Mining vs. Web Mining - Case studies:-Survey Analysis	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS

1. Dean Abbott, "Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst", Wiley, 2014.(Unit 1-5)
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012

REFERENCES

1. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
2. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014
3. Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, Wiley, 2017.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3												
2		3	3											3
3		3	3	3									3	
4		3	3	3									3	
5	3								3					
CO (W.A)	3	3	3	3					3				3	3

22ITX16 - IMAGE AND VIDEO ANALYTICS *(Common to 22AIX16,22CSX16,22CIX26,22CCX27)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : Nil					
Course Objective:	To provide a broad view on processing and analyzing images and videos.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the image processing techniques for image and video analysis.	Ap	20%
CO2	Use image pre-processing techniques for object detection.	Ap	20%
CO3	Apply the various levels of segmentation and interpret the results for object detection.	Ap	20%
CO4	Apply recognition and machine learning techniques.	Ap	20%
CO5	Make use of video analysis for real time case studies.	An	20%

UNIT I - INTRODUCTION	**(9)**
Computer Vision – Image representation and image analysis tasks - Image representations – Digitization- Digital image properties- color images- Linear integral transforms- Images as stochastic processes- Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.	
UNIT II - IMAGE PRE-PROCESSING	**(9)**
Pixel brightness transformations – Geometric transformations-Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-spectral images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.	
UNIT III - OBJECT DETECTION USING MACHINE LEARNING	**(9)**
Object detection– Object detection methods – Deep Learning framework for Object detection– Bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-Fast R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Single Shot MultiBox Detector(SSD)-Transfer Learning-Python Implementation.	
UNIT IV - FACE RECOGNITION AND GESTURE RECOGNITION	**(9)**
Face Recognition- Applications of Face Recognition-Process of Face Recognition-Deep Face solution by Face book- FaceNet for Face Recognition- Python Implementation using FaceNet-Python Solution for Gesture Recognition.	

UNIT V - VIDEO ANALYTICS	(9)
Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-ResNet architecture- ResNet and skip connections-Inception Network- GoogLENet architecture-Improvement in Inception v2-Video analytics-Python Solution using ResNet and Inception v3.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4th edition, Thomson Learning, 2013. (UNIT-I and II)
2. Vaibhav Verdhan," Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras", Apress 2021(UNIT-III,IV and V)

REFERENCES:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011.
2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
3. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3				3								3	
3	3												3	
4	3													3
5		3	3		3									3
CO (W.A)	3	3	3		3								3	3

22ITX17 - NATURAL LANGUAGE PROCESSING (*Common to 22AIX17,22CSX17,22CIX27)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :					
Course Objective:	To learn and understand syntactic and semantic elements of NLP and knowledge representation and interface.				

Course Outcomes **The Students will be able to**		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Summarize the concepts in speech and language processing and utilize regular expressions and other statistical methods to create Language Models.	Ap	20%
CO2	Apply Vector Embedding to words and build Neural Language models.	Ap	20%
CO3	Solve sequence labeling problems (Named Entity Tagging and POS tagging) using RNN and LSTM.	An	20%
CO4	Apply the Machine translation model to dialogue systems.	Ap	20%
CO5	Illustrate the working of Automatic speech recognition and information retrieval.	Ap	20%

UNIT I –FUNDAMENTALS OF NATURAL LANGUAGE PROCESSING	**(9)**
Regular Expressions, Text normalization, Edit Distance-.N-gram language models:N-grams-Evaluating language models: training and test sets-perplexity-Sampling sentences from a language model-Generalization and Zeros-Smoothing-Native bayes,text classification and sentiment-Logistic regression	
UNIT II –VECTOR SEMANTICS AND NEURAL NETWORK MODELS	**(9)**
Lexical Semantics – Vector Semantics – Words and Vectors – Cosine for measuring similarity – TF-IDF: weighing terms in vectors – pointwise Mutual Information (PMI) – Applications of TF-IDF and PPMI – Visualizing embeddings-Neural Network Language Models – Units – XOR problem – Feed Forward Neural Networks – Training Neural Nets – Neural Language Models.	
UNIT III – SEQUENCE LABELING AND DEEP LEARNING ARCHITECTURES	**(9)**
English word classes –Part-of-Speech (PoS) Tagging – Named Entities and Named Entities Tagging – HMM PoS – Conditional Random Fields – Evaluation of Named Entity Recognition-RNN and LSTMs-.Transformers and large language models-Fine tuning and masked language models.	
UNIT IV – MACHINE TRANSLATION (MT) AND DIALOGUE SYSTEMS	**(9)**
Language divergences and Typology – Machine translation using Encoder-Decoder model –Encoder-Decoder–Beam search-Translating in low resource situations- MT evaluation – Bias and ethical issues-properties of human conversations-Frame based dialogue systems-Dialogue acts and dialogue state.	

UNIT V –AUTOMATIC SPEECH RECOGNITION AND INFORMATION RETRIEVAL	(9)
The Automatic Speech Recognition Task -Feature Extraction for ASR: Log Mel Spectrum -Speech Recognition Architecture-CTC and TTS -Information Retrieval -Information Retrieval with Dense Vector-Evaluating Retrieval-based Question Answering-Context free grammars and constituency parsing-Dependency parsing-Information extractions-Semantic role labeling.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS

1. Daniel Jurafsky and James H.Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition" (Prentice Hall Series in Artificial Intelligence), 2020
2. Christopher D. Manning and Hinrich Schuetze ,"Foundations of Statistical Natural Language Processing", MIT Press, 2018

REFERENCES

1. Jacob Eisenstein. "Natural Language Processing ", MIT Press, 2019
2. Samuel Burns "Natural Language Processing: A Quick Introduction to NLP with Python and NLTK", 2019

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3			3									3
3	3		3											
4		3	3		3								3	3
5	3		3		3				3	3				
CO (W.A)	3	3	3		3				3	3			3	3

22ITX18 - AUGUMENTED REALITY AND VIRTUAL REALITY *(Common to 22AIX18,22CSX18,22CIX28)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PREREQUISITE :NIL

Course Objective:	To impart the knowledge of Exploring the design, development, and applications of augmented reality and virtual reality technologies.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply principles of virtual reality and commercial VR technologies.	Ap	30%
CO2	Analyze the classic components of a VR system through hands-on experimentation and simulation.	An	20%
CO3	Make use of diverse modeling techniques with real-world sensor data.	Ap	30%
CO4	Evaluate the solution to enhance VR user experience and safety in diverse fields.	E	20%
CO5	Create VR applications by utilizing VR programming tools.	C	Internal Assessment

UNIT I - INTRODUCTION	**(9)**
The three I's of virtual reality, commercial VR technology and the five classic components of a VR system, Augmented Reality and Tele presence.	
UNIT II -INPUT AND OUTPUT DEVICES	**(9)**
Input Devices : Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays& haptic feedback.	
UNIT III –MODELING	**(9)**
Geometric modelling, kinematics modelling, physical modelling, behaviour modelling, model management and Modelling real-life from sensors.	
UNIT IV - HUMAN FACTORS	**(9)**
Methodology and terminology, user performance studies, VR health and safety issues. Applications: Medical applications, military applications, robotics applications, Virtual product design (CAD display, process simulation, virtual prototyping) ,Enhancing Training and Skill Development in Healthcare Using AR and VR: A Case Study on Simulation-Based Learning	

UNIT V -VR PROGRAMMING	(9)
VR Programming-I: Introducing Unity 3D, Project panel, Scene hierarchy, Simple game object, Scene editor: A case study on Developing and Evaluation of a Simple Game Object and Scene Editor for Indie Game Developers VR Programming-II: Middle VR, device management, graphics card limitation, 3D user interactions, deployment, VR software: A case study on the Impact of Unreal Engine in Architectural Visualization: A Case Study of VR Integration in Real Estate Marketing.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Gregory C. Burdea& Philippe Coiffet, "Virtual Reality Technology", John Wiley & Sons, Inc., Second Edition,2006

REFERENCES:

1. Grigore C. Burdea and Philippe Coiffet ,"Virtual Reality Technology",January 2022.
2. Harry F. Shneider ,"Virtual Reality Technology and Applications",FirstEdition,2018.
3. Philippe Fuchs, Pascal Guitton, and Guillaume Moreau ,"Virtual Reality: Concepts and Technologies", First Edition,2011.
4. Philippe Fuchs, Patrick Reignier, and Fabien Lotte ,"Human Factors in Augmented Reality Environments", First Edition,2020.
5. Jessica Plowman ,"Unreal Engine Virtual Reality Quick Start Guide: Design and Develop immersive virtual reality experiences with Unreal Engine 4", First Edition,2019

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3			3		3								3	
4			3										3	
5					3		3		3	2		3		3
CO (W.A)	3	3	3		3		3		3	2		3	3	3

22ITX21 - FUNDAMENTALS OF CRYPTOGRAPHY AND NETWORK SECURITY *(Common to 22CSX21)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : 22ITC07					
Course Objective:	To understand basics of Cryptography and Network Security and to learn about how to maintain the Confidentiality, Integrity and Availability of a Data.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Interpret the basic principles of cryptography and general cryptanalysis	Ap	20%
CO2	Classify the encryption techniques and identify the use of public key encryption, digital signatures, and key establishment.	An	20%
CO3	Design a model for achieving Data Integrity using key management techniques and authentication.	Ap	20%
CO4	Describe how trust can be demonstrated in the underlying protocols of modern systems and evaluate the security techniques	An	40%
CO5	Apply security practices for real time applications.	Ap	Internal Assessment

UNIT I - INTRODUCTION TO CRYPTOGRAPHY	(9)
Introduction to Cryptography, Security Threats, Vulnerability, Services, Mechanisms and attacks – the OSI security architecture – Network Security model- Conventional Encryption Model- CIA model - Classical Cryptography: Dimensions of Cryptography, - Classical Encryption techniques (Symmetric cipher, Substitution techniques, transposition techniques, Stegnography).	
UNIT II - SYMMETRIC AND ASYMMETRIC CIPHERS	(9)
Block Ciphers (DES, AES): Feistal Cipher Structure, Simplifies DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations- Public-Key Cryptography: Principles of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie- Hellman Key Exchange.	
UNIT III – CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS	(9)
Hash and MAC Algorithms: Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures	
UNIT IV - MUTUAL TRUST AND USER AUTHENTICATION	(9)
Key Management and Key Distribution: Symmetric Key distribution using symmetric and asymmetric encryption – Distribution of Public keys – x.509 certificate – Public key Infrastructure – remote user authentication Principles – remote user authentication using Symmetric and Asymmetric encryption- Kerberos – Federated Identity Management – Personal Identity Verification.	

UNIT V - SECURITY IN NETWORKS	(9)
IP Security and Key Management-Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management. Web and System Security-Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security",7th Edition ,Pearson Education, New Delhi, 2017.

REFERENCES:

1. Behrouz A. Ferouzan , Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw-Hill Education, India, 2015.
2. Charles P. Fleeger, "Security in Computing" ,5th Edition, Prentice Hall of India, New Delhi 2015.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3		3									3
4				3									3	
5						3						3		3
CO (W.A)	3	3	3	3	3	3						3	3	3

22ITX22 – ETHICAL HACKING
(Common to 22CSX22,22CIX32,22CCC14)

L	T	P	C
3	0	0	3

PRE-REQUISITE :NIL

Course Objectives :	• To provide a comprehensive understanding of computer-based vulnerabilities, including various kinds of malware and attacks, and to explore tools and techniques for foot printing, social engineering, port scanning, and ping sweeping. • The course aims to equip students with practical skills in ethical hacking to identify and expose system vulnerabilities.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze and gain knowledge on the basics of computer- based vulnerabilities	Ap	20%
CO2	Demonstrate and analyze the network and vulnerability attacks in system.	An	20%
CO3	Investigation about foot printing, reconnaissance and scanning methods using tools	Ap	20%
CO4	Analyze the basics of scanning methodologies and exploitation techniques using modern tools	An	20%
CO5	Perform in a team to identify the options for network protection and firewall protection in ethical hacking.	Ap	20%

UNIT I - INTRODUCTION	**(9)**
Ethical Hacking Overview - Role of Security and Penetration Testers - Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer- The Internet Layer - IP Address	
UNIT II - NETWORK AND COMPUTER ATTACKS	**(9)**
Network and Computer Attacks - Malware - Protecting Against Malware Attacks. - Intruder Attacks -Denial-of-Service Attacks- Distributed Denial-of-Service Attacks-- Buffer Overflow Attacks- Ping of Death Attacks - Session Hijacking-Addressing Physical Security- Key loggers	
UNIT III - FOOT PRINTING AND SOCIAL ENGINEERING	**(9)**
Web tools for Foot printing , Competitive Intelligence - Analyzing a Company's Web Site-Using Other Foot printing Tools-Using E-mail Addresses-Using HTTP Basics-Other Methods of Gathering Information-Using Domain Name System Zone Transfers .-Introduction to Social Engineering-The Art of Shoulder Surfing-The Art of Dumpster Diving-The Art of Piggybacking-Phishing	

UNIT IV - PORT SCANNING	(9)
Introduction to Port Scanning- Types of Port Scans - Port-Scanning Tools – N map- Unicorns can — Nessus and Open VAS-Ping Sweeps - Fping - Hoping-Crafting IP Packets	
UNIT V - DESKTOP AND SERVER OS VULNERABILITIES	**(9)**
Windows OS Vulnerabilities-Windows File Systems-Remote Procedure Call—NetBIOS-Server Message Block-Common Internet File System-Null Sessions-Web Services-SQL Server-Buffer Overflows-Passwords and Authentication-Tools for Identifying Vulnerabilities in Windows-Best Practices for Hardening Windows Systems	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.

REFERENCES:

1. Dr. John Smith, Dr. Emily Johnson, Dr. Mohammad Khan, A Survey of Ethical Hacking Techniques and Tools for Penetration Testing,2020
2. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3											3	3
2		3		3									3	3
3				3	3								3	3
4		3			3								3	3
5		2						3	3				3	3
CO (W.A)	**3**	**2.2**		**3**	**3**			**3**	**3**				**3**	**3**

22ITX23 – CLOUD SECURITY (*Common to 22AIX23,22CSX23,22CCX04)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :NIL					
Course Objectives :	• To introduce the fundamental concepts and architecture of cloud computing. • To understand and address security concerns, risks, and legal aspects. • To explore data security strategies and best practices for securing data in the cloud • To evaluate security criteria for building and managing private clouds and selecting external cloud service providers. • To assess and evaluate cloud security through comprehensive frameworks				
Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**		
CO1	Analyze various the concepts of cloud computing, policy and compliance in cloud environment.	An	20%		
CO2	Develop and implement secure cloud architectures, security patterns, and strategies for secure cloud operations.	Ap	20%		
CO3	Apply key strategies and best practices for managing cloud data security risks and monitoring security controls	Ap	20%		
CO4	Apply the fundamental concepts in infrastructure security facilities in cloud computing.	Ap	20%		
CO5	Implement security operations activities and architectures for efficient and secure cloud management	Ap	20%		

UNIT I - INTRODUCTION	**(9)**
Introduction to Cloud computing and security: Understanding cloud computing – The IT foundation for Cloud. An historical view: Roots of Cloud computing – A brief primer on architecture. Security architecture: Cloud computing architecture – Cloud reference architecture – Control over security in the cloud model – Making sense of cloud deployment – Making sense of services models – Real- world cloud usage scenarios.	
UNIT II - SECURING THE CLOUD	**(9)**
Security concerns – Risk issues and legal aspects – Security concerns –Assessing risk tolerance in Cloud Computing–Legal and regulatory issues–Securing the Cloud: Architecture–Security patterns and architectural element – Cloud security architecture –Planning key strategies for secure operation.	
UNIT III - CLOUD DATA SECURITY	**(9)**
Securing the cloud: Data security – Overview of data security in Cloud Computing. Data encryption: Applications and limits – Cloud data security – Sensitive data categorization – Cloud data storage – Cloud lock-in (the Roach Motel Syndrome). Securing the cloud: Key strategies and Best practices–Overall strategy– Effectively managing risk –Overview of security controls –The limits of security controls – Best practices – Security monitoring.	

UNIT IV - SECURITY CRITERIA	(9)
Security criteria: Building an internal cloud – Private clouds – Motivation and overview – Security criteria for ensuring a private cloud – Security criteria – Selecting an external cloud provider – Selecting a CSP – Overview of assurance – Selecting a CSP – Overview of risks – Selecting a CSP	
UNIT V – EVALUATING CLOUD SECURITY	**(9)**
Security criteria – Evaluating cloud security – An information security framework – Evaluating cloud security – Checklists for evaluating cloud security – Metrics for the checklists – Operating a cloud – Architecture to efficient and secure operations – Security operations activities.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Raghuram Yeluri and EnriqueCastro-Leon, Building the Infrastructure for Cloud Security: A Solutions View, A press, First Edition,2014
2. Ronald L Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley, First Edition,2010

REFERENCES:

1. Chris Dotson, Practical Cloud Security A Guide for Secure Design and Deployment, O'Reilly Media, First Edition,2019
2. Raymond Choo and Ryan Ko, The Cloud Security Ecosystem Technical, Legal, Business and Management Issues, Elsevier Science, First Edition,2015

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											3	3
2			3										3	3
3	3			3			3						3	3
4	3												3	3
5				3		3							3	3
CO (W.A)	3	3	3	3		3	3						3	3

22ITX24 - INFORMATION SYSTEM SECURITY MANAGEMENT *(Common to 22CSX24,22CCX16)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE: Nil					
Course Objective:	To focuses on the strategies and practices required to protect information systems and manage security effectively within an organization.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply theoretical knowledge to practical problems, demonstrating the ability to develop and implement security solutions based on frameworks.	Ap	20%
CO2	Analyze and explore the information security controls	An	20%
CO3	Assess and evaluate the risk management practices of information security.	Ap	20%
CO4	Identify the disasters and recovering from them with appropriate decisions.	An	20%
CO5	Apply various recovery strategies, such as data backup and restoration, alternative site arrangements, and failover solutions, to ensure effective recovery.	Ap	20%

UNIT I - INFORMATION SECURITY PRINCIPLES AND FRAMEWORK	**(9)**
Information Security- Assets and Types - Threat, Vulnerability, Risk and Impact - Information Security Policy Concepts - Need for Information Security. Organization and Responsibilities: Organizational Policy, Standards and Procedures - Information Security Governance - Information Assurance Programme Implementation - Security Incident Management - Legal Framework: Security Standards and Procedures.	
UNIT II - SECURITY LIFE CYCLE AND CONTROLS	**(9)**
Information Security Life Cycle - Testing, Audit, Review and Controls - Systems Development and Support - General Controls - People Security - User Access Controls - Technical Security - Protection from Malicious Software - Physical Security - Different Uses of Controls.	
UNIT III - SECURITY MANAGEMENT MODELS AND PERFORMANCE MEASUREMENT	**(9)**
Blueprints - Frameworks and Security Models - Security Architecture Models - Various Access Control Models - Information Security Performance Measurement.	
UNIT IV - RISK ASSESSMENT & RISK MANAGEMENT	**(9)**
Threats and its Categories - Vulnerabilities and its Categories - Risk - Calculation of Overall Risk – Risk Identification - Risk Analysis - Risk Evaluation - Risk Control - Risk Termination - Risk Reduction – Risk Transfer - Risk Tolerance - Overall Risk Assessment. Risk Management Framework and Process – Managing Risk - Risk Treatment- Alternative Risk Management Methodologies.	

UNIT V -DISASTER RECOVERY AND BUSINESS CONTINUITY MANAGEMENT	(9)
Disaster Recovery Process and policy - Relationship between Disaster Recovery and Business Continuity Management - Resilience and Redundancy - Approaches to Writing and Implementing Plans - Need for Documentation - Maintenance and Testing.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Andy Taylor, David Alexander, Amanda Finch and David Sutton, "Information Security Principles",2020, Third Edition, BCS, United Kingdom.
2. Michael E. Whitman and Herbert J. Mattord, "Management of Information Security", 2018, Sixth Edition, Cengage Learning, United States of America.

REFERENCES:

1. Calder, A., and Watkins, S. G., "Information security risk management for ISO27001/ISO27002", 2018, Third Edition, IT Governance Ltd, United States of America.
2. Susanto, H., and Almunawar, M. N, "Information security management systems: A novel framework and software as a tool for compliance with information security standards", 2018, First Edition, Apple Academic Press, New York.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3				3							2	
3	3													
4			2	3									3	
5		3												3
CO (W.A)	3	3	2	3		3							3	3

22ITX25- SOCIAL NETWORK SECURITY
(Common to 22AIX21,22CSX25,22CCX02,22CIX34)

	L	T	P	C
	3	0	0	3

PRE REQUISITE: NIL

Course Objective:	To focuses on understanding and addressing security issues related to social networking platforms, including protecting user privacy, preventing cyber threats, and managing data security.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply network analysis and explore its applications.	Ap	20%
CO2	Comprehend the role of ontologies in the Semantic Web, ontology-based knowledge representation,	An	20%
CO3	Develop skills to extract the evolution of web communities	C	20%
CO4	Predict human behavior in social communities through reality mining	An	20%
CO5	Visualizing social network on various technologies	An	20%

UNIT I - INTRODUCTION	**(9)**
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web – Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.	
UNIT II - MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION	**(9)**
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.	
UNIT III - EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS	**(9)**
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting community's social network infrastructures and communities - Decentralized online social networks - multi-relational characterization of dynamic social network communities.	

UNIT IV - PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES	(9)
Understanding and predicting human behaviour for social communities - User data management – Inference and Distribution – Enabling new human experiences-Reality Mining-Context- Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.	
UNIT - V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS	**(9)**
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover Networks-Community welfare - Collaboration networks - Co-Citation networks.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Andy Taylor, David Alexander, Amanda Finch and David Sutton, "Information Security
2. Principles",2020, Third Edition, BCS, United Kingdom. Michael E. Whitman and Herbert J. Mattord, "Management of Information Security", 2018,
3. Sixth Edition, Cengage Learning, United States of America.

REFERENCES:

1. Calder, A., and Watkins, S. G., "Information security risk management for ISO27001/ISO27002", 2018, Third Edition, IT Governance Ltd, United States of America.
2. Susanto, H., and Almunawar, M. N, "Information security management systems: A novel framework and software as a tool for compliance with information security standards", 2018, First Edition, Apple Academic Press, New York.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3											3	
3		3	3											3
4				3									3	
5							3							
CO (W.A)	3	3	3	3			3						3	3

22ITX26 - DATA PRIVACY AND PROTECTION
(Common to 22AIX24,22CSX26,22CCX06)

L	T	P	C
3	0	0	3

PREREQUISITE: NIL

Course Objective:	To provide students with a comprehensive understanding of how to safeguard personal and sensitive data from unauthorized access, breaches, and misuse.

	Course Outcomes The student will be able to	**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply knowledge on fundamental principles of Data privacy.	Ap	20%
CO2	To design and development of data preservation by using data mining.	An	20%
CO3	Ability to assess privacy risks associated with Privacy regulations.	Ap	20%
CO4	Analyses various approaches in data security by using tools.	An	20%
CO5	Apply security on storage and database.	Ap	20%

UNIT I – INTRODUCTION TO DATA PRIVACY	**(9)**
Data Privacy and its Importance - Need for Sharing Data - Methods of Protecting Data - Importance of Balancing Data Privacy and Utility – Introduction to Anonymization Design Principles - Nature of Data in the Enterprise Static Data Anonymization on Multidimensional Data: Introduction - 36 Classification of Privacy Preserving Methods - Classification of Data in a Multidimensional Data Set - Group-Based Anonymization.	
UNIT II - PRIVACY PRESERVING DATA MINING	**(9)**
Introduction - Privacy Preserving Graph Data - Privacy Preserving Time Series Data - Privacy Preservation of Longitudinal Data - Privacy Preservation of Transaction Data - Static Data Anonymization: Threats to Anonymized Data-Threats to Data Structures-Threats by Anonymization Techniques.	
UNIT III – PRIVACY REGULATIONS	**(9)**
Introduction - UK Data Protection Act 1998. - Federal Act of Data Protection of Switzerland 1992 - Payment Card Industry Data Security Standard (PCI DSS)- The Health Insurance Portability and accountabilityActof1996(HIPAA): Effects of Protection-Anonymization Considerations- Anonymization Design for HIPAA - Explicit Identifiers - Quasi-Identifiers - Sensitive Data. – Anonymization Design Checklist.	
UNIT IV - DATA SECURITY	**(9)**
Securing Unstructured Data: Structured Datavs. Unstructured Data – At Rest ,in Transit and in Use – Approaches to secure Unstructured Data–Newer Approaches to Secure Unstructured Data. Information Rights Management: Overview–IRM Technology Details – Getting Started with IRM. Encryption: History of Encryption – Symmetric Key Cryptography – Public Key Cryptography	

UNIT V - CONTEMPORARY ISSUES	(9)
Storage Security: Evolution – Modern Storage Security – Risk Remediation – Best Practices. Database Security: General Concepts – Database Security Layers – Database-Level Security – Database Backup and Recovery – Database Auditing and Monitoring	
TOTAL (L:45) = 45 PERIODS	

TEXTBOOK:

1. Venkataramanan, Nataraj, and Ashwin Shriram. Data Privacy: Principles and Practice. CRC Press, 2017

REFERENCES:

1. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, And Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.
2. David Salomon, Data Privacy and Security, Springer,2003
3. Andrew Vladimirov Michajlows ki, Konstantin, Andrew A. Vladimirov, and Konstantin V. Gavrilenko. Assessing Information Security: Strategies, Tactics, Logic and Framework. IT Governance Ltd, 2010.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3												
3		3		3									3	2
4		3			3									
5	3		3										3	2
CO (W.A)	3	3	3	3	3								3	2

22ITX27- E-COMMERCE SECURITY (*Common to 22CSX27,22CCX05)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE: NIL					
Course Objective:	To focuses on understanding and implementing security measures to protect online transactions and digital business operations.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analysis the historical context, benefits, drawbacks, and societal implications.	An	20%
CO2	Acquire knowledge of key e-commerce technologies such as symmetric and asymmetric encryption, SSL	Ap	20%
CO3	Conduct investigation about the diverse security threats inherent in e - commerce	Ap	20%
CO4	Design and develop - commerce security policies, including privacy protection, security infrastructure implementation	An	20%
CO5	Gain insight into the various threats faced by e-business	An	20%

UNIT I - INTRODUCTION	**(9)**
Introduction to e-Commerce -The Background of e-Commerce-Delimitation-Advantages and Disadvantagesofe-Commerce-Advantagesofe-Commerc-enetstoConsumers-BenetstoSo□ety- e-Commerce Disadvantages	
UNIT II - E-COMMERCE TECHNOLOGIES	**(9)**
Symmetric Encryption – Asymmetric Encryption- Secure Socket Layer – Digital Signature- Electronic Certicates - Wise Cards-Electronic Money – Characteristics of e-Commerce Technologies	
UNIT III – SECURITY THREATS TO E-COMMERCE	**(9)**
ClientDangers-CommunicationChannelPerils-ServerRisks-SecurityNecessitiesandSecurity Approach-Authentication--Privacy-Approval- Integrity	
UNIT IV – SECURITY POLICY	**(9)**
Privacy-SecurityInfrastructure-SolutionforTrust-FourTrustingConvictions-SevenBasicFactors at Influence Trust -Secure Trading for Electronic Businesses Makes Trust-Solutions for Security -Testing E-Commerce Security	
UNIT V - E-BUSINESS THREATS AND SOLUTIONS	**(9)**
E-Business Threats- Authentication Attacks-Respect ability Attacks- Secrecy Attacks-Infection-Trojan Horse-Worms-e-Business Solutions	
	TOTAL (L:45) = 45 PERIODS

TEXTBOOK:
1. Tavares, Joao Manuel R.S, "Handbook of e-business security", LCCN 2018013131 | ISBN 9781138571303,2019.
REFERENCES:
1. MehdiKhosrowpour, "E-commerce Security: Advice from Experts", Idea Group Inc(IGI),2004 2. Ronggang Zhang , Lijuan Fang , Xiaoping He , Chuan Wei, "The Whole Process of E-commerce Security Management System",February2023

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1		3											3	3
2	3												3	3
3				3									3	3
4			3										3	3
5						3							3	3
CO (W.A)	**3**	**3**	**3**	**3**		**3**							**3**	**3**

22ITX28- BIOMETRIC SECURITY (*Common to 22AIX22,22CSX28,22CCX03,22CIX35)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE REQUISITE: NIL				
Course Objective:	To provide students with a comprehensive understanding of biometric security systems, covering their design, implementation, evaluation, and applications in various security contexts.			

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the biometric systems, their functionalities, and the underlying principles and their practical Applications in real-world scenarios.	An	20%
CO2	Apply the face recognition and face detection methods.	Ap	20%
CO3	Evaluate encoding and matching algorithms used to extract distinctive features from there is for Verification purposes.	E	20%
CO4	Illustrate the architecture and components involved in capturing data from multiple biometric sources.	An	20%
CO5	Research types of attacks that can occur at the user interface level.	An	20%

UNIT I - INTRODUCTION TO BIOMETRICS	**(9)**
Biometric functionalities – Biometric system errors – The design cycle of biometric systems – Applications of biometric systems – Security and privacy issues – Fingerprint recognition – Fingerprint acquisition – Feature extraction – Fingerprint indexing – Palmprint.	
UNIT II - FACE RECOGNITION	**(9)**
Introduction to face recognition – Image acquisition–Face detection–Feature extraction and matching.	
UNIT III – IRIS RECOGNITION	**(9)**
Introduction to iris recognition – Design of an iris recognition system – Iris segmentation – Iris normalization - Irisencodingandmatching–Irisquality–Biometrictraits–Handgeometry–Softbiometrics.	
UNIT IV - MULTI-BIOMETRICS	**(9)**
Multi-biometrics – Sources of multiple evidence – Acquisition and processing architecture – Fusion levels.	
UNIT V – SECURITY OF BIOMETRIC SYSTEMS	**(9)**
Adversary attack – Attacks at the user interface – Attacks on the biometric processing – Attacks on the template database.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Anil K Jain, Arun A Ross and Karthik Nandakumar, Introduction to Biometrics, Springer, First Edition, 2011.
2. Rachid Guerraoui and Franck Petit, Stabilization, Safety, and Security of Distributed Systems, Springer, FirstEdition,2010.

REFERENCES:

1. Marcus Smith, Monique Mann and Gregor Urbas, Biometrics, Crime and Security, Taylor and Francis, First Edition, 2018.
2. Ravindra Das, The Science of Biometrics Security Technology for Identity Verification, Taylor and Francis, First Edition, 2018.

Mapping of Cos with POs/PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	3								3	
2	3			3	3								3	2
3	3			3	3									
4	3	3	3	3	3									
5	3	3		3	3	3							3	
CO (W.A)	**3**	**3**	**3**	**3**	**3**	**3**							**3**	**2**

22ITX31-INDUSTRIAL & MEDICAL IOT *(Common to 22AIX31,22CSX31,22CCX31,22CIX01)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• To provide students with good depth of knowledge of Designing Industrial and Medical IoT Systems for various applications. • Students will learn the new evolution in hardware, software, and data				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply data management techniques to analyze and manipulate IIoT data, using tools for basic analytics and mining.	Ap	20%
CO2	Analyze various attack types targeting IoMT devices and systems, demonstrating the ability to identify specific vulnerabilities in real-world scenarios.	An	20%
CO3	Apply the IoMT system architecture by designing a basic framework that includes data collection, management, and server layers, ensuring proper integration of each component.	Ap	40%
CO4	Analyze the impact of smart medicinal packages on medication adherence, examining data on patient outcomes and adherence rates.	An	20%
CO5	Analyze case studies from various industrial IoT domains, focusing on operational efficiency, safety improvements, and sustainability impacts.	An	Internal Assessment

UNIT I- INTRODUCTION TO INDUSTIAL IOT (IIOT)	**(9)**
Introduction to IIOT, History of IIOT, Components of IIOT – Sensors, Interface, Networks, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIOT in Manufacturing Processes Use of IIOT in plant maintenance practices, Sustainability through Business excellence tools Challenges & Benefits in implementing IIOT	
UNIT II – INTERNET OF MEDICAL THINGS SECURITY THREATS, SECURITY CHALLENGES AND POTENTIAL SOLUTIONS	**(9)**
IoMT Attack Types, Challenges in IoMT Security Schemes, Current Security Plans for IoMT, Potential Solutions for Security Vulnerabilities.	
UNIT III – INTERNET OF MEDICAL THINGS INTRODUCTION AND SYSTEM ARCHITECTURE	**(9)**
Introduction, IoMT Devices-On-Body Devices, In-Home Devices, Community Devices, In-Clinic Devices, In- Hospital Devices, IoMT System Architecture-Data Collection Layer, Data Management Layer, Medical Server Layer.	

UNIT IV – HEALTH CARE TECHNOLOGIES & IoMT	(9)
Home Monitoring System for Aged Care, Smart Medicinal Packages for Medication Adherence, Smart Drug Delivery System for Automated Drug Dispensation, Connected Rural Healthcare Consultation, Population and Environment Monitoring of Infectious Diseases-What are IoMT and its working? Tracking assets and resources, Internet of things in hospitals, collection and integration of clinical data, Major benefits of IoT in healthcare, Disadvantages of IoT in healthcare.	
UNIT V – APPLICATION DESIGN & CASE STUDY	**(9)**
Application Design & Case Study: Wireless Patient Monitor system, Wearable Fitness & Activity Monitor Application Design: Design of IOT based pulse oximeter, Reliability of IoT-Aware BPNM Healthcare process. Industrial IOT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies: Milk Processing and Packaging Industries, Manufacturing Industries.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

4. Veneri, Giacomo, and Antonio Capasso. Hands-on Industrial Internet of Things: Create a Powerful Industrial IoT Infrastructure Using Industry 4.0, 1st edition, Packt Publishing Ltd, 2018.
5. Reis, Catarina I., and Marisa da Silva Maximiano, eds. Internet of Things and advanced application in healthcare, 1st edition, IGI Global, 2016.
6. D. Jude Hemanth and J. Anitha George A. Tsihrintzis- Internet of Medical Things Remote Healthcare Systems and Applications, covered by Scopus.

REFERENCES:

3. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, 1st Edition, Apress, 2017
4. Aboul Ella Hassanien, NilanjanDey and SureakaBoara, Medical Big Data and Internet of
5. Medical Things: Advances, Challenges and Applications, 1st edition, CRC Press, 2019.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3											3	
3		3	3											3
4				3									3	
5							3							
CO (W.A)	3	3	3	3			3						3	3

22ITX32-BLOCKCHAIN TECHNOLOGY (*Common to 22AIX32,22CSX32,22CIX02)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• To impart knowledge of distributed ledgers in business • To acquire knowledge in emerging concepts using blockchain				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the principles of blockchain technology to articulate their significance.	Ap	20%
CO2	Evaluate the effectiveness of different consensus algorithms in specific blockchain applications.	An	20%
CO3	Evaluate their impact on security and privacy in digital transactions.	An	20%
CO4	Implement a strategic plan for integrating specific distributed ledger technologies into a business environment, considering operational efficiency, security, and regulatory compliance.	Ap	20%
CO5	Apply appropriate techniques to manage trust-based business networks, considering societal, environmental, economic, and global perspectives.	Ap	20%

UNIT I –INTRODUCTION	**(9)**
The growth of blockchain technology – Distributed Systems – P2P – Distributed Ledger – Cryptographically Secure - Generic Element of Blockchain – Benefits and limitations of blockchain - Block chain Challenges - Tiers of BT – Types of Blockchain - Consensus.	
UNIT II –DECENTRALIZATION	**(9)**
Methods of Decentralization – Routes to Decentralization – Smart Contract – Decentralized Organization – Platforms for Decentralization – Consensus Algorithms.	
UNIT III –CRYPTOCURRENCIES	**(9)**
Cryptographic Hash Functions – Cryptography basic and Concepts – Introduction Bitcoin – Bitcoin Network and Payments – Bitcoin clients and APIs – Alternative Coins.	
UNIT IV -DISTRIBUTED LEDGERS FOR BUSINESS	**(9)**
Ethereum: Introduction – Ethereum Network – Components – Programming Languages; Hyperledger: Introduction – Reference Architecture – Fabric – Sawtooth Lake – Corda.	

UNIT V -BLOCKCHAIN DEVELOPMENT TOOLS AND FRAMEWORKS	(9)
Compilers: Solidity Complier – Ganache – Metamask – Truffle; Languages: Solidity – Go – Java – NodeJS; Blockchain Use case: Financials – Insurance - Supply Chain Management – HealthCare – IoT.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. Van Haren Publishing (Editor), "Introduction to Blockchain Technology: The Many Faces of Blockchain Technology in the 21st Century", Paperback Import, 2019.
2. Imran Bashir, "Mastering Blockchain" Packt 2nd Ediction, 2018.

REFERENCES:

1. Don, Alex Tapscott, "Blockchain Revolution". Portfolio Penguin 2016.
2. William Mougayar, "Business Blockchain Promise, Practice and Application of the Next Internet Technology", John Wiley & Sons 2016.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3											3	
3		3	3											3
4			3	3	3									
5											3	3	3	
CO (W.A)	**3**	**3**	**3**	**3**	**3**						**3**	**3**	**3**	**3**

22ITX33-BEYOND 5G AND IOT TECHNOLOGIES (*Common to 22AIX33,22CSX33,22CCX33,22CIX03)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• Explore the evolution from 5G to 6G and the implications for data rates, latency, and connectivity. • Examine the role of edge computing in reducing latency and improving real-time data processing in IoT systems.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply knowledge of key capabilities and requirements of 5G to evaluate their implications for specific industry applications, such as IoT, smart cities, and autonomous vehicles.	Ap	20%
CO2	Analyze the specific requirements for 5G waveform design, including spectral efficiency, flexibility, and resilience to interference.	An	20%
CO3	Apply knowledge of the 5G architecture framework to design a basic model of a 5G network, incorporating elements such as the Radio Access Network (RAN) and core network components.	Ap	40%
CO4	Analyze the theoretical foundations of multi-antenna systems, identifying key requirements and performance indicators essential for effective MIMO operation.	An	20%
CO5	Conduct a detailed case study on a specific implementation of V2X or terahertz communication technology, evaluating its design, performance outcomes, and lessons learned.	An	Internal Assessment

UNIT I - OVERVIEW OF 5G WIRELESS COMMUNICATIONS	**(9)**
Evolution of mobile technologies (1G-5G), 3GPP Releases & its key aspects, Overview of 5G, three high level 5G usage scenarios (eMBB, URLLC, mMTC), Key capabilities & requirements, 5G vs. LTE-A Comparison, 5G frequency bands, 5G Use cases.	
UNIT II - WAVEFORM DESIGN FOR 5G & BEYOND	**(9)**
Introduction - 5G Waveform Design and Waveform Requirements – Flexible OFDM comparison with CP-OFDM, generalized frequency division multiplexing (GFDM), filter bank multicarriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques –non-orthogonal multiple accesses (NOMA), Sparse Code Multiple Access (SCMA) – Comparison of multiple access methods.	
UNIT III - 5G ARCHITECTURE AND 5G NEXTGEN CORE NETWORK	**(9)**
5G Architecture: Introduction, 5G Architecture framework, 3GPP 5G architecture, Non-Roaming 5G system architecture, overall RAN architecture, Functional Split Between NG-RAN and 5G Core Network. 5G NextGen core network: Modern network requirements, SDN architecture, NFV benefits and requirements, – NFV Reference Architecture, Network Slicing concepts & requirements	

UNIT IV - MASSIVE MIMO SYSTEMS	(9)
Introduction to multi-antenna system, Theoretical background: MIMO requirement, MIMO vs. massive MIMO, Massive MIMO benefits, single user and multi-user MIMO, capacity of MIMO for unknown CSIT, massive MIMO capacity, Massive MIMO OFDM transmitter employing digital precoding, analog beamforming and hybrid of digital precoding and analog beamforming.	
UNIT V -V2X COMMUNICATIONS AND NOVEL ASPECTS IN TERAHERTZ WIRELESS COMMUNICATIONS	**(9)**
Vehicle-to-Vehicle (V2V) Communications, Vehicle-to-Infrastructure (V2I) Communications, Vehicle-to-Pedestrian (V2P) Communication, Self-driving Vehicles & its challenges, Vehicle-to-Network (V2N) Communications. Overview, potential spectral windows at THz frequencies, Terahertz wave propagation characteristics, opportunities & challenges, application	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies" CRC Press, 2019.
2. Suvra Sekhar Das and Ramjee Prasad, "Evolution of Air Interface Towards 5G: Radio Access Technology and Performance Analysis", Gistrup, Denmark: River Publishers series in Communication, 2018.
3. Wei Xiang, KanZheng, Xuemin (Sherman) Shen, **"**5G Mobile Communications", Springer publications-2016.
4. William Stallings "5G Wireless: A Comprehensive Introduction", Pearson Education, 2021.
5. AfifOsseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology"Cambridge University Press-2016**.**

REFERENCES:

1. R. S. Kshetrimayum, "Fundamentals of MIMO Wireless Communications", Cambridge University Press, UK,2017.
2. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks" first edition, John Wiley & Sons, 2015.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1													3	
2	3		3										3	
3		3												3
4				3									3	
5									2					
CO (W.A)	3	3	3	3					2				3	3

22ITX34 – PROGRAMMING FOR IoT BOARDS *(Common to 22AIX34,22CSX34,22CCX34,22CIX04)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	• To introduce Internet of Things (IoT) environment and its technologies for designing smart systems • To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Investigate various challenges and explore open-source hardware prototyping platforms for designing IoT devices	Ap	20%
CO2	Analyze basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world	An	20%
CO3	Apply knowledge on Tkinter GUI using python in different sensors	Ap	20%
CO4	Program SBC by exploring protocols, data conversion process, API and expansion boards for practical IoT devices using Python	Ap	20%
CO5	Apply embedded programming constructs and constraints in real time systems for real world socio-economic problems	Ap	20%

UNIT I- INTRODUCTION TO RASPBERRY PI	**(9)**
Raspberry Pi components-Installation of NOOBS and Raspbian on SD card- Terminal commands-Installation of Libraries on Raspberry pi- Getting the static IP address of Raspberry Pi-run a program-Installing the remote desktop server.	
UNIT II - INTERFACING WITH RASPBERRY PI	**(9)**
Interfacing of relay with raspberry Pi-LCD-DHT11 sensor-ultrasonic sensor- camera-play with digital sensor, analog sensor and actuator.	
UNIT III – PYTHON GUI WITH TKINTER	**(9)**
Tkinter for GUI design-LED Blink-brightness control-selection from multiple options-Reading a PIR sensor-Reading a analog sensor.	
UNIT IV – DATA ACQUISITION WITH PYTHON	**(9)**
Basics-CSV File- Storing Arduino data with CSV file- plotting random numbers using Matplotlib-Plotting real time from arduino- Integrating the plots in the TKinter window.	

UNIT V – CONNECTING TO THE CLOUD	(9)
Smart IoT systems- DHT11 data logger with thinkspeak server-ultrasonic sensor data logger-air quality monitoring system-landslide detection and disaster management system-smart motion detector and upload image to gmail.com.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS :

1. Rajesh singh, AnithaGehlot, Lovi raj gupta, Bhupendrasingh and MahendranSwain "Internet of things with Raspberry Pi and Arduino" CRC Press 2020.

REFERENCES:

1. Sai Yamanoor, Sri hari Yamanoor " Python programming with Raspberry Pi" Packet Publishing Ltd, Ist edition, 2017.
2. Wolfram Donat "Learn raspberry Pi programming in python" A Press 2014.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3												3
3				3										3
4			3										3	
5									3	3				
CO (W.A)	**3**	**3**	**3**	**3**					**3**	**3**			**3**	**3**

22ITX35 – WIRELESS AD-HOC AND SENSOR NETWORKS (*Common to 22CSX35,22CCX32,22CIX07)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	• Understand the design issues in ad hoc and sensor networks. • Learn the different types of MAC protocols				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Understanding the concepts, network architectures and applications of ad hoc and wireless sensor networks	U	20%
CO2	Understanding the working of MAC Protocols for ad hoc networks	U	20%
CO3	Understanding the working of Routing Protocols for ad hoc networks	U	20%
CO4	Analyze the protocol design issues of ad hoc and sensor networks	An	20%
CO5	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues	Ap	20%

UNIT I- FUNDAMENTALS OF WIRELESSS COMMUNICATION TECHNOLOGY	**(9)**
Introduction –Spectrum Allocation-characteristics of wireless channel-modulation techniques-multiple accesss techniques-wireless internet- mobile IP.	
UNIT II –AD-HOC WIRELESS NETWORK and MAC Protocols	**(9)**
Cellular and Ad hoc wireless networks-Applications- Issues in Ad-Hoc wireless network. MAC Protocols: Issues-classifications-other MAC Protocols.	
UNIT III – ROUTING PROTOCOLS FOR AD-HOC WIRELESS NETWORKS	**(9)**
Introduction- Issues in designing a routing protocol-classifications of routing protocols-table driven routing protocol-on-demand routing protocol-hybrid routing protocols-routing protocols with efficient flooding mechanisms.	
UNIT IV – TRANSPORT LAYER PROTOCOLS	**(9)**
Design goals of transport layer protocols-TCP over Ad-hoc wireless networks-other transport layer protocols-Security in Ad-hoc wireless networks-network security attacks-key management-secure routing in in Ad-hoc wireless networks.	

UNIT V – WIRELESS SENSOR NETWORKS	(9)
Sensor network architecture-data dissemination-data gathering-MAC protocols for sensor networks-Location discovery-Quality of a sensor network-evolving standards.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Dargie, Waltenegus, and Christian Poellabauer. Fundamentals of wireless sensor networks: theory and practice. John Wiley & Sons, 2010.

REFERENCES:

1. Carlos De MoraisCordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3												3	
3	3												3	
4		3												3
5				3	3				2	2				3
CO (W.A)	3	3		3	3				2	2			3	3

22ITX36-WEARABLE COMPUTING *(Common to 22AIX36,22CSX36,22CCX36,22CIX05)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	• Explore various applications of wearable computing across industries, such as healthcare, sports, entertainment, and fitness. • Examine the technical challenges associated with wearable systems, including power management, data accuracy, and user comfort.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply theoretical knowledge to practical situations, fostering skills in design, evaluation, and innovative thinking within the field of wearable technology.	Ap	20%
CO2	Analyze different signal processing techniques can be integrated into wearable systems to improve data quality and user experience.	An	20%
CO3	Apply knowledge of different wireless communication techniques to evaluate their suitability for implementing BANs in healthcare settings.	Ap	40%
CO4	Apply theoretical knowledge to practical challenges in wireless health systems, fostering skills in design, problem-solving, and innovation within the context of healthcare technology.	An	20%
CO5	Analyze case studies focused on wearable technologies used for monitoring patients with chronic diseases, assessing their impact on patient care and management.	An	Internal Assessment

UNIT-I INTRODUCTION TO WEARABLE SYSTEMS	**(9)**
Wearable Systems- Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems- Wearable ground reaction force sensor.	
UNIT-II SIGNAL PROCESSING	**(9)**
Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation.	
UNIT-III WIRELESS HEALTH SYSTEM	**(9)**
Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication Techniques.	

UNIT-IV SMART TEXTILE	(9)
Introduction to smart textile- Passive smart textile, active smart textile. Fabrication Techniques- Conductive Fibres, Treated Conductive Fibres, Conductive Fabrics, Conductive Inks.Case study- smart fabric for monitoring biological parameters - ECG, respiration.	
UNIT-V APPLICATIONS OF WEARABLE COMPUTING	**(9)**
Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Edward Sazonov, Sergey G. Togov "Wearable Sensors: Fundamentals, Implementation and Applications" , Elsevier ,2014

REFERENCES:

1. Subhas Chandra Mukhopadhyay ",Wearable Sensors: Fundamentals, Implementation, and Applications"
2. Robert Matthews and Alberto Piaggesi,"Wearable Sensors: Fundamentals, Implementation, and Applications"
3. Mehmet R. Yuce."Wearable Sensors and Systems ".

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2	3		3										3	
3		3												3
4				3									3	
5							3							
CO (W.A)	3	3	3	3			3						3	3

22ITX37– FOG AND EDGE COMPUTING (*Common to 22AIX37,22CSX37,22CCX37,22CIX06)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• To introduce IoT enabling technologies and its opportunities. • To review underlying technologies, limitations, and challenges along with performance metrics and discuss generic conceptual framework in fog computing.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Explore technologies behind the communication and management of fogs and edge resources.	Ap	20%
CO2	Analyze the techniques for storage and computation in fogs, edges and clouds.	An	20%
CO3	Implement Internet of Everything (IoE) applications through fog computing architecture and use optimization techniques for the same	Ap	40%
CO4	Analyze the goals of middleware for fog and edge computing.	An	20%
CO5	Review the performance and issues of the applications developed using fog and edge architecture.	Ap	Internal Assessment

UNIT I - INTERNET OF THINGS (IOT) AND NEW COMPUTING PARADIGMS	**(9)**
Introduction - Relevant Technologies - Fog and Edge Computing Completing the Cloud - Hierarchy of Fog and Edge Computing - Business Models - Opportunities and Challenges .	
UNIT II - CHALLENGES IN FEDERATING EDGE RESOURCES	**(9)**
Introduction –the networking challenge - the management challenge- Miscellaneous challenges - Integrated C2F2T Literature by Modeling Technique - Integrated C2F2T Literature by Use - Case Scenarios - Integrated C2F2T Literature by Metrics.	
UNIT III – OPTIMIZATION PROBLEMS IN FOG AND EDGE COMPUTING	**(9)**
Introduction- Preliminaries - The Case for Optimization in Fog Computing-Formal Modeling Framework for Fog Computing – Metrics - Optimization Opportunities along the Fog Architecture - Optimization Opportunities along the Service Life Cycle - Toward a Taxonomy of Optimization Problems in Fog Computing – optimization Techniques.	
UNIT IV – MIDDLEWARE FOR FOG AND EDGE COMPUTING	**(9)**
Need for Fog and Edge Computing Middleware - Design Goals-State-of-the-Art Middleware Infrastructures - System Model - Fog Data Management - Smart Building - Predictive Analysis with FogTorch .	

UNIT V – APPLICATIONS OF FOG AND EDGE COMPUTING	(9)
Exploiting Fog Computing in Health Monitoring-Smart Surveillance Video Stream Processing at the Edge for Real - Time Human Objects Tracking-Fog Computing Model for Evolving Smart Transportation Applications - Testing Perspectives of Fog - Based IoT Applications - Legal Aspects of Operating IoT Applications in the Fog.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS :

1. Buyya, Rajkumar, and SatishNarayanaSrirama, Fog and Edge computing: Principles and Paradigms, 2019, 1st edition, John Wiley & Sons, USA.

REFERENCES:

1. Bahga, Arshdeep, and Vijay Madisetti, Cloud computing: A hands-on approach, 2014, 2ndedition, CreateSpace Independent Publishing Platform, USA
2. OvidiuVermesan, Peter Friess, "Internet of Things –From Research and Innovation to Market Deployment", 2014, 1st edition, River Publishers, India

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3												3
3				3										3
4			3										3	
5									3	3				
CO (W.A)	3	3	3	3					3	3			3	3

22ITX38-IMAGEPROCESSING (*Common to 22CSX38,22CCX35,22CIX08)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : NIL					
Course Objective:	• To provide the basic knowledge on image processing concepts. • To develop the ability to apprehend and implement various image processing algorithms.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Understand different components of image processing system	U	20%
CO2	Describe various image transforms, enhancement techniques using various processing methods	U	20%
CO3	Illustrate the compression and segmentation techniques on a given image	Ap	40%
CO4	Demonstrate the filtering and restoration of images(pixels) with examples	Ap	20%
CO5	Illustrate the various schemes for image representation and detection techniques with examples	An	20%

UNIT-I DIGITAL IMAGE FUNDAMENTALS	**(9)**
Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception , Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels.	
UNIT-II IMAGE ENHANCEMENT IN THE SPATIAL AND FREQUENCY DOMAIN	**(9)**
Image Enhancement in the Spatial Domain : Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters. Image Enhancement in the Frequency Domain : Introduction to the Fourier Transform and the Frequency Domain,Smoothingfrequency-domainFilters,SharpeningFrequency-domain Filters, Homomorphic Filtering ,Implementation.	
UNIT-III IMAGE RESTORATION	**(9)**
Image Restoration : A Model of the Image Degradation/Restoration Process, Linear, Position- Invariant Degradations, Inverse Filtering, Minimum Mean Square Error(Wiener)Filtering, Constrained Least Squares Filtering. Wavelets and Multire solution Processing: Multire solution Expansions, Wavelet Transforms in one Dimension,The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions.	

UNIT-IV IMAGE COMPRESSION & SEGMENTATION	(9)
Image Compression: Image Compression Models, Error-free Compression, Lossy Compression,Image Compression Standards. Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.	
UNIT-V REPRESENTATION AND DESCRIPTION	**(9)**
Various schemes for representation-chain codes-polygonal approximation-signatures –boundry segments-boundary descriptors: shape numbers-fourier descriptors and regional descriptors-topological descriptors-texture-moments of two dimentional functions.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing. Prentice Hall India/Pearson Education.

REFERENCES:

1. A.K.Jain, Fundamentals of Digital Image Processing. Prentice Hall India.
2. Madhuri.A.Joshi, Digital Image Processing, PHI.
3. Sonka,Image Processing, Analysis and Machine Vision. Cengage Publications.

Mapping of COs with POs / PSOs

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1														
2	3		3										3	
3		3												3
4				3									3	
5							3							
CO (W.A)	3	3	3				3						3	3

22ITX41- CLOUD SERVICES MANAGEMENT *(Common to 22CCX42,22CIX51)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE : Nil					
Course Objective:	Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply Cloud Service Management terminology, definition & concepts and predict benefits of cloud service management with traditional IT service management.	Ap	20%
CO2	Analyze strategies to reduce risk and manage issues associated with adoption of cloud services	An	40%
CO3	Exhibit cloud-design skills to build and automate business solutions using cloud technologies.	Ap	20%
CO4	Demonstrate the strategies for designing, deploying and running cloud-based services in a business environment	An	20%
CO5	Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services	An	Internal Assessment

UNIT I CLOUD SERVICE MANAGEMENT FUNDAMENTALS	(9)
Cloud Ecosystem-The Essential Characteristics-Basics of Information Technology Service Management and Cloud Service Management-Service Perspectives-Cloud Service Models-CloudService Deployment Models	
UNIT II CLOUD SERVICES STRATEGY	(9)
Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture	
UNIT III CLOUD SERVICE MANAGEMENT	(9)
Cloud Service Reference Model-Cloud Service Life Cycle-Basics of Cloud Service Design-Dealingwith Legacy Systems and Services-Benchmarking of Cloud Services-Cloud Service Capacity Planning-Cloud Service Deployment and Migration-Cloud Marketplace-Cloud Service OperationsManagement.	
UNIT IV CLOUD SERVICE ECONOMICS	(9)
Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models	

UNIT V CLOUD SERVICE GOVERNANCE & VALUE	(9)
IT Governance Definition-Cloud Governance Definition-Cloud Governance Framework-Cloud Governance Structure-Cloud Governance Considerations-Cloud Service Model Risk Matrix-Understanding Value of Cloud Services- Measuring the value of Cloud Services- Balanced Scorecard-Total Cost of Ownership	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications 2020.
2. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour 2017.
3. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013.

REFERENCES:

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing 2020.
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi 2013.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3		3									3
4				3									3	
5										3		3		3
CO (W.A)	3	3	3	3	3					3		3	3	3

22ITX42- UI AND UX DESIGN *(Common to 22AIX42,22CSX42,22CCX41,22CIX45)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PREREQUISITE :NIL

Course Objective:	To understand fundamental concepts of UI/UX design and to develop real time applications.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply UI design concepts for building user Applications.	Ap	20%
CO2	Demonstrate UI Design of any product or application.	An	20%
CO3	Evaluate UX Skills in product development.	Ap	20%
CO4	Create Wireframe and Prototype and learns to design successful products through personas and ideation.	An	40%
CO5	Present their web design demonstrating teamwork and reflective learning.	Ap	Internal Assessment

UNIT I - FOUNDATIONS OF DESIGN	**(9)**
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.	
UNIT II - FOUNDATIONS OF UI DESIGN	**(9)**
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.	
UNIT III - FOUNDATIONS OF UX DESIGN	**(9)**
Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals- FIGMA tool	
UNIT IV - WIREFRAMING, PROTOTYPING AND TESTING	**(9)**
Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.	
UNIT V – RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE	**(9)**
Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Joel Marsh, "UX for Beginners", O'Reilly , 2022.
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021.

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rdEdition , O'Reilly 2020.
2. Steve Schoger, Adam Wathan "Refactoring UI", 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. https://www.interaction-design.org/literature.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2	3	3											3	
3		3	3		3									3
4				3						3			3	
5										3	3	3		3
CO (W.A)	3	3	3	3	3					3	3	3	3	3

22ITX43-DEVOPS (*Common to 22AIX43,22CSX43,22CCX46,22CIX46)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :NIL					
Course Objective:	To introduce DevOps terminology, definition & concepts, version control tools and configuration management.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyse different actions performed through Version control tools like Git	An	20%
CO2	Apply Jenkinsfor Continuous Integration and Continuous Testing and Continuous Deployment by building automating test cases using Maven & Gradle.	Ap	30%
CO3	Design configuration management application using Ansible	An	20%
CO4	Implement the configuration management using Ansible and leverage Cloud-based DevOps tools using Azure DevOps	An	30%
CO5	Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems	An	Internal Assessment

UNIT I- INTRODUCTION TO DEVOPS	**(9)**
Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.	
UNIT II - COMPILE AND BUILD USING MAVEN & GRADLE	**(9)**
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle	
UNIT III - CONTINUOUS INTEGRATION USING JENKINS	**(9)**
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.	

UNIT IV - CONFIGURATION MANAGEMENT USING ANSIBLE	(9)
Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible	
UNIT V – BUILDING DEVOPS PIPELINES USING AZURE	**(9)**
Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014

REFERENCES:

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
4. MariotTsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
5. https://www.jenkins.io/user-handbook.pdf
6. https://maven.apache.org/guides/getting-started/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3											3	
2	3				3								3	
3			3											3
4				3	3								3	
5						3				3				3
CO	**3**	**3**	**3**	**3**	**3**	**3**				**3**			**3**	**3**

22ITX44-PRINCIPLES OF PROGRAMMING LANGUAGES (*Common to 22AIX44,22CSX44,22CCX47)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE :NIL					
Course Objective:	To understand design concepts for programming languages				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply programming languages for problem solving.	Ap	20%
CO2	Analyze object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog.	Ap	40%
CO3	Design a solution for given problem using programming languages structures	An	20%
CO4	Demonstrate the different functionalities of programming languages.	An	20%
CO5	Make an Oral presentation related to course.	Ap	Internal Assessment

UNIT I -SYNTAX AND SEMANTICS	**(9)**
Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing	
UNIT II -DATA, DATA TYPES, AND BASIC STATEMENTS	**(9)**
Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements	
UNIT III - SUBPROGRAMS AND IMPLEMENTATIONS	**(9)**
Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions -implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping.	
UNIT IV - OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING	**(9)**
Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – statement level concurrency – Event handling	

UNIT V – FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES	(9)
Introduction to lambda calculus – fundamentals of functional programming languages -Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. Robert W. Segesta, Concepts of Programming Languages, Twelfth Edition (Global Edition), Pearson, 2022.
2. Michael L. Scott, Programming Language Pragmatics, Fourth Edition, Elsevier, 2018.
3. Jeffrey D. Ullman, Elements of programming, Second Edition, Pearson, 1997.
4. W. F. Clocksin and C. S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

REFERENCES:

1. Ghezzi, —Programming Languages , 3rd Edition, John Wiley, 2008
2. 2. John C. Mitchell, —Concepts in Programming Language, Cambridge University Press, 2004
3. Lutz M, "Programming Python", SPD/O'reilly, (4th Edition),(2015).
4. 3. Allen Tucker, Robert Noonan, "Programming Languages: Principles and Paradigms", Tata McGraw Hill, (2nd edition),(2007).

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3			3								3	
3			3		3								3	
4		3		3										3
5										3				2
CO (W.A)	3	3	3	3	3					3			3	3

22ITX45- MEAN STACK DEVELOPMENT *(Common to 22AIX45,22CSX45,22CCX45,22CIX56)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To build complex web application with using minimum code.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply Node JS and NOSQL concepts for front end and back-end design	Ap	40%
CO2	Analyse the various stacks available for web application development and finds the best for given application.	An	20%
CO3	Design responsive pages using scripting technologies and Mongo DB.	Ap	20%
CO4	Implement interactive web pages using Angular JS	An	20%
CO5	Involve in independent study and aware of technological advances related to the course	An	Internal Assessment

UNIT I- INTRODUCTION TO NOSQL DATABASE	**(9)**
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.	
UNIT II - Node JS	**(9)**
Introduction – Architecture – Features- Creating Web Servers with HTTP -Request - Response – Event Handling - GET and POST Methods –File Upload - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.	
UNIT III MONGO DB	**(9)**
Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications	
UNIT IV–TYPESCRIPT AND ANGULAR	**(9)**
TypeScript: Introduction – Features – Variables – Data types – Enum – Array – Tuples – Functions – OOP concepts – Interfaces. Angular: Introduction - Needs - Evolution – Features – Architecture - Setup and Configuration – Components and Modules –Templates - Controllers – Scope – Directives – Data Binding.	

UNIT V - ANGULARJS FRAMEWORK	(9)
Pipes/Filters -DOM – Events - Routing - Services – HTTP – Ajax– Template Driven Forms - Reactive Forms – Form Validation – Basic Animations.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

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

REFERENCES:

2. https://www.javatpoint.com

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3		3									3
4				3	3								3	
5									2	3		3		3
CO (W.A)	**3**	**3**	**3**	**3**	**3**				**2**	**3**		**3**	**3**	**3**

22ITX46-SOCIAL AND INFORMATION NETWORKS (*Common to 22AIX46,22CSX46,22CCX43,22CIX47)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE: Nil					
Course Objective:	To determine the theories and methods for analyzing network data, understanding network formation, and applying network analysis to real-world problems.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply various techniques for analyzing and visualizing network data.	Ap	25%
CO2	Analyze the efficiency of different measurements and metrics of social network.	An	25%
CO3	Develop real-world applications of network analysis in various domains.	Ap	25%
CO4	Implement the solutions for problems in case studies related to social and information networks.	An	25%
CO5	Abide by the norms of professional ethics in information sharing in social networks.	Ap	Internal Assessment

UNIT I- INTRODUCTION TO SOCIAL AND INFORMATION NETWORKS	**(9)**
Overview of social and information networks - Basic terminology and concepts - Types of networks: Social networks, Information networks, Citation networks - Network Representations and Data Formats	
UNIT II – NETWORK STRUCTURE AND PROPERTIES AND MODELS	**(9)**
Degree distribution and Power loss – Clustering Co-efficients – Small World Phenomenon – Network Motifs and Patterns. Random Graphs – Scale Free Networks – Exponential Random Graphs – Preferential attachment Models	
UNIT III – INFORMATION DIFFUSION AND COMMUNITY DETECTION	**(9)**
Models of Information Diffusion – Influence Maximization – Contagion Models – Cascading behavior in networks – Community detection: Modularity and Community structure – Clustering algorithms : Louvain, Girvan-Newman – overlapping communities – Evaluation metrics for community detection	
UNIT IV – ALGORITHMIC ASPECTS OF NETWORK ANALYSIS	**(9)**
Network resilience and Robustness: Vulnerability of networks to nodes and edge removal – Resilience strategies – Robustness metrics – Cascading failures and network collapse. Algorithmic Aspects of Network Analysis: Centrality measures: Degree centrality and Betweenness centrality – Page Rank Algorithm – Network Embedding Techniques – Graph Neural Networks	

UNIT V – APPLICATIONS OF SOCIAL AND INFORMATION NETWORKS	(9)
Social media analysis – Recommender system – Epidemiology and disease spread modeling – Online advertising and viral marketing	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World" by David Easley and Jon Kleinberg, first edition,2010
2. "Network Science" by Albert-Laszlo Barabasi,first edition, 2016
3. "Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Instagram, GitHub, and More" by Matthew A. Russell, Second edition, O'Reilly Media , 2019

REFERENCES:

1. "Social Network Analysis: Methods and Applications" by Stanley Wasserman and Katherine Faust:
2. "The Structure and Dynamics of Networks" by Mark Newman,This book covers the fundamental principles of network theory, including network structure, dynamics, and applications in various fields.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3			3										3	
4				3		3								3
5								3		3		3		3
CO (W.A)	**3**	**3**	**3**	**3**		**3**		**3**		**3**		**3**	**3**	**3**

22ITX47-WEB MINING (*Common to 22AIX47,22CSX47,22CCX44,22CIX57)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To learn techniques for extracting knowledge from Web content as a basis for business decisions and applications.				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply key concepts of Web mining to discover useful information from the World-Wide Web and its usage patterns	Ap	25%
CO2	Analyse the data on web using crawlers and extract strutured data.	An	25%
CO3	Compare various methods of web data mining and its applications	Ap	25%
CO4	Demonstrate various pattern discovery and analysis techniques	An	25%
CO5	Ability to read and comprehend research articles related to the course.	An	Internal Assessment

UNIT I- INTRODUCTION -WEBSEARCH	**(9)**
Basic Concepts – Information Retrieval Models - Evaluation Measures – Text and Web Page Pre-processing – Inverted Index and its compression – Latent Sematic Indexing – Web Search – Meta-Searching and Combining Multiple Rankings–Web Spamming.	
UNIT II - WEBCRAWLING	**(9)**
BasicCrawlerAlgorithm–ImplementationIssues–UniversalCrawlers–FocusedCrawlers–TopicalCrawlers–Evaluation–CrawlerEthicsand Conflicts.	
UNIT III - STRUCTURED DATA EXTRACTION	**(9)**
Structured Data Extraction –Wrapper Induction-Instance-Based Wrapper Learning –Automatic Wrapper Generation: Problems –String Matching and Tree Matching – Multiple Alignment – Building DOM Trees – Extraction Based on a Single List Page –Introduction to Schema Matching–Pre-Processing for Schema Matching-Schema–Level Match– Domain and Instance-Level Matching	
UNIT IV – WEB USAGE MINING	**(9)**
WebUsageMining–ClickstreamAnalysis–LogFiles–DataCollectionandPre-Processing–DataModelingforWebUsageMining–TheBIRCHClusteringAlgorithm–AffinityAnalysisandtheAPrioriAlgorithm–DiscretizingtheNumericalVariable	

UNIT V – OPINION MINING	(9)
The Problem of Opinion Mining – Document Sentiment Classification – Sentence Subjectivity and Sentiment Classification –Opinion Lexicon Expansion – Aspect-Based Opinion Mining – Mining Comparative Opinions Search and Retrieval – Opinion Spam Detection.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data Centric Systems and Applications)",Springer;2nd Edition2011forunitsI,II,III&V
2. DravkoMarkov,DanielT.Larose,"DataMiningtheWeb:UncoveringPatternsinWebContent,Structure,andUsage",JohnWiley& Sons, Inc.,2010for unit IV.

REFERENCES:

1. AnthonyScime,"WebMiningApplicationsandTechniques",IdeaGroupPub.,2005

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3											3
4				3	3								3	
5										3		3		
CO (W.A)	**3**	**3**	**3**	**3**	**3**					**3**		**3**	**3**	**3**

22ITX48-MULTIMEDIA DATA COMPRESSION AND STORAGE *(Common to 22AIX48,22CSX48,22CCX48,22CIX48)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE: Nil					
Course Objective:	• Apply data compression algorithms • Explain Multimedia Information Sharing				

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply compression algorithms related to multimedia components such as text, speech, audio, image and video.	Ap	20%
CO2	Analyze the various image compression techniques and apply efficient technique for multimedia content	An	20%
CO3	Design a video using advanced video compression techniques and ensure efficient disk placement.	An	40%
CO4	Implement scheduling methods for request streams	An	20%
CO5	Submit a Multimedia presentation on assigned topics related to course	An	Internal Assessment

UNIT I- BASICS OF DATA COMPRESSION	**(9)**
MULTIMEDIA: Introduction-Uses of multimedia, Text, Images, Sound, Animation, Video—Lossless and Lossy Compression– Basics of Huffmann coding- Arithmetic coding- Dictionary techniques- Context based compression – Applications	
UNIT II - IMAGE COMPRESSION	**(9)**
Lossless Image compression – JPEG-CALIC-JPEG LS-Prediction using conditional averages – Progressive Image Transmission – Lossless Image compression formats – Applications - Facsimile encoding	
UNIT III - VIDEO COMPRESSION	**(9)**
Introduction – Motion Compensation – Video Signal Representation – H.261 – MPEG-1- MPEG-2- H.263.	
UNIT IV - DATA PLACEMENT ON DISKS	**(9)**
Statistical placement on Disks – Striping on Disks – Replication Placement on Disks – Constraint allocation on Disks – Tertiary storage Devices – Continuous Placement on Hierarchical storage system – Statistical placement on Hierarchical storage systems – Constraint allocation on Hierarchical storage system.	

UNIT V – DISK SCHEDULING METHODS	(9)
Scheduling methods for disk requests – Feasibility conditions of concurrent streams– Scheduling methods for request streams	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. 1.KhalidSayood, Introduction to Data Compression, Morgan Kaufmann Series in Multimedia Information and Systems, 2018, 5th Edition.
2. Philip K.C.Tse, Multimedia Information Storage and Retrieval: Techniques and Technologies, 2008

REFERENCES:

1. David Salomon, A concise introduction to data compression, 2008.
2. Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teaching series, 2017.
3. Yun-Qing Shi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor& Francis,2019
4. Irina Bocharova, Compression for Multimedia, Cambridge University Press; 1st edition, 2009

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3												3	
2		3											3	
3			3	3	3									3
4				3									3	
5										3				3
CO (W.A)	**3**	**3**	**3**	**3**	**3**					**3**			**3**	**3**

22ITX51- OBJECT ORIENTED SOFTWARE ENGINEERING (*Common to 22CSC16*)					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	Learn to apply object-oriented principles and software engineering methodologies to design and develop robust software solutions.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply object oriented and software engineering process for a given problem	Ap	20%
CO2	Analyze the system requirements, various design and testing techniques for a given system	An	30%
CO3	Design object-oriented model for different phases of software development to a given scenario	Ap	30%
CO4	Design object solutions with patterns and architectural layers	An	20%
CO5	Document and present project deliverables	Ap	Internal Assessment

UNIT I – SOFTWARE PROCESS AND AGILE DEVELOPMENT	**(9)**
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	**(9)**
Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram- CASE TOOLS.	
UNIT III - SOFTWARE DESIGN	**(9)**
Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered – Client Server – Tiered Pipe and filter- User interface design- Case Study.	
UNIT IV - OBJECT DESIGN	**(9)**
Preface to object orientation – Classes and Objects - Reusing pattern solutions –Overview of reuse concepts - Design patterns - Mapping models to code: Mapping concepts.	

UNIT V - SOFTWARE TESTING AND MAINTENANCE	(9)
Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging – Program analysis – Symbolic execution – Model Checking-Case Study.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Bernd Bruegge & Allen H. Dutoit, "Object-Oriented Software Engineering", 3rd edition, Pearson Education, 2014.

REFERENCES:

1. Roger S. Pressman, "Object-Oriented Software Engineering: An Agile Unified Methodology", First Edition, Mc Graw-Hill International Edition, 2014.
2. Timothy C. Lethbridge, Robert Laganiere, "Object Oriented Software Engineering", Tata McGraw-Hill, 6th ed., reprint, 2008.
3. Stephen Schach, "Object Oriented and Classical Software Engineering", 6th edition, McGraw-Hill, 2005.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3												3
3			3											3
4			3		2	2			2	3	2			3
5														3
CO (W.A)	**3**	**3**	**3**		**2**	**2**			**2**	**3**	**2**			**3**

22ITX52-SOFTWARE DEFINED NETWORKS (*Common to 22AIX52,22CSX52,22CCX52)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :NIL					
Course Objective:	Gain knowledge in networking fundamentals and conceptual understanding of Software Defined Networks (SDN)				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the conventional network and SDN paradigm	An	20%
CO2	Analyze the flexibility and scalability of using SDN in terms of innovation and network management	An	20%
CO3	Apply troubleshooting on various components of SDN networks	Ap	20%
CO4	Analyze the security challenges in SDN paradigm	An	20%
CO5	Evaluate the emerging SDN applications	Ap	20%

UNIT I – INTRODUCING SOFTWARE DEFINED NETWORKS	**(9)**
SDN Origins and Evolution – Introduction : SDN - Centralized and Distributed Control and Data Planes - The Genesis of SDN	
UNIT II - SOFTWARE DEFINED NETWORKS ABSTRACTIONS	**(9)**
How SDN Works - The Open flow Protocol - SDN Controllers: Introduction – General Concepts - VMware - Nicira - VMware/Nicira - Open Flow-Related - Mininet - NOX/POX- Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK	
UNIT III - PROGRAMMING SOFTWARE DEFINED NETWORKS	**(9)**
Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing	
UNIT IV - SOFTWARE DEFINED NETWORKS APPLICATIONS AND USE CASES	**(9)**
SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System	
UNIT V - SOFTWARE DEFINED NETWORKS FUTURE AND PERSPECTIVES	**(9)**
SDN Open Source - SDN virtualization -SDN Futures - Final Thoughts and Conclusions	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. S. Azodolmolky, "Software Defined Networking with Open Flow", 2nd Edition, Packt Pub Ltd, October 2017
2. E. Banks, "SDN Showdown: Examining the Differences between VMware's NSX and Cisco's ACI", Network World, January 6, 2014

REFERENCES:

1. Paul Goransson and Chuck Black ,"Software Defined Networks -A Comprehensive Approach ", Morgan Kaufmann Publications, 2014
2. Thomas D. Nadeau and Ken Gray ,"SDN- Software Defined Networks ", O'Reilly, 2013
3. Siamak Azodolmolky "Software Defined Networking with OpenFlow" By, Packt Publishing, 2013

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3												
2		3												
3	3											2		3
4		3			3									
5	3				3							2		3
CO (W.A)	**3**	**3**			**3**							**2**		**3**

22ITX53-SOFTWARE PROJECT MANAGEMENT *(Common to 22AIX53,22CSX53,22CCX53,22CIX54)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To provide an insight into detailed project management activities including project evaluation, planning, estimation, monitoring and control activities especially for software projects.				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply different techniques in monitoring and control of the project	Ap	30%
CO2	Apply project estimation and evaluation techniques to real world problems	Ap	20%
CO3	Plan, schedule and sequence the activities using various techniques	An	30%
CO4	Identify project risk, monitor and track project deadlines	An	20%
CO5	Managing people and organizing teams while developing a software project	Ap	Internal Assessment

UNIT I – SOFTWARE PROJECT MANAGEMENT	**(9)**
Project Definition – Importance – Activities – Overview of the project Planning – Software project economics – objectives – Project Life Cycle.	
UNIT II - PROJECT ESTIMATION AND EVALUATION	**(9)**
An overview of project planning -project Evaluation –Selection Of Appropriate Project Objectives- Software Effort Estimation Techniques, Function Point Analysis-Object Point-COCOMO.	
UNIT III - ACTIVITY PLANNING AND SCHEDULING	**(9)**
Sequencing and scheduling activities – Objectives of planning – Forward pass and backward pass – Scheduling – PERT techniques – CRM.	
UNIT IV - RISK MANAGEMENT AND MONITORING	**(9)**
Creating Framework – Decision making – cost Monitoring – Types of Risk – Risk managing - Risk Planning and controlling.	
UNIT V - MANAGING TEAM PROJECT	**(9)**
Team structure – Project tracking - Managing the contract – change control – Team management – Communication – Software Configuration Management-Case Study: PMBOK , Agile Development	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management" , Sixth Edition, Tata McGraw Hill, New Delhi, 2017.
2. Pressman R S & Bruce R Maxhim, "Software Engineering - A Practitioner's Approach", 9th Edition, Tata McGraw Hill, 2023.

REFERENCES:

1. Robert K Wysocki "Effective Project Management, Traditional, Agile, Extreme, Hybrid", John Wiley & Sons Inc, 2019.
2. Hans-Bernd Kittlaus , Samuel A. Fricker, "Software Product Management: The ISPMA-Compliant Study Guide and Handbook",2018.
3. Gopalaswamy Ramesh, "Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models", 2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2			3										3	
3		3												
4				3										
5	3								3		3			
CO (W.A)	**3**	**3**	**3**	**3**					**3**		**3**		**3**	**3**

22ITX54-SOFTWARE TESTING TOOLS AND TECHNIQUES *(Common to 22AIX54,22CSX54,22CCX54,22CIX52)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: NIL

Course Objective:	To equip students with the knowledge necessary to effectively utilize software testing tools and techniques in real-world software development environments.

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the knowledge of software testing fundamentals to a real-world problem	Ap	30%
CO2	Analyze various software testing levels	An	20%
CO3	Make use of structured and analytical testing approaches to ensure thorough testing	Ap	30%
CO4	Identify quality testing processes and tools in projects	An	20%
CO5	Use WinRunner tool to perform automated testing	Ap	Internal Assessment

UNIT I – INTRODUCTION	**(9)**
Introduction – The Testing process – Measurement of Testing - Basic Terminology Related to Software Testing - Testing Life Cycle – Principles of Testing – Limitations of Testing – Testing tools, techniques and metrics.	
UNIT II - LEVELS OF TESTING	**(9)**
Unit Testing – Integration Testing – System Testing – Acceptance Testing – Object Oriented Testing – Automated Testing.	
UNIT III - STRUCTURED AND ANALYTICAL TESTING	**(9)**
Structure-Based Testing: Introduction - Condition Coverage - Decision Condition Coverage - Modified Condition/Decision Coverage (MC/DC) - Multiple Condition Coverage - Path Testing - APT Testing; Analytical Techniques: Static Analysis - Dynamic Analysis.	
UNIT IV - QUALITY TESTING AND TOOLS	**(9)**
Quality Characteristics for technical testing: Security - Reliability - Efficiency – Maintainability - Portability - sample questionnaire; Test tools and Automation: Test automation project - Specific test tools: Fault Seeding and Fault Injection Tools – Performance Testing and Monitoring Tools – Tools for Web Testing.	

UNIT V - SOFTWARE TESTING TOOL	(9)
Need for Automated Testing Tool - Performance Testing Tools – WinRunner: Testing an application using WinRunner – Test Script Language (TSL) – GUI MAP File – Synchronization of Test Cases – Data-Driven Testing – Rapid Test Script Wizard – Mapping Custom Object to a Standard Classes – Checking GUI Objects. Silk Test: Architecture – Testing an Application Using Silk Test – The 4Test Scripting Language – Checkpoints – Data-Driven Test Cases.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Rajiv Chopra, "Software Testing: A Self-Teaching Introduction", David Pallai- Mercury Learning and Information Publisher, 2018.
2. Jamie L Mitchell, Rex Black, "Advanced Software Testing: Guide to the ISTQB Advanced Certification as an Advanced Technical Test Analyst", 2nd Edition, Vol 3, 2015.

REFERENCES:

1. Dr.K.V.K.K Prasad, "Software Testing Tools", Dream tech 2012.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3												
3	3													3
4		3												3
5	3				3									3
CO (W.A)	3	3			3									3

22ITX55-SOFTWARE QUALITY ASSURANCE *(Common to 22AIX56,22CSX55,22CCX56,22CIX53)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	Acquire knowledge of software quality assurance principles, practices and standards				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the common challenges which affect software quality	An	20%
CO2	Apply the knowledge of SQA Components and Project Life Cycle	Ap	20%
CO3	Establish Software Quality Infrastructure through implementation of modern Engineering and IT tools	An	20%
CO4	Analyze the various metrics used in quality management	An	20%
CO5	Apply SQA Standards, Certifications and Assessments	Ap	20%

UNIT I – INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE	**(9)**
Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall"s quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.	
UNIT II - SQA COMPONENTS AND PROJECT LIFE CYCLE	**(9)**
Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.	
UNIT III - SOFTWARE QUALITY INFRASTRUCTURE	**(9)**
Procedures and work instructions - Templates - Checklists – 3S developmenting - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.	
UNIT IV - SOFTWARE QUALITY MANAGEMENT & METRICS	**(9)**
Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model.	

UNIT V - SQA STANDARDS, CERTIFICATIONS & ASSESSMENTS	(9)
Quality management standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units and other actors in SQA systems.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

REFERENCES:

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2. Mordechai Ben-Menachem, "Software Quality: Producing Practical Consistent Software", International Thomson Computer Press, 1997.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3		3									3	
3					3				3					3
4						3								
5							3	3						
CO (W.A)	**3**	**3**		**3**	**3**	**3**	**3**	**3**	**3**				**3**	**3**

22ITX56-SERVICE ORIENTED ARCHITECTURE (*Common to 22AIX57,22CSX56,22CCX57)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To learn service-oriented analysis and design for developing SOA based application				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply XPath and XQuery to navigate and query XML documents efficiently	**Ap**	30%
CO2	Apply SOA principles and technologies to analyze real-world case studies across different industries.	**Ap**	30%
CO3	Analyze the impact of SOA on business process automation and agility	**An**	20%
CO4	Design service models and business process flows adhering to SOA principles and industry standards.	**Ap**	20%
CO5	Implement and demonstrate SOA-based applications using Microservices Architecture.	**An**	Internal Assessment

UNIT I – XML	**(9)**
XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath – XML Transformation and XSL – Xquery	
UNIT II - EXPLORING SOA	**(9)**
SOA Fundamentals: Evolution of SOA – SOA – Characteristics of SOA – Concept of a service in SOA – Basic SOA architecture -Web Services Introduction - Protocols: SOAP-REST – Web Security - Enterprise Software models - IBM on Demand operating environment.	
UNIT III - SOA PRINCIPLES AND DESIGN	**(9)**
Business centric SOA and its benefits – Principles of Service Orientation-SOA layers-SOA Patterns -Basic modeling building blocks –Service models for legacy application integration and enterprise integration – Enterprise solution assets (ESA).	
UNIT IV - BUILDING SOA BASED APPLICATIONS	**(9)**
Introduction to SAAS-Microservices Architecture-SOA Limitations - WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.	

UNIT V - SERVICE ORIENTED ANALYSIS AND DESIGN	(9)
SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines — Service design – Business process design – Case Study	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Thomas Erl,"Service Oriented Architecture Concepts Technology & Design", Pearson Education Limited, 2015.
2. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

REFERENCES:

1. Mark Endrei, Jenny Ang, Ali Arsanjani, Sook Chua, Philippe Comte, Pål Krogdahl, Min Luo, Tony Newling ,"Patterns: ServiceOriented Architecture and Web Services", 2004.
2. Mark D. Hansen "SOA Using Java™ Web Services", 2007.
3. Thomas Erl PHI "SOA Design Pattern", 2009.
4. Thomas Erl, Benjamin Carlyle, Cesare Pautasso, Raj Balasubramanian ,"SOA with REST: principles, patterns & constraints for building enterprise solutions with REST", 2013.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2	3	3												3
3		3												3
4	3													3
5	3		3							3				3
CO (W.A)	**3**	**3**	**3**							**3**				**3**

22ITX57-IT OPERATIONS *(Common to 22AIX55,22CSX57,22CCX55,22CIX55)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE: NIL					
Course Objective:	To provide knowledge on IT Operation Management and Service Management.				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the fundamental components and processes involved in IT operations	**An**	30%
CO2	Analyze existing health and safety regulations applicable to IT operations environments	**An**	30%
CO3	Apply organizational theories to evaluate and improve the structure and efficiency of IT operations within an organization	**Ap**	20%
CO4	Analyze fundamental concepts and principles of information security in IT environments	**An**	20%
CO5	Develop strategies for leveraging Microsoft 365 to enhance productivity, collaboration, and efficiency within IT operations.	**Ap**	Internal Assessment

UNIT I – IT OPERATIONS	**(9)**
IT Operation Definition - Roles & Responsibilities of IT Operations - IT Monitoring - IT operations Management - Responsibilities of IT operations Management. IT Service Management: IT Service Management Best Practices - The Service Life Cycle(Service Strategy - Service Design - Service Transition - Service Operation - Continual Service Improvement) Functions of IT Service Management (Incident Management, Event Management, Request fulfillment, Problem Management, Change Management, Availability Management - The Service Desk) - Escalation & Governance Management.	
UNIT II - HEALTHY SAFE AND SECURE WORKING ENVIRONMENT & ETIQUETTE	**(9)**
Health and Safety Essentials - Control and Management Systems - Facilities Management and Ergonomics - Managing Equipment - Managing Material. Etiquette: Professionalism in Relationships - First Impressions - Conducting Yourself in a Working Environment - Make Your Work Place Healthy - Dinning Etiquette - Elevator Etiquette - Cafeteria Etiquette - Meeting Etiquette - Telephone Etiquette - Dealing with Difficult People and Conflicting Situations.	
UNIT III - ITIL	**(9)**
Introduction – Understanding ITIL Guiding Principles in an Organization–Optimize and Automate – Four Dimensions of Service Management – Key Activities of the Service Value Chain	
UNIT IV - IT INFRASTRUCTURE & INFORMATION SECURITY	**(9)**
Definition - Components of IT Infrastructure (Hardware, Software, Network) - Types of IT infrastructure (Traditional, Cloud, Hyperconverged)- Risk, Response and Recovery: Risk Management and Information Security - The Risk Management Process - Business Continuity Management - Backing Up Data and	

Applications - Incident Handling - Recovery From a Disaster.
UNIT V - AMS & TOOLS **(9)**
Introduction – Support Models – Activities Type – Audits – Microsoft 365 – Domain Management – Licensing – Managing Teams – Meeting Policies – Messaging Policies
TOTAL (L:45) : 45 PERIODS

REFERENCES:

1. John Sansbury, Ernest Brewster, Aidan Lawes, Richard Griffiths, "IT Service Management :Support for your ITSM Foundation Exam",March 2016.
2. Elearn ,"Managing Health, Safety and Working Environment ",Revised Edition(Management Extra), 1st Edition, 2017 .
3. Vivek Bindra ,"Everything About Corporate Etiquette" , Bloomsbury India,2015.
4. AXELOS, "ITIL: Foundation ITIL 4 Edition", 2019
5. David Kim, Michael G. Solomon,"Fundamentals of Information Systems Security", Jones & Bartlett Learning, 3rd Edition.
6. https://docs.microsoft.com/en-us/learn/m365

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3				3								3
3	3													3
4		3					3							3
5	3							3			3			3
CO (W.A)	**3**	**3**				**3**	**3**	**3**			**3**			**3**

22ITX58-PRODUCT LIFE CYCLE MANAGEMENT *(Common to 22AIX58,22CSX58,22CCX58,22CIX58)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE-REQUISITE :NIL					
Course Objective:	To comprehend the foundations, implementation, business benefits, integration with product management strategy, and application in service-related industries				

Course Outcomes The students will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply Product Life Cycle Management **(**PLM) and integrate with lifecycle phases	Ap	30%
CO2	Analyze global impacts of PLM on product development	An	20%
CO3	Examine PLM deployment stages for decision-making	An	30%
CO4	Interpret and use PLM strategies for enhancing productization	An	20%
CO5	Develop a project using Scrum	Ap	Internal Assessment

UNIT I – INTRODUCTION TO PRODUCT LIFECYCLE MANAGEMENT	**(9)**
Introduction to PLM, Fundamentals of PLM- Objective of PLM - Activities of PLM - Joined-up and Holistic Approach - Generic Product Lifecycle Phases, PLM Grid, Components of PLM Grid, Why PLM, How PLM.	
UNIT II - COMPLEX AND CHANGING ENVIRONMENT	**(9)**
Changes and Interconnections, Macroeconomic and Geopolitical Changes, Environmental and Social Changes, Corporate Changes, Technological Changes, Product Changes, The Result and the Requirements.	
UNIT III - PLM DEPLOYMENT AND BUSINESS BENEFITS	**(9)**
Deployment Stages of PLM, PLM maturity model, Realization stage of the project, Accomplishing change, Business benefits of a PLM system - Factors leading to PLM, Benefits of the PLM system, Improving the productivity of labour, Costs of quality, PLM and data warehousing as a tool to support decision-making.	
UNIT IV - SERVICE INDUSTRY AND PLM	**(9)**
Introduction to service, Further productization, Making a service, PLM in service business - PLM challenges in service business, Services modularized, Making items out of product functions, IT specifically variable product.	

UNIT V - PRODUCT AND PRODUCT MANAGEMENT STRATEGY AS A PART OF BUSINESS STRATEGY	(9)
Product lifecycle management as a business strategy tool, From changes in the business environment to product strategy, Making a product strategy, Product management strategy, Time to market, Time to react, Time to volume, Time to service, Electronic business and PLM, Case Study: Scrum Framework	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. John Stark, "Product Lifecycle Management: 21st Century Paradigm for Product Realisation", 2nd Edition ,Springer Publisher, 2011.
2. Antti Saaksvuori and Anselmi Immonen, "Product Lifecycle Management", 3rd Edition,Springer Publisher, 2008

REFERENCES:

1. Uthayan Elagovan, "Product Lifecycle Management (PLM): A Digital Journey Using Industrial Internet of Things (IIoT)" , July 2020.
2. Ivica Crnkovic, Ulf Asklund and Annita Persson Dahlqvist, "Implementing and Integrating ProductData Management and Software Configuration Management", Art ech House Publishers, 2003

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3		3												
4			3											
5					3				2	3				
CO (W.A)	**3**	**3**	**3**		**3**				**2**	**3**			**3**	**3**

22GEA02-PRINCIPLES OF MANAGEMENT				
	L	T	P	C
	3	0	0	3

PRE-REQUISITE: NIL

Course Objective:	• To provide with a foundational understanding of management concepts and practices. • To equip students with the knowledge and skills necessary to manage and lead organizations effectively, understanding both theoretical frameworks and practical applications in management. • To learn about various planning tools and decision-making processes crucial for organizational success. • To gain insights into human resource management functions. • To study effective communication strategies and the impact of information technology on communication and how effective control can lead to improved productivity and organizational performance.

Course Outcomes The student will be able to		Cognitive Level	Weightage of COs in End Semester Examination
CO1	Apply key management theories and practices to real-world business scenarios, demonstrating the ability to implement management functions.	Ap	20%
CO2	Analyze human resource management practices, evaluating how recruitment, training, performance appraisal, and employee relations contribute to organizational success.	An	30%
CO3	Evaluate strategic decisions and their impacts on organizational performance, the effectiveness of communication strategies and the use of information technology in facilitating efficient and effective communication within organizations.	E	30%
CO4	Create comprehensive strategic plans and organizational policies and design control systems to ensure continuous improvement in productivity and organizational performance.	C	20%
CO5	Engage in independent study as a member of a team and develop higher-order thinking skills that are crucial for effective management and leadership in complex organizational settings with assignments or case studies.	Ap	Internal Assessment

UNIT I -INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS	**(9)**
Definition of Management - Science or Art - Manager Vs Entrepreneur - types of managers -managerial roles and skills - Evolution of Management - Scientific, human relations, system and contingency approaches - Types of Business organization-Organization culture and Environment - Current trends and issues in Management.	
UNIT II -PLANNING	**(9)**
Nature and purpose of planning - planning process - types of planning - objectives - setting objectives - policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.	

UNIT III -ORGANISING	(9)
Nature and purpose - Formal and informal organization - organization chart - organization structure - types - Line and staff authority - departmentalization -delegation of authority - centralization and decentralization -Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management	
UNIT IV - DIRECTING	**(9)**
Foundations of individual and group behaviour - motivation -motivation theories - motivational techniques - job satisfaction - job enrichment - leadership - types and theories of leadership -communication - process of communication - barrier in communication - effective communication -communication and IT.	
UNIT V - CONTROLLING	**(9)**
System and process of controlling - budgetary and non-budgetary control techniques - use of computers and IT in Management control - Productivity problems and management - control and performance -direct and preventive control -reporting.	
	TOTAL (L:45) : 45 PERIODS

TEXT BOOKS:

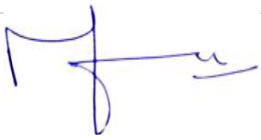
1. Harold Koontz, Heinz Weihrichand Mark V. Cannice"Essentials of Management: An International, Innovation, and Leadership Perspective", 11th Edition, Tata McGraw-Hill Education, 2021.
2. J.A.F. Stoner, R.E. Freeman, and Daniel R. Gilbert "Management", 6th Edition, Pearson Education, 2018.

REFERENCES:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.
2. Robert Kreitner & MamataMohapatra, "Management", Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3		3												
4			3											
5					3				2	3				
CO (W.A)	**3**	**3**	**3**		**3**				**2**	**3**			**3**	**3**



22GEA03-TOTAL QUALITY MANAGEMENT				
	L	T	P	C
	3	0	0	3

PRE-REQUISITE: NIL

Course Objective:	• To Recognize the importance of quality councils and strategic planning in TQM. • To Explore the elements and historical development of TQM. • To Foster employee involvement through motivation, empowerment, teamwork, and recognition. • To Implement continuous process improvement methods like Juran's Trilogy, PDSA Cycle, 5S, and Kaizen. • To Conduct quality audits and understand the introduction to other ISO standards like ISO 14000, IATF 16949, TL 9000, IEC 17025, ISO 18000, ISO 20000, ISO 22000, and ISO 21001.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Describe the elements and principles of Total Quality Management (TQM).	Ap	30%
CO2	Apply continuous process improvement methodologies such as Juran's Trilogy, PDSA Cycle, 5S, and Kaizen.	Ap	20%
CO3	Apply various quality tools and techniques in both manufacturing and service industry.	Ap	20%
CO4	Develop strong supplier partnerships and understand supplier selection, rating, and relationship development.	An	20%
CO5	choose appropriate quality standards and implement them in the respective industry App.	E	10%

UNIT I - QUALITY CONCEPTS AND PRINCIPLES	**(9)**
Definition of Quality - Dimensions of Quality - Quality Planning - Quality Assurance and Control - Quality Costs with Case Studies - Elements / Principles of TQM - Historical Review – Leadership – Qualities / Habits - Quality Council - Quality Statements, Strategic Planning – Importance - Case Studies - Deming Philosophy - Barriers to TQM Implementation – Cases with TQM Success and Failures.	
UNIT II -TQM-PRINCIPLES AND STRATEGIES	**(9)**
Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement – Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Juran's Trilogy - PDSA Cycle - 5S - Kaizen, Supplier Partnership - Partnering - Sourcing - Supplier Selection - Supplier Rating - Relationship Development, Performance Measures – Purpose – Methods - Cases.	
UNIT III - CONTROL CHARTS FOR PROCESS CONTROL	**(9)**
Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study- Introduction to Six Sigma.	

UNIT IV - TQM-MODERN TOOLS	(9)
New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies.	
UNIT – V QUALITY SYSTEMS	**(9)**
Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System – Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO20000 - ISO 22000 - ISO21001. Process of Implementing ISO - Barriers in ISO Implementation.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOK:

1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, UrdhwareshеHemant, UrdhwareshеRashmi "Total Quality Management", 5th Edition, Pearson Education, Noida, 2018.

REFERENCES:

1. SubburajRamasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, Cengage Learning, 2012.
3. David Goetsch& Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8thEdition,Pearson, 2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3		3												
4			3											
5					3				2	3				
CO (W.A)	**3**	**3**	**3**		**3**				**2**	**3**			**3**	**3**

22GEA04-PROFESSIONAL ETHICS				
	L	T	P	C
	3	0	0	3

PRE-REQUISITE : NIL

Course Objective:	• To develop students' ability to identify, analyse, and resolve ethical dilemmas in engineering contexts, fostering a commitment to professional responsibility, integrity, and ethical decision-making. • To provide engineering students with a comprehensive understanding of ethical principles and practices in the engineering profession. • To Familiarize students with key ethical theories, principles, and frameworks that guide ethical decision-making in professional practice. • To Foster the ability to communicate ethical concerns and collaborate effectively with diverse stakeholders, including colleagues, clients, and the public. • To Encourage students to uphold integrity, honesty, and accountability in their professional activities, fostering a culture of trust and reliability.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply ethical reasoning to evaluate and resolve these issues.	Ap	30%
CO2	Apply ethical principles and reasoning to analyze real-world case studies in engineering.	Ap	30%
CO3	Analyze the importance of ethics in professional practice.	An	20%
CO4	Develop the ability to make informed and ethical decisions in engineering practice.	An	10%
CO5	Recognize the importance of continuous learning and professional development in maintaining ethical standards.	E	10%

UNIT I - INTRODUCTION TO PROFESSIONAL ETHICS	**(9)**
Definition and Importance of Ethics,Ethical Theories and Principles,Ethics vs. Morals vs. Values, Role of Ethics in Engineering.	
UNIT II - PROFESSIONAL RESPONSIBILITY AND CODES OF CONDUCT	**(9)**
Professional Responsibility and Accountability, Codes of Conduct in Engineering (e.g., IEEE, NSPE),Conflicts of Interest and Whistleblowing, Case Studies.	
UNIT III - ETHICAL DECISION-MAKING AND PROBLEM-SOLVING	**(9)**
Ethical Decision-Making Models,Tools and Frameworks for Ethical Analysis,Resolving Ethical Dilemmas,Case Studies	
UNIT IV - LEGAL AND REGULATORY ASPECTS	**(9)**
Legal Frameworks Governing Engineering Practice, Intellectual Property Rights, Health, Safety, and Environmental Regulations, Case Studies.	

UNIT V - SOCIAL AND ENVIRONMENTAL RESPONSIBILITY	(9)
Social Responsibility of Engineers, Sustainable Engineering Practices, Impact of Engineering on Society and Environment,Case Studies.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

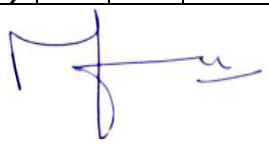
1. Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins,"Engineering Ethics: Concepts and Cases" 6th edition, 2018.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering" 5thEdition 2010.
3. by M. Govindarajan, S. Natarajan, and V. S. SenthilKumar,"Professional Ethics and Human Values",Ist Edition 2006.

REFERENCES:

1. Stephen H. Unger, "Engineering Ethics: Real-World Case Studies"
2. Online Ethics Center for Engineering and Science - www.onlineethics.org
3. National Society of Professional Engineers (NSPE) - www.nspe.org

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													3
2		3											3	
3		3												
4			3											
5					3				2	3				
CO (W.A)	**3**	**3**	**3**		**3**				**2**	**3**			**3**	**3**



22GEZ01-Entrepreneurship Development				
	L	**T**	**P**	**C**
	2	**0**	**2**	**3**
PRE REQUISITE : Nil				

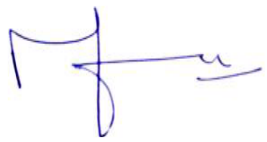
Course Objective:	• Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship • Apply process of problem –opportunity identification and validation through human centred approach to design thinking in building solutions as part of engineering projects. • Analyze market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a Minimum Viable Product. • Explore business models, create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise. • Prepare and present an investible pitch deck of their practice venture to attract stakeholders.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze different types of entrepreneurs and their impact on emerging economies through case studies of successful and failed engineering entrepreneurs	An	20%
CO2	Apply concepts related to societal problems, generate and validate ideas, and assess business opportunities by studying emerging markets and their potential	Ap	20%
CO3	Develop prototypes using various methods and tools, understand their importance in the entrepreneurial process, and iterate based on feedback to enhance their designs	C	20%
CO4	Apply the Lean Canvas to develop business models and craft effective pitches that engage investors and customers	Ap	20%
CO5	Analyze the entrepreneurial ecosystem, including its components, financing models, and stakeholder networks through interactive activities such as visits and interactions with startup founders	Ap	20%

MODULE–I: ENTREPRENEURIAL MINDSET	(6+6)
Introduction to Entrepreneurship: Definition – Types of Entrepreneurs – Emerging Economics–Developing and Understanding an Entrepreneurial Mindset– Importance of Technology Entrepreneurship – Benefits to the Society. Case Analysis: Study cases of successful & failed engineering entrepreneurs - Foster Creative Thinking: Engage in a series of Problem-Identification and Problem-Solving tasks.	

MODULE– II: OPPORTUNITIES	(6+6)
ProblemsandOpportunities–IdeasandOpportunities–Identifyingproblemsinsociety– Creation of opportunities – Exploring Market Types – Estimating the Market Size, - Knowing the Customer and Consumer - Customer Segmentation - Identifying niche markets – Customer discovery and validation; Market research techniques, tools for validation of ideas and opportunities. Activity Session: Identify emerging sectors / potential opportunities in existing markets - Customer Interviews: Conduct preliminary interviews with potential customers for Opportunity Validation – Analyse feedback to refine the opportunity.	
MODULE–III: PROTOTYPING &ITERATION	(6+6)
Prototyping – Importance in entrepreneurial process – Types of Prototypes - Different methods – Tools & Techniques. Hands-on sessions on prototyping tools (3D printing, electronics, software), Develop a prototype based on identified opportunities; Receive feedback and iterate on the prototypes.	
MODULE– IV: BUSINESS MODELS &PITCHING	(6+6)
Business Model and Types - Lean Approach - 9 block Lean Canvas Model - Riskiest assumptions to Business Models – Using Business Model Canvas as a Tool – Pitching Techniques: Importance of pitching-Types of pitches-crafting a compelling pitch –pitch presentation skills - using storytelling to gain investor/customer attention. Activity Session: Develop a business model canvas for the prototype; present and receive feedback from peers and mentors - Prepare and practice pitching the business ideas- Participate in a Pitching Competition and present to a panel of judges - receive & reflect feedback.	
MODULE–V: ENTREPRENEURIAL ECOSYSTEM	(6+6)
Understanding the Entrepreneurial Ecosystem – Components: Angels, Venture Capitalists, Maker Spaces, Incubators, Accelerators, Investors. Financing models–equity, debt, crowd funding, etc, Support from the government and corporate. Navigating Ecosystem Support: Searching & Identifying the Right Ecosystem Partner – Leveraging the Ecosystem - Building the right stakeholder network. Activity Session: Arrangement of Guest Speaker Sessions by successful entrepreneurs and entrepreneurial ecosystem leaders (incubation managers; angels; etc.), Visit one or two entrepreneurial ecosystem players (Travel and visit a research park or incubator or maker space or interact with startup founders).	
TOTAL(L:30,P:30) = 60 PERIODS	
TEXT BOOKS:	
1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGraw Hill, 11th Edition. 2. Ries,E.(2011).The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.	
REFERENCES:	
1.Blank, S.G.,&Dorf,B.(2012).The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch. 2. Roy, R.(2017).Indian Entrepreneurship: Theory and Practice New Delhi: Oxford University Press. 3. Osterwalder,A.,&Pigneur, Y.(2010).Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.	

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs / POs & PSOs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		3							3	3		3		
CO2		3	3				2		3	3		3		
CO3			3		3				3	3		3		
CO4									3	3	3	3		
CO5									3	3	3	3		
CO Weighted average	-	3	3	-	3	-	2	-	3	3	3	3	-	-
1 – Slight, 2 – Moderate, 3 – Substantial														



22ITM01 JAVA PROGRAMMING BASICS					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: Nil					
Course Objective:	To understand Object Oriented Programming concepts and basic characteristics of Java				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the fundamental concepts of Java to solve simple problems.	Ap	20%
CO2	Analyse how oops concepts like inheritance, polymorphism improves code organization and enhances flexibility.	Ap	20%
CO3	Build programs that efficiently handles errors through exception handling	Ap	20%
CO4	Demonstrate the use of packages and interfaces in achieving loose coupling.	An	20%
CO5	To create, manage, and synchronize threads to build high-performance, multi-threaded applications	An	20%

UNIT I - NTRODUCTION	**(9)**
Introduction of Java - Features of Java – Application of Java – Data Types –Statements – Operators – Control statements - Basics of Oops Concepts: Class – Objects – Methods –Constructor – finalizer –Access Control.	
UNIT II - INHERITANCE AND KEYWORDS	**(9)**
Inheritance: Types of Inheritance – Polymorphism – Method Overloading – Method Overriding- super – final with inheritance – Abstract Class - Keywords: static –final - this - String – Arrays	
UNIT III EXCEPTION HANDLING AND FILES	**(9)**
Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Using Exceptions. I/O Basics- Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files	
UNIT IV PACKAGES AND INTERFACES	**(9)**
Packages and Interfaces: Packages, Access Protection, Importing Packages. Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.	
UNIT V THREADS	**(9)**
Java Thread Model - Main Thread - Creating a Thread - Creating Multiple Threads - Thread Priorities - Synchronization - Interthread Communication - Suspending, Resuming, and Stopping Threads- Using Multithreading.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
Herbert Schildt, "JAVA THE COMPLETE REFERENCE", 13th Edition, March 2024
REFERENCES:
Deital & Deital, "Java How to Program: Early Objects", Eleventh Edition, Pearson,July 2018.

Mapping of COs with POs / PSOs														
	POs												**PSOs**	
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3													
2		3												
3			3											
4				3										
5					3									
CO (W.A)	**3**	**3**	**3**	**3**	**3**									

22ITM02 DATABASE SYSTEM CONCEPTS					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: Nil					
Course Objective:	To focus on database fundamentals, database designing and implementation of queries				

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply relational algebra operations to write basic queries to access database	An	20%
CO2	Analyse the use of DDL in building queries for accessing and modifying database	Ap	20%
CO3	Design entity relationship modeling	Ap	20%
CO4	Implement normalization techniques during database design	An	20%
CO5	Analyze and Implement transaction properties and concurrency protocols in SQL	An	20%

UNIT I - INTRODUCTION	**(9)**
Database System Applications- Purpose - View of Data - Data Models- Transaction Management - Database Architecture- Data Mining and Information Retrieval – Specialty Databases – Users and Administrators – History of Database Systems - Relational Model: Structure of Relational Databases- Database Schema – Keys – Schema Diagrams – Relational Query Languages - Relational Algebra Operations	
UNIT II - SQL	**(9)**
Introduction to SQL: - SQL – Data Definition – Basic Structure –Basic Operations – Set Operations – Null Values and Aggregate Functions– Nested Sub Queries- Modification of Databases	
UNIT III - INTERMEDIATE SQL AND ER MODELING	**(9)**
Join Expressions – Views – Transactions – Integrity Constraints – SQL - Data Types and Schemas - Authorization – Triggers – Database Design and ER Model – ER Diagrams – Extended ER Features	
UNIT IV - RELATIONAL DATABASE DESIGN	**(9)**
Features of Good Relational Designs - 1NF-Functional Dependencies-Decomposition Using Functional Dependencies - 2NF- Boyce Codd Normal Form - 3NF - Functional Dependency theory.	
UNIT V - TRANSACTIONS	**(9)**
Transactions: Desirable properties of Transactions – Serializability – Transactions Statements– Concurrency Control: Lock-Based Protocols – Deadlock Handling – Timestamp-Based Protocols	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
Silberschatz, Abraham, Korth, Henry F., Sudarshan S, "Database System Concepts", 7th Edition, Mc Graw Hill, 2020.
REFERENCES:
Ramez Elmasri, Shamkanth B.Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016 C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2012

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3													
2	3	3												
3			3											
4				3										
5			3		3									
CO (W.A)	**3**	**3**	**3**	**3**	**3**									

22ITM03 WEB ESSENTIALS					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: Nil					
Course Objective:	● To Understand the fundamental concepts of website basics.				
Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**		
CO1	Analyze how websites are structured, how they are accessed, and the roles of HTML, CSS, and JavaScript.	An	20%		
CO2	Build simple, static web pages using HTML and CSS.	Ap	20%		
CO3	Apply JavaScript to add simple interactive elements to web pages, such as buttons, forms, or basic animations.	Ap	20%		
CO4	Implement functions and browser handling power of PHP	Ap	20%		
CO5	Critically evaluate interactive web applications using Java Servlets with session management and database integration via JDBC.	An	20%		

UNIT I - WEBSITE BASICS	**(9)**
Internet Overview – Fundamental computer network concepts – Web Protocols – URL – Domain Name- Web Browsers and Web Servers- Working principle of a website –Creating a website – Client-side and server-side scripting	
UNIT II - WEB DESIGNING	**(9)**
HTML – Form Elements – Input types and Media elements – CSS3 – Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.	
UNIT III CLIENT-SIDE PROCESSING AND SCRIPTING	**(9)**
JavaScript Introduction – Variables and Data Types-Statements – Operators – Literals-Functions- Objects-Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Validation – JavaScript Debuggers.	

UNIT IV SERVER-SIDE PROCESSING AND SCRIPTING – PHP	(9)
PHP – Working principle of PHP – PHP Variables – Constants – Operators – Flow Control and Looping – Arrays – Strings – Functions – File Handling – File Uploading – Email Basics – Email with attachments – PHP and HTML – Simple PHP scripts – Databases with PHP	
UNIT V SERVLETS AND DATABASE CONNECTIVITY	**(9)**
Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions -Sessions – Cookies – Database connectivity–JDBC Creation of simple interactive applications – Simple database applications	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reilly publishers, 2014.
2. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web – How to Program", 5th edition, Pearson Education, 2012.

REFERENCES:

1. Jeffrey C. Jackson, "Web Technologies–A Computer Science Perspective", Pearson Education,2006.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson Education,2012
3. Steven Holzener, "PHP – The Complete Reference", 1st Edition, Mc-Graw Hill, 2017
4. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, McGraw Hill Publishers,2017
5. Bates, "Developing Web Applications", Wiley Publishers, 2006

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3												
2			3											
3			3											
4				3	3									
5					3						2			
CO (W.A)	3	3	3	3	3						2			

22ITM04 FULL STACK WEB DEVELOPMENT					
		L	T	P	C
		3	0	0	3
PRE-REQUISITE: Nil					
Course Objective:	To learn the basics of JavaScript and importance of MERN stack				
Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**		
CO1	Set up MERN environment for node.js	Ap	20%		
CO2	Design and develop front end application using Bootstrap and MongoDB.	Ap	20%		
CO3	Apply the knowledge of react based web programming	Ap	20%		
CO4	Deal with Node based programming and Express and analyze Express based web development	An	20%		
CO5	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone using jQuery to solve real world problems.	An	20%		

UNIT I - MERN Stack Foundations	**(9)**
Introduction to the MERN Stack and its Ecosystem, setting up the Development Environment (Node.js, npm, MongoDB), Introduction to Terminal/Command Line (basic commands, navigating directories), Version Control with Git (basic commands: init, add, commit, push, pull, Overview of JavaScript for Node.js (modules, callbacks, promises)	
UNIT II - Frontend Development with React	**(9)**
Introduction to React.js and JSX, Components, Props, and State, Handling Events in React (on Click, on Change, etc.), Introduction to React Hooks (use State, use Effect - basic usage), Building Simple React Components (Lists, Forms, Conditional Rendering), Styling React Components (CSS-in-JS, inline styles, external CSS)	
UNIT III - Backend Development with Node.js & Express.js	**(9)**
Introduction to Node.js and its Event Loop, Building a Basic HTTP Server with Node.js, Introduction to Express.js Framework (routing, middleware), Creating RESTful APIs with Express.js (GET, POST, PUT, DELETE), Data Handling and Validation in Express.js, Error Handling and Middleware (basic implementation)	
UNIT IV - Database Management with MongoDB	**(9)**
Introduction to NoSQL Databases and MongoDB, MongoDB Basics (Documents, Collections, Databases), CRUD Operations in MongoDB (Create, Read, Update, Delete), Basic MongoDB Query Language (find, filter, sort, limit), Connecting Node.js to MongoDB (using a driver), Data Modeling and Schema Design (basic concepts)	
UNIT V – MERN Project: Building a Simple Application	**(9)**
Project Planning and Design (small, focused project), Developing the Frontend with React (components, state management), Creating the Backend API with Node.js & Express.js (API endpoints, data handling), Integrating MongoDB for Data Storage (connecting frontend to backend). Testing and Debugging (basic testing techniques), Project Presentation and Demonstration.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

.1. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.
2. Bradshaw, S., Brazil, E., & Chodorow, K. (2019). MongoDB: the definitive guide: powerful and scalable data storage. O'Reilly Media.
3. Mardan, A. (2014). Express. js Guide: The Comprehensive Book on Express. js. Azat Mardan.
4. Deitel and Deitel and Nieto, "Internet and World Wide Web – How to Program", Prentice Hall, 5th Edition, 2011.
5. Zammetti, F. (2020). Modern Full-Stack Development: Using TypeScript, React, Node. js, Webpack, and Docker. Apress.

REFERENCES:

1. Silvio Moreto, Matt Lambert, Benjamin Jakobus, Jason Marah, "Bootstrap 4–Responsive Web Design" Packt Publishing (6 July 2017)
2. Thomas Powell, "Web Design: The Complete Reference", Osborne / McGraw-Hill
https://www.w3schools.com/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2		3	3		3									
3	3			3	3									
4				3										
5					3	2					2			
CO (W.A)	3	3	3	3	3	2					2			

22ITM05 – FUNDAMENTALS OF INTERNET OF THINGS				
	L	T	P	C
	3	0	0	3

PREREQUISITE : Nil

Course Objective:	• To provide an understanding of the technologies and the standards relating to the Internet of Things.

Course Outcomes The Student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the principles of IoT and digitization on industries	Ap	20%
CO2	Analyze the concepts of sensors and other smart objects.	An	20%
CO3	Examine the various requirements of IoT access technologies.	Ap	20%
CO4	Analyze and implement security measures in IoT.	An	20%
CO5	Summarize applications of IoT in real time scenario.	Ap	20%

UNIT I - INTRODUCTION TO INTERNET OF THINGS	**(9)**
IoT and Digitization-IoT Impact-Convergence of IT and OT, Network architecture and Design: Drivers behind network architecture-one M2M-IoT world forum (IoTWF).	
UNIT II – SMART OBJECTS: The "Things "in IoT	**(9)**
Sensors-Actuators-Micro Electro Mechanical Systems(MEMS)-Sensor networks: Wireless Sensor Networks(WSN)- Communication protocols for WSN -Connecting smart objects: range-frequency band-power consumption –topology.	
UNIT III - IOT ACCESS TECHNOLOGIES	**(9)**
Physical layer – MAC layer-the need for optimization-optimizing IP for IoT- the transport layer-IoT application transport methods-SCADA- CoAP-MQTT.	
UNIT IV – SECURING IoT	**(9)**
Common challenges-pervasive legacy system- insecure operational protocols-modbus-DNP3-ICCP-OPC-other protocols-formal risk analysis structure-OCTAVE-FAIR-phased application of security in an operational environment.	
UNIT V - APPLICATIONS OF IOT	**(9)**
Various Real time applications of IoT- Home Automation - Smart Parking - Environment: Weather monitoring system - Agriculture: Smart irrigation.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, CISCO Press, India, First Edition, 2017.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES:

1. Perry Lea, Internet of things for architects, Packt Publishing, UK, First Edition, 2018.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things – Key applications and Protocols, Wiley, US, First Edition, 2012.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3													
2	3													
3			3											
4					3									
5									2		2	2		
CO (W.A)	3		3		3				2		2	2		

22ITM06 DATA ACQUISITION FOR IOT				
	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

Course Objective:	• To design and implement power supplies, amplifiers, and sensor circuits for accurate data acquisition and signal conditioning. • Understand and apply communication protocols and interfacing techniques to connect sensors and microcontrollers for efficient data transfer and system control.

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Analyze the behavior of amplifiers and power supplies under different conditions.	An	20%
CO2	Analyze the performance of signal conditioning circuits and identify potential sources of error.	An	20%
CO3	Apply RS232, RS485, and IEEE488 standards in real-world communication systems.	Ap	20%
CO4	Apply time-division and space-division channeling methods in designing data acquisition systems for multi-channel sensor applications.	Ap	20%
CO5	Apply interfacing techniques to connect memory, sensors (LVDT, RPM meter), and microcontrollers to collect and process data	Ap	20%

UNIT-I: Power Supplies & Filters	(9)
Amplifiers-Instrumentation amplifiers-isolation-chopper and low drift amplifier -Lock- in amplifiers electrometer and trans-impedance amplifiers-modulation-filters-Constant voltage and constant current regulators, DC-DC converter, SMPS. D/A converters, Comparator,PLL.	
UNIT-II: Sensor Signal Conditioning Circuits	(9)
Signal conditioning for resistive sensors, Reactive variation sensors and Self generating sensors-Error budget analysis.	
UNIT-III: Basic Signal Conversion and Communication	(9)
RS232 interface standard, S485 interface standard. Distributed and stand alone data loggers, IEEE488 standard. methods of frequency-to-code conversion-standard, indirect and combined counting method, two wire transmission-four wire, six wire sensing.	
UNIT-IV: Data Acquisition Methods for Multi Channel Sensor Systems	(9)
Data acquisition method with time-division channeling, data acquisition with space- division channeling, and main errors of multi channel data-acquisition systems, data transmission and error protection.	

Unit-V: Serial Communication &Networks	(9)
Serial data communication –transmission modes,SPI,I2C, CAN. Examples of Implementation on a 8051 based microcontroller. Interfacing: memory interfacing, linear variable Differential Transformer (LVDT), speed measurement (RPM meter), Digital Thermometer	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. Jacob Fraden, "Hand Book of Modern Sensors: physics, Designs and Applications", 3rd edition, Springer, 2003.
2. Jon.S. Wilson, "Sensor Technology Hand Book", Elsevier Inc., 2005.

REFERENCES:

1. 1. Pallas Areny. R, Webster. J. G, "Sensors and Signal conditioning", 2nd ed. John Wiley and Sons, 2001.
2. Taylor H Rosemary, "Data Acquisition for Sensor Systems", Kluwer Academic Publishers Group, 1997
3. Microcontrollers (Theory & Applications) –A.V. Deshmuk, WTMH 2005
4. Embedded Systems Architecture, programming and Design 2nd ed. Rajkaml McGraw –Hill

Mapping of COs with POs / PSOs

	POs												PSOs	
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3													
2	3	3												
3				3										
4				3										
5							3							
CO (W.A)	**3**	**3**		**3**			**3**							

22ITM07 – WEB APPLICATION SECURITY				
	L	T	P	C
	3	0	0	3

PRE – REQUISITE: Nil

Course Objective:	• To equip students with the knowledge and skills required to secure web applications by identifying vulnerabilities, implementing protective measures, and adhering to security best practices.

Course Outcomes: The student will be able to		**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Analyze the Basic Concepts and Structure of Web Applications, Including the Role of Frontend and Backend Components	An	20%
CO2	Critically evaluate different web application architecture models to understand their strengths, weaknesses, and appropriate use cases in modern web development.	An	20%
CO3	Critically assess the difference between authentication and authorization, and evaluate how both concepts play distinct but complementary roles in securing web applications and systems.	An	20%
CO4	Analyze encryption methods and hashing algorithms to assess their strengths, weaknesses, and use cases in securing sensitive data both in transit and at rest.	An	20%
CO5	Apply encryption techniques to secure sensitive data at rest and in transit, and implement data masking and tokenization to protect data in non-production environments.	Ap	20%

UNIT - I INTRODUCTION TO WEB APPLICATION	**(9)**
Fundamentals of Web Application - Confidentiality, Integrity, and Availability (CIA Triad) - Common attack vectors in web applications - Frontend (Client-side) - Backend (Server-side)	
UNIT - II WEB APPLICATION ARCHITECTURE	**(9)**
Introduction - Microservices Architecture - Monolithic Architecture - Microservices Architecture - Serverless Architecture - Web Application Layers.	
UNIT – III AUTHENTICATION AND AUTHORIZATION	**(9)**
Introduction - Authentication Basics - Authorization Fundamentals - Session Management - OAuth and OpenID Connect - Single Sign-On	
UNIT – IV DATA SECURITY BASICS	**(9)**
Data Security - Types of Data - Encryption Techniques - Data Integrity - Data Access Control - Data Security Tools.	

UNIT – V APPLICATION SECURITY	(9)
Security in the Software Development Lifecycle - Web Application Vulnerabilities - Secure Coding - Application Security Testing - API Security - Cloud Security - Application Security Management.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Web Application Security: Exploitation and Countermeasures, by Andrew Hoffman, McGraw-Hill Education Publishers, 1 February 2013.

REFERENCE:

1. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws by Dafydd Stuttard & Marcus Pinto , 2011, Wiley.
2. OWASP Top 10: The Most Critical Web Application Security Risks
3. Security Engineering: A Guide to Building Dependable Distributed System by Ross Anderson, Wiley, 2020 (3rd Edition)

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3	3		-	-	-		-	-		3	3
2	3		3	3									3	
3					3									
4	3				3									
5	3	3							3		3			3
CO (W.A)	3	3	3	3	3				3		3			3

22ITM08 – FUNDAMENTALS CYBER FORENSICS				
	L	T	P	C
	3	0	0	3

PRE – REQUISITE: Nil

Course Objective:	• To equip students with the objective to develop a fundamental understanding of information security and data integrity.

Course Outcomes: The Student will be able to		**Cognitive Level**	**Weightage of COs in Continuous Assessment Test**
CO1	Analytical experience in utilizing the Wireshark tool for advanced packet sniffing, network traffic analysis, anomaly detection, and protocol investigation.	An	20%
CO2	Develop a deep understanding and hands-on expertise in utilizing open-source forensic tools for advanced data extraction, in-depth analysis, and digital evidence processing.	An	20%
CO3	Advanced practical knowledge in image hiding and recovery using Steganography tools, conduct in-depth metadata analysis of images (JPG) and videos (MP4) using EXIF viewers, and perform comprehensive time-based forensic analysis using Decode	An	20%
CO4	Utilize expertise in the Digital Forensics process through forensic imaging using a Write-blocker and Forensic Duplicator and performing comprehensive forensic examinations with Autopsy and FTK.	An	20%
CO5	Develop the ability to properly handle, preserve, and analyze digital evidence while ensuring integrity, chain of custody, and compliance with forensic best practices.	Ap	20%

UNIT - I DIGITAL INVESTIGATION	**(9)**
Digital Evidence and Computer Crime - History and Terminology of Computer Crime Investigation - Technology and Law - The Investigative Process - Investigative Reconstruction - Modus Operandi, Motive and Technology - Digital Evidence in the Courtroom.	
UNIT - II INFORMATION INVESTIGATION	**(9)**
Methods of storing data: number systems, character codes, record structures, file formats and file signatures - Word processing and graphic file formats - Structure and Analysis of Optical Media Disk Formats - Recognition of file formats and internal buffers used by the most common CD and DVD writing applications	
UNIT – III COMPUTER BASICS FOR DIGITAL INVESTIGATORS	**(9)**
Computer Forensic Fundamentals - Applying Forensic Science to computers - Computer Forensic Services - Benefits of Professional Forensic Methodology - Steps taken by computer forensic specialists.	

UNIT – IV TYPES OF COMPUTER FORENSICS TOOLS AND TECHNOLOGY	(9)
Tools and Types of Military Computer Forensics Technology - Tools and Types of Law Enforcement Computer Forensic Technology - Tools and Types of Business Computer Forensic Technology	
UNIT – V ELECTRONIC DISCOVERY	**(9)**
Introduction to Electronic Discovery - Legal Context - Case management - Identification of Electronic Data - Forensic Preservation of Data - Data Processing - Production f electronic data - Case studies	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Computer Forensics: Cyber Criminals, Laws and Evidence by Marie-Helen Maras, 1st edition, Jones and Bartlett Publishers, 1 February 2011
2. Computer Forensics, Computer Crime Scene Investigation by John.R.Vacca, 2nd Edition, Charles River Media Publication, 15 June 2002

REFERENCE:

1. Cyber Forensics: A field manual for collecting, Examining, preserving evidence of computer crimes by Albert Marcella, Jr., Doug Menendez, Second Edition, CRC Press 2007
2. Guide to Computer Forensics and Investigations, Processing Digital Evidence by Bill Nelson, Amelia Phillips, Christopher Steuart, 4th edition, Delmar Cengage Learning, 28 Oct 2009
3. Digital Forensics for Legal Professionals - Understanding Digital Evidence from the Warrant to the Courtroom by Larry Daniel, Lars Daniel, 1st edition, Syngress, 14 October 2011

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3		-	-	-		-	-		3	3
2	3	3	3	3									3	
3	3													
4	3													
5			3											3
CO (W.A)	3	3	3	3										3