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.E – Computer Science and Engineering [R17]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year 2017-2018 onwards)

SEPTEMBER 2021

COMPUTER SCIENCE AND ENGINEERING DEPARTMENT PEOs, PSOs and POs

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

The following Programme Educational Objectives are designed for B.E. Computer Science and Engineering programme in Computer Science and Engineering based on the Department Vision & Mission to provide higher engineering education and motivate research in the field of Computer Engineering.

PEO 1. Graduates will be employed in IT industries to solve industrial technological issues.

PEO 2. Graduates will take up masters and pursue career paths in teaching and research.

PEO 3. Graduates will be an entrepreneur who develops, deploys and maintains Real-time software.

PEO 4. Graduates will continuously learn and adopt new technologies to solve communal issues.

PEO 5. Graduates will enhance leadership skills and contribute towards societal growth.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1. Ability to understand the principles and working of hardware and software aspects in a computer system

PSO2. Ability to demonstrate knowledge in mathematical models, algorithms and software development methodologies

PSO3. Ability to develop practical competency in programming languages and open source platforms

PSO4. Ability to provide a foundation for higher studies, research and entrepreneurship

PROGRAM OUTCOMES (POs)

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 informed 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 Program 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	2	2	2	3	3	3	3
2	3	3	3	3	3	2	2	1	3	3	2	3
3	3	3	3	3	3	2	2	2	3	3	3	3
4	3	3	3	3	3	2	2	1	3	3	2	3
5	3	3	3	3	3	3	2	2	2	3	3	3

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Outcomes and the Programme 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	2	2	2	1	1	1	1	1	1	2
2	3	3	3	3	2	2	1	3	1	2	3	3
3	3	3	3	3	3	3	1	2	1	1	2	3
4	3	3	2	3	3	2	2	3	1	2	2	3

* Contribution   **1: Reasonable**   **2: Significant**   **3: Strong**

REGULATIONS – 2017   **CHOICE BASED CREDIT SYSTEM**

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULA: **I – VIII SEMESTERS**   **SYLLABI**   **I - VIII SEMESTER**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17EYA01	Professional English- I	HS	-	4	2	0	2	3
2.	17MYB01	Calculus and Solid Geometry	BS	-	5	3	2	0	4
3.	17PYB02	Physics for Computer Engineers	BS	-	5	3	0	2	4
4.	17CYB03	Environmental Science	BS	-	3	3	0	0	3
5.	17CSC02	Python Programming	ES	-	3	3	0	0	3
PRACTICAL									
6.	17MEP01	Engineering Graphics Laboratory	ES	-	4	0	0	4	2
7.	17CSP02	Python Programming Laboratory	ES	-	4	0	0	4	2
8.	17GEP01	Personal Values	HS	-	2	0	0	2	0
				TOTAL	30	14	2	14	21

Table heading: SEMESTER: I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17EYA02	Professional English- II	HS	17EYA01	4	2	0	2	3
2.	17MYB02	Complex Analysis and Laplace Transforms	BS	17MYB01	5	3	2	0	4
3.	17PYB04	Applied Physics	BS	17PYB02	3	3	0	0	3
4.	17CYB04	Chemistry for Computer Engineers	BS	-	5	3	0	2	4
5.	17CSC03	Structured Programming	ES	-	3	3	0	0	3
6.	17ECC04	Basics of Electronics Engineering	ES	-	4	3	0	0	3
PRACTICAL									
7.	17CSP03	Structured Programming Laboratory	ES	-	4	0	0	4	2
8.	17ECP02	Electronics Laboratory	ES	-	4	0	0	4	2
9.	17GEP02	Interpersonal Values	HS	17GEP01	2	0	0	2	0
				TOTAL	34	17	2	14	24

Table heading: SEMESTER: II

SEMESTER: III									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17MYB04	Probability and Statistics	BS	-	4	2	2	0	3
2.	17CSC04	Data Structures using Python	PC	17CSC02	5	3	0	2	4
3.	17ITC01	OOPS using JAVA	PC	-	3	3	0	0	3
4.	17CSC05	Operating Systems	PC	-	3	3	0	0	3
5.	17ECC09	Digital Principles and System Design	ES	17ECC04	3	3	0	0	3
6.	17CSC06	Microprocessor and Computer Architecture	PC	-	3	3	0	0	3
PRACTICAL									
7.	17ITP01	OOPS using JAVA Laboratory	PC	-	4	0	0	4	2
8.	17CSP04	Operating Systems Laboratory	PC	-	2	0	0	2	1
9.	17GED01	Soft Skills – Listening & Speaking	EEC	-	2	0	0	2	0
				TOTAL	29	17	2	10	22

SEMESTER: IV									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17MYB08	Discrete Mathematics	BS	-	4	2	2	0	3
2.	17ITC04	Design and Analysis of Algorithms	PC	17CSC04	5	3	2	0	4
3.	17CSC07	Database Management System	PC	-	3	3	0	0	3
4.	17CSC08	Computer Networks	PC	-	3	3	0	0	3
5.	17CSC09	Artificial Intelligence	PC	-	3	3	0	0	3
6.	17GEA01	Engineering Economics and Financial Accounting	HS	-	3	3	0	0	3
PRACTICAL									
7.	17CSP05	Database Management System Laboratory	PC	-	4	0	0	4	2
8.	17CSP06	Computer Networks Laboratory	PC	-	2	0	0	2	1
9.	17GED02	Soft Skills – Reading and Writing	EEC	-	2	0	0	2	0
10.	17GED03	Personality and Character Development	EEC	-	1	0	0	1	0
				TOTAL	30	17	4	9	22

				SEMESTER: V					
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17CSC10	Theory of Computation	PC	17MYB08	3	3	0	0	3
2.	17ITC09	Internet and Web Programming	PC	17ITC01	4	2	0	2	3
3.	17CSC11	Object Oriented Software Engineering	PC	17CSC07	3	3	0	0	3
4.	17CSC12	Graphics and Multimedia	PC	-	3	3	0	0	3
5.	E1	Elective (PSE)	PSE	-	3	3	0	0	3
6.	E2	Elective (PSE/OE)	PSE/OE	-	3	3	0	0	3
PRACTICAL									
7.	17CSP07	Case Tools Laboratory	PC	-	4	0	0	4	2
8.	17CSP08	Graphics and Multimedia Laboratory	PC	-	4	0	0	4	2
9.	17GED08	Essence of Indian Traditional Knowledge	MC	-	2	2	0	0	0
				TOTAL	29	19	0	10	22

				SEMESTER:VI					
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17CSC14	Cloud Computing	PC	-	3	3	0	0	3
2.	17CSC15	Security in Computing	PC	17CSC07, 17CSC08	3	3	0	0	3
3.	17CSC16	Principles of Compiler Design	PC	17CSC10	3	3	0	0	3
4.	E3	Elective (PSE)	PSE	-	3	3	0	0	3
5.	E4	Elective (PSE)	PSE	-	3	3	0	0	3
6.	E5	Elective (PSE/OE)	PSE/OE	-	3	3	0	0	3
PRACTICAL									
7.	17CSP09	Internet of Things Laboratory	ES	-	4	0	0	4	2
8.	17GED06	Comprehension	PC	-	2	0	0	2	0
9.	17GED07	Constitution of India	MC	-	2	2	0	0	0
				TOTAL	27	19	0	8	20

SEMESTER: VII									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17CSC17	Mobile Computing	PC	17CSC08	3	3	0	0	3
2.	17ITC15	Machine Learning Techniques	PC	17MYB01	3	3	0	0	3
3.	17CSC18	Full Stack Development	PC	-	3	3	0	0	3
4.	E6	Elective (PSE/ OE)	PSE/OE	-	3	3	0	0	3
5.	E7	Elective (OE)	OE	-	3	3	0	0	3
PRACTICAL									
6.	17CSP10	Mobile Computing Laboratory	PC	-	2	0	0	2	1
7.	17CSD01	Project Work I	EEC	-	8	0	0	8	4
				TOTAL	25	15	0	10	20

SEMESTER: VIII									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	E8	Elective (PSE)	PSE	-	3	3	0	0	3
2.	E9	Elective (OE)	OE	-	3	3	0	0	3
PRACTICAL									
3.	17CSD02	Project Work II	EEC	-	16	0	0	16	8
				TOTAL	22	6	0	16	14

LIST OF PROGRAMME SPECIFIC ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1	17CSX04	TCP/IP Design and Implementation	PSE	17CSC08	3	3	0	0	3
2	17CSX05	Network Analysis and Management	PSE	17CSC08	3	3	0	0	3
3	17CSX06	Wireless Communication and Networks	PSE	17CSC08	3	3	0	0	3
4	17CSX07	Embedded systems	PSE	-	3	3	0	0	3
5	17CSX08	Graph Theory	PSE	17CSC04	3	3	0	0	3
6	17CSX10	Mobile Application Development	PSE	-	3	3	0	0	3
7	17CSX11	Human Computer Interaction	PSE	17CSC08	3	3	0	0	3
8	17CSX12	Green Computing	PSE	17CSC08	3	3	0	0	3
9	17CSX13	Nano Computing	PSE	17CSC08	3	3	0	0	3
10	17CSX15	Knowledge Management	PSE	-	3	3	0	0	3
11	17ITX05	PHP programming	PSE	17ITC09	3	3	0	0	3
12	17ITX06	Programming with Java2 Enterprise Edition	PSE	17ITC01	3	3	0	0	3
13	17ITX08	C# and .Net	PSE	17ITC01	3	3	0	0	3
14	17ITX09	Ruby programming	PSE	-	3	3	0	0	3
15	17CSX23	Text Mining	PSE	17CSX22	3	3	0	0	3
16	17CSX24	Distributed Systems	PSE	-	3	3	0	0	3
17	17CSX25	Game Programming	PSE	-	3	3	0	0	3
18	17CSX27	Quantum Computing	PSE	17MYB04	3	3	0	0	3
19	17CSX28	Container OrchestrationUsing Kubernetes	PSE	17CSC14	3	3	0	0	3
20	17CSX29	Internet of Things	PSE	17CSC08	3	3	0	0	3
21	17MYB12	Basic Statistics andNumerical Analysis	PSE	-	3	3	0	0	3
22	17CSX31	Problem Solving and Programming	PSE	-	3	3	0	0	3
23	17CSX32	Social network Analysis	PSE	-	3	3	0	0	3
24	17ITX26	Problem Solving and Algorithmic Skills	PSE	-	3	3	0	0	3
25	17ECX16	Internet of Things and its applications	PSE	-	3	3	0	0	3
26	17CSX33	Google Cloud Platform	PSE		3	3	0	0	3

27	17CSX34	Tableau	PSE	-	3	3	0	0	3
28	17CSX35	Node JS	PSE	17ITC09, 17ITX05	3	3	0	0	3
29	17CSX36	React JS	PSE	17ITC09, 17ITX05	3	3	0	0	3
30	17ITX29	IT operations	PSE	-	3	3	0	0	3
31	17ITX30	IT operations Advanced	PSE	17ITX29	3	3	0	0	3
32	17CSX37	Professional Readiness for Innovation, Employability and Entrepreneurship	PSE	-	3	3	0	0	3
33	17ITX32	JAVA - J2EE	PSE	-	3	3	0	0	3
34	17ITX33	JAVA-Full Stack Implementation	PSE	-	3	3	0	0	3
35	17ITX17	Building Enterprise Applications	PSE	-	3	3	0	0	3
36	17ITX37	Problem Solving Using JAVA	PSE	-	3	3	0	0	3

HUMANITIES AND SOCIAL SCIENCES (HS)									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERREQUISITE	CONTACT PERIODS	L	T	P	C
1.	17EYA01	Professional English- I	HS	-	4	2	0	2	3
2.	17GEP01	Personal Values	HS	-	2	0	0	2	0
3.	17EYA02	Professional English- II	HS	17EYA01	4	2	0	2	3
4.	17GEP02	Interpersonal Values	HS	17GEP01	2	0	0	2	0
5.	17GEA01	Engineering Economics andFinancial Accounting	HS	-	3	3	0	0	3
BASIC SCIENCES (BS)									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERREQUISITE	CONTACT PERIODS	L	T	P	C
1.	17MYB01	Calculus and Solid Geometry	BS	-	5	3	2	0	4
2.	17PYB02	Physics for Computer Engineers	BS	-	5	3	0	2	4
3.	17CYB03	Environmental Science	BS	-	3	3	0	0	3
4.	17MYB02	Complex Analysis andLaplace Transforms	BS	17MYB01	5	3	2	0	4
5.	17PYB04	Applied Physics	BS	17PYB02	3	3	0	0	3
6.	17CYB04	Chemistry for Computer Engineers	BS	-	5	3	0	2	4
7.	17MYB04	Probability and Statistics	BS	-	4	2	2	0	3
8.	17MYB08	Discrete Mathematics	BS	-	4	2	2	0	3

ENGINEERING SCIENCES (ES)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1.	17CSC02	Python Programming	ES	-	3	3	0	0	3
2.	17MEP01	Engineering Graphics Laboratory	ES	-	4	0	0	4	2
3.	17CSP02	Python Programming Laboratory	ES	-	4	0	0	4	2
4.	17CSC03	Structured Programming	ES	-	3	3	0	0	3
5.	17ECC04	Basics of Electronics Engineering	ES	-	4	3	0	0	3
6.	17CSP03	Structured Programming Laboratory	ES	-	4	0	0	4	2
7.	17ECP02	Electronics Laboratory	ES	-	4	0	0	4	2
8.	17ECC09	Digital Principles and System Design	ES	17ECC04	3	3	0	0	3
9.	17CSC13	Internet of Things	ES	-	3	3	0	0	3
10.	17CSP09	Internet of Things Laboratory	ES	-	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1.	17GED01	Soft Skills – Listening & Speaking	EEC	-	2	0	0	2	0
2.	17GED02	Soft Skills – Reading & Writing	EEC	-	2	0	0	2	0
3.	17GED03	Personality and Character Development	EEC	-	1	0	0	1	0
4.	17GED08	Essence of Indian Traditional Knowledge	MC	-	2	2	0	0	0
5.	17GED07	Constitution of India	MC	-	2	2	0	0	0
6.	17CSD01	Project Work I	EEC	-	8	0	0	8	4
7.	17CSD02	Project Work II	EEC	-	16	0	0	16	8

PROFESSIONAL CORE (PC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1.	17CSC04	Data Structures using Python	PC	17CSC02	4	2	0	2	3
2.	17ITC01	OOPS using JAVA	PC	-	3	3	0	0	3
3.	17CSC05	Operating Systems	PC	-	3	3	0	0	3

Sl. No.	Course Code	Course Title	Category	Prerequisite					
4.	17CSC06	Microprocessor and Computer Architecture	PC	-	3	3	0	0	3
5.	17ITP01	OOPS using JAVA Laboratory	PC	-	4	0	0	4	2
6.	17CSP04	Operating Systems Laboratory	PC	-	2	0	0	2	1
7.	17CSC07	Database Management System	PC	-	3	3	0	0	3
8.	17CSC08	Computer Networks	PC	-	3	3	0	0	3
9.	17ITC04	Design and Analysis of Algorithms	PC	17CSC04	4	3	2	0	4
10.	17CSC09	Artificial Intelligence	PC	-	3	3	0	0	3
11.	17CSP05	Database Management System Laboratory	PC	-	4	0	0	4	2
12.	17CSP06	Computer Networks Laboratory	PC	-	2	0	0	2	1
13.	17CSC10	Theory of Computation	PC	17MYB08	3	3	0	0	3
14.	17CSC11	Object Oriented Software Engineering	PC	17CSC07	3	3	0	0	3
15.	17ITC09	Internet and Web Programming	PC	-	4	2	0	2	3
16.	17CSC12	Graphics and Multimedia	PC	-	3	3	0	0	3
17.	17CSP07	Case Tools Laboratory	PC	-	4	0	0	4	2
18.	17CSP08	Graphics and Multimedia Laboratory	PC	-	4	0	0	4	2
19.	17CSC14	Cloud Computing	PC	-	3	3	0	0	3
20.	17CSC15	Security in Computing	PC	17CSC07, 17CSC08	3	3	0	0	3
21.	17CSC16	Principles of Compiler Design	PC	17CSC10	3	3	0	0	3
22.	17GED06	Comprehension	PC	-	2	0	0	2	0
23.	17ITC15	Machine Learning Techniques	PC	17MYB01	3	3	0	0	3
24.	17CSC17	Mobile Computing	PC	17CSC08	3	3	0	0	3
25.	17CSP10	Mobile Computing Laboratory	PC	-	2	0	0	2	1
26.	17CSC18	Full Stack Development	PC	-	3	3	0	0	3

(b)Open Electives					AICTE Credit Distribution Norm:18					
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17AGZ01	Baking and Confectionery Technology	OE	-	3	3	0	0	3	VII
2.	17AGZ02	Food safety and quality control system	OE	-	3	3	0	0	3	VII
3.	17AGZ03	Farm Mechanization	OE	-	3	3	0	0	3	VIII
4.	17AGZ04	Processing of Fruits and Vegetables	OE	-	3	3	0	0	3	VIII
5.	17CHZ01	Waste Water Treatment	OE	-	3	3	0	0	3	VII
6.	17CHZ02	Piping Engineering	OE	-	3	3	0	0	3	VII
7.	17CHZ03	Process Automation	OE	-	3	3	0	0	3	VII
8.	17CHZ04	Process Instrumentation	OE	-	3	3	0	0	3	VII
9.	17CEZ01	Energy conservation in buildings	OE	-	3	3	0	0	3	VII
10.	17CEZ02	Air Pollution Management	OE	-	3	3	0	0	3	VIII
11.	17CEZ03	Building Services	OE	-	3	3	0	0	3	VIII
12.	17CEZ04	Road Safety Management	OE	-	3	3	0	0	3	VII
13	17CEZ05	Waste Management	OE	-	3	3	0	0	3	VII/VIII
14.	17CSZ01	Design Thinking	OE	-	3	3	0	0	3	VII
15.	17CSZ02	Digital Marketing	OE	-	3	3	0	0	3	VII
16.	17CSZ03	Software Engineering	OE	-	3	3	0	0	3	VIII
17.	17CSZ04	Unified Functional Testing	OE	-	3	3	0	0	3	VIII
18	17CSZ05	C Programming	OE	-	3	3	0	0	3	VI
19.	17CSZ06	Data Structures	OE	-	3	3	0	0	3	VI
20.	17CSZ07	Web Services Using Java	OE	-	3	3	0	0	3	VI
21.	17ECZ01	Modern wireless communication system	OE	-	3	3	0	0	3	VII
22.	17ECZ02	Consumer Electronics	OE	-	3	3	0	0	3	VII
23.	17ECZ03	Automotive Electronics	OE	-	3	3	0	0	3	VIII
24.	17ECZ04	Electronic Testing	OE	-	3	3	0	0	3	VIII
25.	17EEZ01	Renewable Energy Technology	OE	-	3	3	0	0	3	VII
26.	17EEZ02	Smart Grid	OE	-	3	3	0	0	3	VII

A p p r o v e d b y N i n t h A c a d e m i c C o u n c i l

No.	Code	Course Title	Type	Prereq		L	T	P	C	Sem
27.	17EEZ03	Energy Auditing, Conservation and Management	OE	-	3	3	0	0	3	VIII
28.	17EEZ04	Electrical Machines	OE	-	3	3	0	0	3	VIII
29	17EIZ01	Autotronix	OE	-	3	3	0	0	3	VII
30	17EIZ02	Industrial Automation	OE	-	3	3	0	0	3	VII
31.	17EIZ03	Fiber Optic Sensors	OE	-	3	3	0	0	3	VIII
32.	17EIZ04	Ultrasonic Instrumentation	OE	-	3	3	0	0	3	VIII
33.	17ITZ01	Software Testing Tool	OE	-	3	3	0	0	3	VII
34.	17ITZ02	User Experience	OE	-	3	3	0	0	3	VII
35.	17ITZ03	Developing Mobile Apps	OE	-	3	3	0	0	3	VIII
36.	17ITZ04	Software Project Management	OE	-	3	3	0	0	3	VIII
37.	17ITZ05	Java Programming	OE	-	3	3	0	0	3	VI
38.	17MEZ01	Engineering Ergonomics	OE	-	3	3	0	0	3	VII / VIII
39.	17MEZ02	Energy Audit and Resource Management	OE	-	3	3	0	0	3	VII / VIII
40.	17MEZ03	Electric Vehicle Technology	OE	-	3	3	0	0	3	VII / VIII
41.	17MEZ04	Value Engineering	OE	-	3	3	0	0	3	VII / VIII
42.	17MEZ05	Smart Mobility	OE	-	3	3	0	0	3	VII / VIII
43.	17MEZ06	Smart Sensor Systems	OE	-	3	3	0	0	3	VII / VIII
44.	17MYZ01	Mathematical Structures	OE	-	3	3	0	0	3	VII
45.	17MYZ02	Optimization Techniques	OE	-	3	3	0	0	3	VII
46.	17MYZ03	Statics for Engineers	OE	-	3	3	0	0	3	VII
47.	17MYZ04	Statistics for Engineers	OE	-	3	3	0	0	3	VII
48.	17PYZ01	Nanomaterials	OE	-	3	3	0	0	3	VII
49.	17PYZ02	Nuclear physics and Reactors	OE	-	3	3	0	0	3	VII
50.	17PYZ03	Space science and technology	OE	-	3	3	0	0	3	VII
51.	17CYZ01	Chemistry for Every DayLife	OE	-	3	3	0	0	3	VII

A p p r o v e d   b y   N i n t h   A c a d e m i c   C o u n c i l

						L	T	P	C	
52.	17CYZ02	E - Waste Management	OE	-	3	3	0	0	3	VII
53.	17CYZ03	Industrial Chemistry	OE	-	3	3	0	0	3	VII
54.	17EYZ01	Communicative Hindi	OE	-	3	3	0	0	3	VII
55.	17EYZ02	Fundamentals of German	OE	-	3	3	0	0	3	VII
56.	17EYZ03	Basics of Japanese	OE	-	3	3	0	0	3	VII
57.	17EYZ04	Employability Enhancement and Analytical Skills	OE	-	3	3	0	0	3	VII
58.	17EYX01	Effective Communication	OE	-	3	3	0	0	3	VII
59.	17EYZ05	Workplace Communication	OE	-	3	3	0	0	3	VII
60.	17GYZ01	Biology for Engineers	OE	-	3	3	0	0	3	VII
61.	17BMZ01	Health care technology	OE	-	3	3	0	0	3	VII
62.	17BMZ02	Telemedicine	OE	-	3	3	0	0	3	VII
63.	17BMZ03	Epidemiology and Pandemic Management	OE	-	3	3	0	0	3	VII
64.	17BMZ04	Medical Ethics	OE	-	3	3	0	0	3	VII
65.	17AIZ01	Fundamentals of Artificial Intelligence and Machine Learning	OE	-	3	3	0	0	3	VII
66.	17AIZ02	Data Science Fundamentals	OE	-	3	3	0	0	3	VII
67.	17AIZ03	Introduction to Business Analytics	OE	-	3	3	0	0	3	VII
68.	17AIZ04	Augmented Reality/Virtual Reality Technologies	OE	-	3	3	0	0	3	VII

		Honor Degree Courses						
		Vertical I - Software Engineering						
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	17ITX07	Advanced Web Programming	17ITC09	3	3	0	0	3
2.	17CSX17	Software Design and Architecture	-	3	3	0	0	3
3.	17CSX18	Software Testing Methodologies	-	3	3	0	0	3
4.	17CSX19	Software Agents	-	3	3	0	0	3
5.	17CSX20	Software Quality Assurance	-	3	3	0	0	3
6.	17CSX21	Software Project Management	-	3	3	0	0	3
7.	17CSX30	Agile methodologies	-	3	3	0	0	3
8.	17CSX38	Devops	-i	3	3	0	0	3
		Vertical II - Data Science						
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	17CSX01	Data Science	17MYB04, 17CSC07	3	3	0	0	3
2.	17CSX02	Data Warehousing and Data Mining	17CSC07	3	3	0	0	3
3.	17CSX03	Data Analytics	17CSC07	3	3	0	0	3
4.	17CSX09	Information Retrieval Techniques	17CSC07	3	3	0	0	3
5.	17CSX14	Deep Learning	17MYB02, 17MYB04	3	3	0	0	3
6.	17CSX16	Image Processing Techniques	-	3	3	0	0	3
7.	17CSX22	Natural Language Processing	-	3	3	0	0	3
8.	17CSX26	Blockchain Technologies	17ITC09	3	3	0	0	3

		Minor Degree Courses						
		Full Stack Development						
SL. NO.	COURSE CODE	COURSE TITLE	PRE-RQUISITE	CONTACT PERIODS	L	T	P	C
1.	17CSM01	User Interface design	-	3	3	0	0	3
2.	17CSM02	Programming using Java	-	3	3	0	0	3
3.	17CSM03	Database System Concepts	-	3	3	0	0	3
4.	17CSM04	XML and Web Services	-	3	3	0	0	3
5.	17CSM05	Web Technologies	-	3	3	0	0	3
6.	17CSM06	Open source systems	-	3	3	0	0	3
7.	17CSM07	UI and UX DESIGN	-	3	3	0	0	3
8.	17CSM08	C# and .Net frame work	17CSM02	3	3	0	0	3

CREDIT DISTRIBUTION

SEM	HS	BS	PC	ES	EEC	PSE	OE	TOTAL
I	3	11	-	7	-	-	-	21
II	3	11	-	10	-	-	-	24
III	-	3	16	3	-	-	-	22
IV	3	3	16	-	-	-	-	22
V	-	-	16	-	-	6	-	22
VI	-	-	9	2	0	9	-	20
VII	-	-	10	-	4	3	3	20
VIII	-	-	-	-	8	3	3	14
TOTAL	9	28	64	22	12	24	6	
%	5.5	17.0	38.8	13.3	7.3	14.5	3.6	165
AICTE %	5-10	15-20	30-40	15-20	-	10-15	5-10	

TOTAL CREDITS (21+24+22+22+22+20+20+14) = 165 CREDITS

Approved by Eleventh Academic Council

			17ITX29 IT OPERATIONS					

						L	**T**	**P**	**C**
						3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – III

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand the basics of IT operations and differentiate IT Operation Management & IT Service Management.	**1.1**	The student will be able to identify the operation policies and procedures.	**a,b,c,d,g,l**
2.0	To learn policies and procedures to achieve a safe working environment in terms of health and safety regulations.	**2.1**	The student will be able to apply the Corporate Etiquettes and make the working environment safer.	**c,d,f,g,h,i,l**
3.0	To know the basic principles of an Organization in IT Operations.	**3.1**	The student will be able to recognize the Key Concepts of Service Management in IT - enabled services.	**a,b,c,d,g,i,l**
4.0	To learn the basics of information security in IT environments.	**4.1**	The student will be able to design IT infrastructure and security mechanism in networks.	**a,b,c,d,e,f,g,h,l**
5.0	To learn the basics of Microsoft 365 in IT Operations.	**5.1**	The student can Implement the policies in Microsoft 365.	**a,b,c,d,e,f,g,l**

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 – <mark>Audits</mark> – Microsoft 365 – Domain Management – Licensing – Managing Teams – <mark>Meeting Policies</mark> – Messaging Policies	

TOTAL (L:45) : 45 PERIODS

REFERENCE BOOKS:

1. IT Service Management Support for your ITSM Foundation exam by John Sansbury, Ernest Brewster, Aidan Lawes, Richard Griffiths.

2. Managing Health, Safety and Working Environment Revised Edition: Management Extra 1st Edition by Elearn

3. Everything About Corporate Etiquette by Vivek Bindra

4. AXELOS, "ITIL® Foundation ITIL 4 Edition", TSO, 2019

5. Fundamentals of Information Systems Security 3rd Edition by David Kim, Michael G. Solomon

6. https://docs.microsoft.com/en-us/learn/m365/

	17ITX30 ADVANCED IT OPERATIONS				
		L	**T**	**P**	**C**
		3	0	0	3

PREREQUISITE : 17ITX29 | **QUESTION PATTERN : TYPE - III**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand basic concepts of cloud platform & design intelligent Cloud Services and Applications.	**1.1**	The student will be able to Recognize the essentials of Cloud Computing.	**a,b,c,e,g,i,k,l**
2.0	To explore the concepts of Map Reduce Programming.	**2.1**	The student will be able to work with Big Data Platform and its Use cases	**a,b,c,d,e,f,i,k,l**
3.0	To introduce the basic concepts and techniques of Machine Learning, Deep Learning and Artificial Intelligence.	**3.1**	The student will be able to use ML and other AI technologies to automate the identification and Resolution of common IT issues.	**a,b,c,d,e,i,k**
4.0	To understand the key concepts of intelligent automation.	**4.1**	The student will be able to identify different types of Variables, control flow and data table automation.	**a,b,c,d,e,f,g,h,i, j,k,l**
5.0	To learn how to use ServiceNow to manage IT tasks at any organization.	**5.1**	The student will be able to do Site Reliability Engineering and to do simulation using SeriveNow.	**a,b,c,e,f,g**

UNIT I - CLOUD COMPUTING	**8**
Introduction – Characteristics of Cloud computing – Architecture – Types – Service Models – SaaS, IaaS, PaaS – Regions – Cloud Security.	

UNIT II - BIG DATA & DATA SCIENCE	**10**
Introduction – Data science and Challenges – HDFS & Hadoop – Structured and Unstructured data – Processing Big Data – Supervised & Unsupervised Learning – Text Analysis – Data visualization	

UNIT III - AI/ML & AIOps	**10**
Introduction – Structure of Intelligent Agents – Knowledge and Reasoning – Machine Learning – Deep Learning – Applications of AI – AIOps Technologies – AIOps Benefits – Implementation	

UNIT IV - ROBOTIC PROCESS AUTOMATION (RPA)	**8**
Introduction – Variables – Control flow – Data Tables and Excel Automation – UI Automation – Selectors – Email Automation	

UNIT V - SRE & SERVICENOW	**9**
Introduction – Adopting a DevOps & SRE Model – SRE vs DevOps – Architecture & Lifecycle – Practices – Error Budgets – Toil Management – DevOps Tools – Introduction to ServiceNow – Reporting & Managing Issue – Benefits.	

	TOTAL (L:45) : 45 PERIODS

REFERENCE BOOKS:

1. Cloud Computing: Concepts, Technology & Architecture by Erl, Thomas, Puttini, Ricardo, Mahmood, Zaigham

2. Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem (Addison-wesley Data & Analytics Series) 1st Edition, Kindle Edition by Douglas Eadline

3. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley, 2015.

4. Machine Learning in the AWS Cloud - Add Intelligence to Applications with Amazon Sage Maker and Amazon Recognition By Abhishek Mishra

5. Deep Learning for Vision Systems By Mohamed Elgendy ·

6. Learning Robotic Process Automation - Create Software Robots and Automate Business Processes with the Leading RPA Tool – UiPath By Alok Mani Tripathi

7. Ui Path, "RPA Design and Development", UiPath Academic Alliance Resource.

8. Hands-on Site Reliability Engineering - Build Capability to Design, Deploy, Monitor, and Sustain Enterprise Software Systems at Scale By Shamayel Mohammed Farooqui Vishnu Vardhan Chikoti.

9. Tim Woodruff, "Learning ServiceNow", 2nd Edition, 2018

			L	T	P	C
17CSX37 – PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP			1	0	4	3

PREREQUISITE : NIL	QUESTION PATTERN : TYPE -NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To give practice to access the resources, gain knowledge about the technology used and list the ideas for project in the chosen domain.	**1.1**	The students will be able to access the resources, gain knowledge about the technology used and list the ideas for project in the chosen domain.	**a,b,c,d,e,f,g,h,i,j, k,l**
2.0	To develop an ability to propose a solution document fit to the problem, prepare Solution Architecture, Data Flow Diagram and Technology Architecture.	**2.1**	The students will be able propose a solution document fit to the problem, prepare Solution Architecture, Data Flow Diagram and Technology Architecture.	**a,b,c,d,e,f,g,h,i,j, k,l**
3.0	To prepare milestones and tasks, sprint schedules, coding and Testing.	**3.1**	The students will be able to prepare milestones and tasks, sprint schedules, coding and Testing.	**a,b,c,d,e,f,g,h,i,j, k,l**

PHASE I – PREPARATION PHASE	**(3+3)**
Access the resources - Join the mentoring channel - Register on IBM academic Initiative - Create Github account – Setup the System based on pre-requisites.	
PHASE II – IDEATION PHASE	**(3+15)**
Literature Survey – Technology Trainings – Empathy Canvas map Preparation – List the ideas.	
PHASE III – PROJECT DESIGN PHASE - I	**(3+9)**
Proposed solution document preparation – Problem solution fit - Solution Architecture Preparation.	
PHASE IV – PROJECT DESIGN PHASE - II	**(3+9)**
Requirement Analysis - Customer Journey – Data Flow Diagrams – Technology Architecture.	
PHASE V – PROJECT PLANNING PHASE	**(3+3)**
Milestones and Tasks preparation – Sprint Schedules	
PHASE VI – PROJECT DEVELOPMENT PHASE	**(0+21)**
Coding & Solutioning – Acceptance Testing – Performance Testing	
TOTAL (T:15+P:60) = 75 PERIODS	

<table>
<tr><td colspan="5" align="center">17ITX32 JAVA - J2EE
(Common to AI&DS,IT & CSE)</td></tr>
<tr><td></td><td></td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
</table>

		L	**T**	**P**	**C**
		3	0	0	3

PRE REQUISITE : Nil

COURSE OBJECTIVES AND OUTCOMES:

	Course objectives		Course outcomes	Related program outcomes
1.0	To understand Object Oriented Programming concepts and basic characteristics of Java	1.1	The students will be able to implement fundamental concepts of Java.	**a,b,c,e,g,h,i, j,l**
2.0	To gain exposure about Abstract classes and collection framework	2.1	The students will be able to develop applications using Abstract classes and collection framework	**a,b,c,i,j,k,l**
3.0	To develop a java application with multiple threads and to access database through Java programs, using Java Data Base Connectivity (JDBC)	3.1	The students will be able to access database through Java programs, using Java Data Base Connectivity (JDBC)	**a,b,c,e,f,g,h, i,j,k,l**
4.0	Design and develop Web applications	4.1	The students will be able to Design and develop Web applications	**a,b,c,d, g,h,i,j,k,l**
5.0	To know about Servlet, XML and AJAX	5.1	The students will be able to apply servlets and AJAX for their web development	**a,b,c,d,e,f, h,j,k,l**

UNIT I - JAVA FUNDAMENTALS	**(9)**

Java Architecture, Environment Setup, Variables, Data Types, Assignment, Operators.**Flow Control Statements**: If statement, If--Else Statement, Nested--If Statement, Switch Statement, While Statement, For Loop Statement, Enhanced For Loop Statement, Do while loop, Break and Continue Statement. **Arrays:** One dimensional and Two Dimensional Array. **OOPS / Inheritance:** Classes and Objects, Constructor, Return Statements. Encapsulation/Abstraction, Inheritance, Overriding/Polymorphism, Method Overloading, Garbage Collection, String, String Buffer.**Eclipse Overview:** Creating packages, classes, Adding Jar Files, Setting eclipse Preferences, Refactoring renaming classes or interfaces

UNIT II - COLLECTION AND ABSTRACTION	**(9)**

Abstraction /Packages / Exception Handling: Abstract Classes, Final Keyword, Packages-import, Interfaces, Introduction to Exception Handling, Exception types, Try and Catch Block, Throws, Throw clause, Finally clause, Runtime exception.**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, ArrayLists, LinkedLists, Sorting Lists, Using Iterators, Generics, Set, Map, HashMap, SortedMaps, Using Custom Objects, Map

UNIT III - TEST CASES AND DATABASE CONNECTIVITY	**(9)**

Junit: Introduction to Junit, Junit Features, Junit with Eclipse, Assert Methods, Annotations, Test Suite, Introduction to Mockito. **Multithreading I / II:** Introduction to Multithreading, Thread Creation-Thread class and Runnable Interface,Thread Control and Priorities, Thread Synchronization.**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 IV- ANT,HTML & JAVASCRIPT	(9)

ANT: Introduction to ANT, Building sample java projects. **HTML :** Introduction to HTML and its elemets, Basic Tags, Basic Elements, Formatting Tags, Layout tags and Semantic Tags, Tables, Forms and Frames, Style and div tags, Introduction to HTML5. **JavaScript / CSS**: Introduction to CSS, Styles and Style sheets, Formatting with CSS, Links and Lists, CSS Box Model, CSS3, Introduction to Javascripts, JS Functions, JS Strings, JS Events, JS Objects, JS Validations, JS Regular Expressions, Introduction to Bootstrap, Formatting and styling using Boostrap, Table, Bootstrap Grid System.

UNIT V - SERVLET, XML AND AJAX	(9)

Servlets and JSP: Introduction to Servlets, Servlet-Get and Post Requests, Servlet Config and Servlet Context, Servlet-Cookies and Session Management, Introduction to JSP, JavaBeans in JSP.**XML-I and XML-II**: Introduction to XML, Document Type Definition, XML Namespaces, XML Schema, XSLT.**AJAX:** Introduction to AJAX, AJAX working principle, AJAX Application, AJAX Database Application.

	TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Core Java Volume I- Fundamentals, Cay S. Horstmann, Gary Cornell, Pearson India Education Services Pvt. Ltd., 11th Edition,
2. Java: The Complete Reference, Eleventh Edition, 11th Edition by Herbert Schildt Released December 2018
3. HTML 5 Black Book, Kogent Learning Solutions Inc., ISBN:978-93-5004-095-9

REFERENCES

1. Head First EJB 3.0 by Kathy Sierra, Bert Bates, Publisher: O'Reilly Media
2. Head First Servlets and JSP by Bryan Basham, Kathy Sierra & Bert Bates, Publisher: O'Reilly Media

17ITX33 JAVA-FULL STACK IMPLEMENTATION Common to AI&DS,CSE&IT				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE REQUISITE : Nil	

COURSE OBJECTIVES AND OUTCOMES:

	Course objectives		Course outcomes	Related program outcomes
1.0	Designing Enterprise based applications by encapsulating an application's business logic.	**1.1**	The students will be able to map Java classes and object associations to relational database tables with Hibernate mapping files	**a,b,c,e,g,h,i, j,l**
2.0	Learn Spring configuration using Java Configuration and Annotations	**2.1**	The students will be able to implement Spring configuration using Java Configuration and Annotations	**a,b,c,i,j,k,l**
3.0	Simplifying application development with Spring Boot	**3.1**	The students will be able to simplify application development using Spring Boot.	**a,b,c,e,f,g,h, i,j,k,l**
4.0	Consume REST services using observables	**4.1**	The students will be able to use REST web services	**a,b,c,d, g,h,i,j,k,l**
5.0	Utilizing AngularJS formats adequately	**5.1**	The students will be able to use various Angular features including directives, components, and services.	**a,b,c,d,e,f, h,j,k,l**

UNIT I - HIBERNATE	(9)

Hibernate Overview, Architecture, Configuration, Sessions, Annotations, Query Language, Native SQL, Batch Processing, Interceptors

UNIT II -SPRING CORE	(9)

Spring Overview, Architecture, IoC Containers, Bean Definition and Scope, Bean Life cycle, Bean inheritance, Dependancy injection, Beans auto wiring, java based configuration, event handling, Custom events, AOP with spring framework, JDBC framework, transaction management.

UNIT III - SPRING BOOT	(9)

Spring Boot-Introduction, Boostrapting, Tomcat deployment, Build systems, code structure, Spring beans and dependancy, Spring boot runners, Application properties, Logging, Building RESTful web services, Exception handling, Interceptor, Servlet filter, tomcat port number, File handling, Consuming RESTful web services, Internationalization, Spring boot scheduling

UNIT IV - REST WEB SERVICE	(9)

RESTful-Introduction, Environment setup, Resources, Messages, Addressing, Methods, Statelessness, Caching, Security, JAX-RS.

UNIT V - ANGULAR	(9)

Angular Introduction, Features, Apps Loading, Architecture, Directives, ngIf Directive, ngFor Directive, ngSwitch Directive, Data Binding, Property Binding, String Interpolation, Event Binding, Two way data binding, Forms.

	TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Soni, R. K. (2017). Full stack angularJS for java developers: Build a full-featured web application from scratch using angularJS with spring RESTful. Apress.
2. Duldulao, D. B., & Villafranca, S. R. (2022). Spring Boot and Angular: Hands-on full stack web development with Java, Spring, and Angular. Packt Publishing Ltd.
3. Fisher, P. T., & Murphy, B. D. (2010). Spring persistence with Hibernate. Apress.

REFERENCES:

1. Just Hibernate, A Lightweight Introduction to the Hibernate Framework by Madhusudhan Konda, Publisher: O'Reilly Media

	17CSX38 – DEVOPS				
	(Common to 17AIX09)				
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		**Course Outcomes**	**Related program outcomes**
1.0	To introduce DevOps terminology, definition & concepts	**1.1**	The students will be able to Understand different actions performed through Version control tools like Git.	**a,b,c,d,e,i,j, k,l**
2.0	To understand the different Version control tools like Git, Mercurial.	**2.1**	The students will be able to Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle	**a,b,c,d,e,i,j,k, l**
3.0	To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment.	**3.1**	The students will be able to Perform Automated Continuous Deployment.	**a,b,c,d,e,i,j,k, l**
4.0	To understand Configuration management using Ansible	**4.1**	The students will be able to do configuration management using Ansible	**a,b,c,d,e,i,j,k, l**
5.0	Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems	**5.1**	The students will be able to Understand to leverage Cloud-based DevOps tools using Azure DevOps	**a,b,c,d,e,i,j,k, l**

UNIT I NTRODUCTION 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, HTMLPublisher, 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)=45PERIODS

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. Mitesh Soni "Hands-On Azure Devops: CICD Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure", English Edition, Paperback – 1 January 2020.
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

		L	T	P	C

17CSM01 - USER INTERFACE DESIGN

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course objectives		Course outcomes	Related program outcomes
1.0	To understand the concepts of HCI	1.1	The students will be able to know the fundamental concepts of HCI	a,b,c,e,g,h,i,j,l
2.0	To gain exposure about Usability Engineering	2.1	The students will be able to get exposure in usability engineering	a,b,c,i,j,k,l
3.0	To understand the guidelines in HCI	3.1	The students will be able to gain knowledge in the guidelines in HCI	a,b,c,e,f,g,h,i,j,k,l
4.0	To understand the concepts of User Interface design process and object oriented design process	4.1	The students will be able to use User Interface design process and object oriented design process	a,b,c,d,g,h,i,j,k,l
5.0	To design the web interface and mobile user interface.	5.1	The students will be able to develop web interface and mobile user interface.	a,b,c,d,e,f,h,j,k,l

UNIT I - FOUNDATIONS OF HCI	**(9)**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – Processing; Interaction: – Frameworks – Ergonomics – Styles – Elements – InteractivityParadigms

UNIT II -USABILITY ENGINEERING	**(9)**

Definition - UI Generations - Evaluation - Lifecycle - Classification of Users – Prototyping - Usability Testing Stages

UNIT III - GUIDELINES IN HCI	**(9)**

Principles to Support Usability - HCI Golden Rules - Shneiderman's Eight Golden Rules - Norman's Seven Principles - Norman's Model of Interaction.

UNIT IV - DESIGN PROCESS	**(9)**

UI Design Process - Task Oriented Design - Object Oriented Design - CSCW UI Design - Case Studies

UNIT V - WEB AND MOBILE UI	**(9)**

Designing Web Interfaces – Drag & Drop -Direct Selection-Contextual Tools-Overlays-Inlays and Virtual Pages-Process Flow - Mobile User Characteristics - Mobile Devices: Taxonomy - Anatomy – Mobile Design Principles - Mobile UIDesign Patterns.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:
1. Dix A, Finlay J, Abowd G D, Beale R , "Human Computer Interaction", 3rd Edition, Pearson Education, USA, 2008.
2. Linda Mcaulay , "HCI for Software Designers", Thompson Computer Press, USA, 1998.

REFERENCES:
1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist, Nicholas Diakopoulos , "Designing the User Interface: Strategies for effective HCI", 6th Edition, Pearson, USA, 2017.
2. Barbara Ballard , "Designing the Mobile User Experience", John Wiley & Sons, Ltd, USA, 2007.
3. Bill Scott, Theresa Neil , "Designing Web Interfaces", 1st Edition, O'Reilly Media, Inc, USA, 2009.
4. Jenifer Tidwell , "Designing Interfaces", 2nd Edition, O'Reilly Media, Inc, Canada, 2011.

17CSM02 – PROGRAMMING USING JAVA				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		**Course Outcomes**	**Related Program outcomes**
1.0	To impart the fundamental concepts of core JAVA.	**1.1**	Know how to solve basic design problems using object oriented concepts	**a,b,c,d,e,l**
2.0	To gain exposure about packages and collections Interfaces.	**2.1**	Develop applications in JAVA using packages and Collection Interfaces	**a,b,c,d,e,l**
3.0	To learn about exception handling and multithreading concepts	**3.1**	Implement the robust and multitasking applications using exception handling and multithreading concepts	**a,b,c,d,e**
4.0	To get knowledge about building Event handling applications using AWT and SWING	**4.1**	Develop the simple GUI interfaces to interact with users and real time applications.	**a,b,c,d,e,l**
5.0	To build applications using Networking and JDBC concepts.	**5.1**	Deploy the real time engineering applications using networking and JDBC concepts.	**a,b,c,d,e,l**

UNIT I - INTRODUCTION	**(9)**

Features of Java – Data types – Operators –Arrays –Control Statements – Classes – Methods – Objects – Constructors – Garbage Collection –Inheritance – Using Super – Method Overriding – Abstract Classes – Using final with inheritance – String Handling – String class – String buffer class.

UNIT II - PACKAGES &INPUT / OUTPUT OPERATIONS	**(9)**

Packages – Interfaces – Exploring java.util Package – Collection Interfaces – Collection Classes – Exploring java.io Package – File – Byte Streams – Character Streams. Exploring Java.lang package – Simple type wrappers – Runtime – System – Object – Class – Math thread – Using clone() and the Cloneable Interface.

UNIT III - EXCEPTION HANDLING AND THREADS	**(9)**

EXCEPTION HANDLING: Fundamentals – Compile time errors –Run time errors – Exception types – try catch block – Multiple catch statement – Nested try – Throw – Finally – User defined exceptions. THREADS: Java threads – Priorities – Synchronization – Thread class and Runnable interfaces – Creating threads – Multiple threads – Inter thread communication.

UNIT IV - APPLETS & SWING	**(9)**

Applet Basics – AWT classes – Frames – Graphics – AWT controls – Layout managers – Swing – ModelView-Controller Design Pattern – Swing Components – Programming examples.

UNIT V - NETWORKING & JAVA DATABASE CONN ECTIVITY	**(9)**

JAVA NETWORKING: Basics – Socket overview – TCP/IP client sockets – TCP/IP server sockets –URL – Datagram sockets. JDBC: Manipulating Database with JDBC- Connecting to and querying the database – RowSet Interface – Prepared Statements and Stored Procedures – Transaction Processing.

TOTAL(L:45)=45PERIODS

TEXT BOOK:

1. Patrick Naughton and Herbert Schildt, "Java 2- The Complete Reference", 8th ed., Tata McGraw Hill, New Delhi, 2011.

REFERENCES:

1. H.M. Deitel and P.J. Deitel, "JAVATM How to program", 9th ed., Pearson Education, 2009.
2. Advanced programming in JAVA prentice – Hall of India Private Limited NIIT – 2003
3. George Reese, "Database Programming with JDBC & Java",2nd ed., O"Reilly Media,2000.

17CSM03 - DATABASE SYSTEM CONCEPTS (Common to 17ITM03)				
	L	**T**	**P**	**C**
	3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course objectives		Course outcomes	Related program outcomes
1.0	To understand the different issues involved in the design and implementation of a database system.	**1.1**	The students will be able to describe the role of Database Management System in an Organization.	**a,c,j,k**
2.0	To study the physical and logical database designs, database modeling.	**2.1**	The students will be able to study basic database concepts including the structure and operations of the relational data model.	**a,c,j,k**
3.0	To understand and use data manipulation language to query, update, and manage a database	**3.1**	The students will be able to construct simple and Moderately advanced database queries using SQL	**a,b,c,j,k**
4.0	To develop an understanding of essential DBMS concepts.	**4.1**	The students will be able to apply logical database design principles includes E-R diagrams & Normalization.	**a,b,c,k**
5.0	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS	**5.1**	The students will be able to explain various file organizing & Indexing structure	**a,b,c,k**

UNIT I - INTRODUCTION	**(9)**

Introduction to database systems - Definition of DBMS - Advantages of dbms - Views of data - Levels of data abstraction - Data Models and types - Database architecture - Entity relationship model - ER diagram.

UNIT II - RELATIONAL DATA MODELING	**(9)**

Relational database structure - Procedural and Non procedural languages - Relational algebra : operations - Relational Calculus : Tuple relational calculus - Domain Relational Calculus - Integrity Constraints - SQL Commands : DDL - DML - TCL

UNIT III - DATABASE DESIGN	**(9)**

Functional dependency: Full functional Dependency - Partial dependency - Transitive dependency - multi valued dependency - Decomposition - Normalization - Normal Forms: 1NF - 2NF - 3NF - BCNF - 4NF - 5NF

UNIT IV - TRANSACTION PROCESSING	**(9)**

Transaction - Properties of transaction - Transaction state - Serialization : types - Need for Serialization - Two Phase Commit - Save Point - Concurrency - Advantages of concurrency - Concurrency control mechanism - Locking protocols

UNIT V - MEMORY STRUCTURES AND FILE ORGANIZATION	**(9)**

Memory hierarchy - Disk storage - Raid levels - Indexing: types - Hashing techniques - Query Processing tool - Query Evaluation.

	TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.

17CSM04 - XML AND WEB SERVICES				
	L	**T**	**P**	**C**
	3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

Course objectives		Course outcomes		Related program outcomes
1.0	To understand XML technologies and and basic concepts in schemas.	**1.1**	The students will be able to implement fundamental concepts of XML	**a,b,c,e,g,h,i, j,l**
2.0	To gain exposure about XML Processing	**2.1**	The students will be able to work on updating XML ,extracting data from XML,XPATH	**a,b,c,i,j,k,l**
3.0	To understand the concepts of Web services	**3.1**	The students will be able to understand the web services concepts.	**a,b,c,e,f,g,h, i,j,k,l**
4.0	To Implement of web services using protocols	**4.1**	The students will be able to implement web services	**a,b,c,d, g,h,i,j,k,l**
5.0	To know about REST based web services	**5.1**	The students will be able to apply servlets and AJAX for their web development	**a,b,c,d,e,f, h,j,k,l**

UNIT I - XML TECHNOLOGY	**(9)**

Benefits – XML Documents - Well-Formed XML – Validation - DTD - XML Schemas - Relax NG-Schematron.

UNIT II - XMLPROCESSING	**(9)**

Parsing XML–Updating XML- Extracting Data from XML- XPATH-Xquery-XSLT

UNIT III - WEBSERVICES	**(9)**

Architecture - Messaging - Service Description - Service Discovery - Service Transport Security

UNIT IV- WEBSERVICES IMPLEMENTATION	**(9)**

SOAP Protocol - WSDL - UDDI - Web Service Clients and Service Invocation - WS-* Standards.

UNIT V - REST BASED WEB SERVICES	**(9)**

Principles - Comparison with SOAP - XML Based Web Services - Design and Implementation of REST Services - Resource Oriented Architecture - best practices.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Ron Schmelzer et al , "XML and Web Services", Pearson Education, 2008.
2. Sandeep Chatterjee, James Webber , "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.

REFERENCES

1. Fawcett J, Danny Ayers, Liam R.E.Quin , "Beginning XML", 5th Edition, Wrox, 2012.
2. Hansen MD , "SOA Using Java Web Services", Prentice Hall, USA, 2007.
3. Martin Kalin , "Java Web Services: Up and Running", O'Reilly Media, USA, 2013.
4. Richardson L, Ruby S , "Restful Web Services", O'Reilly, USA, 2008.

	17CSM05 – WEB TECHNOLOGIES		L	T	P	C
			3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand the basic concepts of web programming and internet	1.1	The students will be able to Implement the basic concepts of web programming	**a,b,d**
2.0	To learn how to use javascript in web applications	2.1	The students will be able to Develop interactive web applications using Javascript	**a,b,c,d,e,f,,l,k,l**
3.0	To Have an basic knowledge of Java servlets and Java server pages	3.1	The students will be able to Differentiate how servlets and Java Server Pages (JSP) fit into java-based web application architecture	**a,e,k,l**
4.0	To learn the basics of XML and AJAX technologies	4.1	The students will be able to Present data in XML format and design rich client presentation using AJAX	**a,b,c,d,e,f,k,l**
5.0	To describe the working of web services.	5.1	The students will be able to Design and launch web services	**a,b,c,d,e,f,l,k,l**

UNIT I - INTRODUCTION TO INTERNET, HTML AND CSS	**(9)**

Web Essentials: Basic Internet Protocol - WWW - HTTP Request Message - HTTP Response Message - HTML Introduction - Basic XHTML syntax and Semantics - HTML Elements & Attributes - Lists - Tables - Frames - Forms-Defining XHTML's Abstract Syntax - CSS - Features - Syntax - Cascading and Inheritance - Text Properties - Box Model

UNIT II JAVASCRIPT	**(9)**

Introduction - Basic Syntax - Variable - Data Types - Operators and Literals - Functions - Objects - Arrays - Event Handling - Validation - Introduction to Node.js

UNIT III SERVLETS AND JSP	**(9)**

Java Servlets: Architecture - Servlet Generating Dynamic Content-Life Cycle - Parameter Data-Sessions - Cookies; JSP : Overview - Running JSP Application - Basic JSP - JavaBeans Classes and JSP - Libraries and Files - MVC Paradigm.

UNIT IV XML and AJAX	**(9)**

XML: XML Namespaces - XML Processing - Transforming XML Documents - XSLT; AJAX: Ajax Client Server Architecture-XML Http Request Object - Call Back Methods

UNIT V INTRODUCTION TO WEB SERVICES	**(9)**

JAX-RPC Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL-Representing Data Types: XML Schema-Communicating Object Data: SOAP- Related Technologies.

TOTAL(L:45)=45PERIODS

TEXT BOOKS:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2011

2. Deitel Deitel Nieto, "Internet & World Wide Web How to Program", 5 th ed., 2012.

REFERENCES:

1. Thomas A. Powell, "The Complete Reference HTML & CSS", 5 th ed., 2010
2. Steve Suehring, "JavaScript – Step by Step", PHI, 3 rd ed., 2013.
3. Brad Dayley," Node.js, MongoDB and AngularJS Web Development", Pearson Education, 2014

17CSM06 - OPEN SOURCE SYSTEMS				
	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand the need of open source software	1.1	The students will be able to Know the basic concepts of open source and LINUX.	a,b,c,d,l
2.0	To gain knowledge about web server and tools	2.1	The students will be able to Configure web server and MySQL	a,b,c,d,l
3.0	To gain knowledge about PHP	3.1	The students will be able to Develop a webpage using PHP.	a,b,c,d,e,l
4.0	To gain knowledge about PYTHON	4.1	The students will be able to Design an application using python	a,b,c,d,e,f,g,h,l
5.0	To create Software applications that can be accessed by all the people over the internet and to allow the users to customize the software based on their requirements.	5.1	The students will be able to Build an application with PERL	a,b,c,d,e,f,g,h,l

UNIT I - OPEN SOURCE OPERATING SYSYTEM	(9)

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources– Application of Open Sources – Open Source Licenses. Open Source Operating Systems: LINUX - Kernel Mode and User Mode- Installation – Processes – User Management – File Systems – Development with Linux

UNIT II - WEB SERVER AND TOOLS	(9)

Web Server: Apache Web server – Working with Web Server – Configuring and Using apache web services - MySQL: Introduction – Installing and configuring MySQL – Data Types – Working with Databases and Tables – Open Source Software tools and processors – Eclipse IDE platform – Compilers – Model Driven Architecture tools.

UNIT III - PHP	(9)

PHP: Introduction- Programming in Web Environment- Variables- Constants- Data types- Operators- StatementsFunctions- Arrays- OOP- String manipulation and regular expression- File handling and data storage- PHP and SQL database- PHP and LDAP- PHP connectivity- Sending and Receiving E-mails- debugging and Error HandlingSecurity

UNIT IV - PYTHON	(9)

Overview of PYTHON - Syntax and Style- Python objects-Numbers-Sequences-Strings-Lists and Tuples - Dictionaries- Conditionals and loops – Files – Input and Output – Error and Exceptions – Functions – Modules – Classes and OOP – Execution Environment

UNIT V - PERL	(9)

Perl Backgrounder – Perl Overview – Perl Parsing Rules – Variables and Data – Statements and Control Structures – Subroutines - Packages and Modules - Working with Files – Data Manipulation

TOTAL(L:45)=45PERIODS

TEXT BOOKS:
1. Hitesh Singh, NidhiArora, "Linux and X-WINDOWS PROGRAMMING", 1st editon., S.K. Kataria& Sons, NewDelhi, 2011.
2. W. Jason Gilmore, "Beginning PHP and MySQL: From Novice to Professional", 3rd edition., Apress, USA, 2010.
3. Wesley J. Chun, "Core Phython Programming", Prentice Hall, 2001
4. Martin C. Brown, "Perl: The Complete Reference", 2nd edition., Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

REFERENCES:
1. Richard Petersen "The Complete Reference Linux ", 6 th ed., Tata McGraw Hill Edition 2010.
2. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2003
3. VikramVaswani, "MYSQL: The Complete Reference", 2 nd ed., Tata McGraw- Hill Publishing Company Limited, Indian Reprint 2009.
4. Rasmus Lerdorf and Levin Tatroe, "Programming PHP",O"Reilly, 2002
5. Steven Holzner, "PHP: The Complete Reference", 2 nd ed., Tata McGraw-Hill Publishing Company Limited, indian Reprint 2009.
6. Peter Wainwright, "Professional Apache",Wrox Press, USA, 2002.

17CSM07 - UI AND UX DESIGN
(Common to 17ITM04)

		L	T	P	C
		3	0	0	3

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To provide a sound knowledge in UI & UX	1.1	The students will be able toBuild UI for user Applications.	a,b,c,d,e,l,j,k,l
2.0	To understand the need for UI and UX	2.1	The students will be able to Evaluate UX design of any product or application	a,b,c,d,e,l,j,k,l
3.0	To understand the various Research Methods used in Design	3.1	The students will be able to Demonstrate UX Skills in product development.	a,b,c,d,e,l,j,k,l
4.0	To explore the various Tools used in UI & UX	4.1	The students will be able to Implement Sketching principles	a,b,c,d,e,l,j,k,l
5.0	To Create a wireframe and prototype	5.1	The students will be able to Create Wireframe and Prototype	a,b,c,d,e,l,j,k,l

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.

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)=45PERIODS

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.

	17CSM08 - C# AND .NET FRAMEWORK				
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

PRE REQUISITE : 17CSM02

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To outline the knowledge about basic concepts and functions of c#.	**1.1**	The students will be able to explain the .NET framework.	**a,k,l**
2.0	To show the structure and the object oriented aspects of C#	**2.1**	The students will be able to explain how c# fits into the .NET Platform.	**a,k,l**
3.0	To demonstrate the application development Processes on .NET and building Windows Applications.	**3.1**	The students will be able to analyze the basic structure of a C# application and to develop real time application	**a,b,c,e,k,l**
4.0	To demonstrate the principles of Web based application development on .NET.	**4.1**	The students will be able to debug, compile, and run a simple web based application on .NET.	**a,b,c,k,l**
5.0	To learn .NET Framework and CLR	**5.1**	The students will be able to develop programs using C# on.NET.	**a,b,c,d,e,g,j,k,l**

UNIT I - INTRODUCTION TO C#	**(9)**

Introducing C#, Understanding.NET, Overview of C#, Literals, Variables, Data Types, Operators and Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, and Enumerations.

UNIT II – OBJECT ORIENTED ASPECTS OF C#	**(9)**

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

UNIT III - APPLICATION DEVELOPMENT ON .NET	**(9)**

Building Windows Applications, Accessing Data with ADO.NET.

UNIT IV - WEB BASED APPLICATION DEVELOPMENT ON .NET	**(9)**

Programming Web Applications with Web Forms, Programming Web Services.

UNIT V - THE CLR AND THE .NET FRAMEWORK	**(9)**

Assemblies, Versioning, Attributes, Reflection, Viewing Meta Data, Type Discovery, Reflecting on a Type, Marshaling, Remoting , Garbage Collection.

	TOTAL (L:45) = 45 PERIODS

TEXT BOOKS:
1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2015.
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002.

REFERENCES:
1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson etal, "Professional C#", 2nd ed., Wrong Press, 2002.
3. S. Thamarai Selvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

	17CSZ07 - WEB SERVICES USING JAVA	L	T	P	C
		3	0	0	3

PRE REQUISITE : Nil

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To build strong expertise in developing front end application using HTML5 and CSS3.	1.1	The students will be able to develop web page using HTML5 and CSS3.	a,b,c,d,e,l
2.0	To create threads and interfaces in Java classes.	2.1	The students will be able to create threads and interfaces in Java classes.	a,b
3.0	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.	3.1	The students will be able to explain various file organizing & Indexing structure.	a,b,c,k
4.0	To develop PL/SQL programs and this would help in web page development.	4.1	The students will be able to develop Nested PL/SQL Subprograms suitable for full stack development.	a,b,c,d,e,l
5.0	To build strong expertise in developing front end application using jQuery Mobile.	5.1	The students will be able to implement MVC and responsive design to scale well across PC, tablet and Mobile phone using jQuery mobile.	a,b,c,j,k

UNIT I HTML AND WEB DESIGN	(9)

HTML5 – Introduction HTML5 - Getting Started, HTML5 - Elements & Attributes, CSS3, JavaScript Fundamentals, Grid System, Bootstrap Components- Basic components, DOM manipulation & events, Basic AJAX with Jquery.

UNIT II CORE JAVA	(9)

Class & Objects, Access Modifiers and final keyword Basics, Types of exceptions, User Defined Exceptions, Convert primitive data type to objects. Integer, Float, Double, Long, Character, Boolean Collection basics, String Methods

UNIT III DBMS MYSQL	(9)

Database Design - Life Cycle, Physical Model, Logical Model, Database Design Process, Normal Forms in DBMS, 1NF, 2NF, 3NF, BCNF, Introduction to NoSQL, GROUP BY clause, Introduction to Subquery

UNIT IV PL/SQL	(9)

Introduction to PL/SQL, PL/SQL architecture, PL/SQL Anonymous Block, PL/SQL Data Types, Oracle RAISE_APPLICATION_ERROR, PL/SQL Exception Propagation, PL/SQL Package, PL/SQL Procedure, Parameter Modes in PL/SQL Subprograms, PL/SQL Function, Nested PL/SQL Subprograms.

UNIT V JSON API	(9)

Introduction to XML, XML Features, HTML vs XML, XML HttpRequest, XML Web Services, Introduction to JSON, JSON vs XML, JSON Data Types, JSON.parse(), JSON with Ajax.

	TOTAL (L: 45) = 45 PERIODS

TEXT/ REFERENCE BOOKS:

1. Henry F Korth, Abraham Silberschatz, S.Sudharashan, "Database System Concepts", 6th ed., McGraw Hill, 2011.
2. Herbert Schildt, "The Complete Reference (Fully updated for jdk7)", Oracle press Ninth Edition, 2014.
3. Jeffrey C.Jackson, "Web Technologies—A Computer Science Perspective", Pearson Education, 2006.

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.E – Computer Science and Engineering [R22]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year (2022-23) onwards)

AUGUST 2022

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
SEMESTER: 1									
1	22MAN01	Induction Programme	MC	-	-	-	-	-	-
THEORY									
2	22EYA01	Professional Communication - 1	HSMC	-	4	2	0	2	3
3	22MYB01	Calculus and Linear Algebra *	BSC	-	4	3	1	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	-	1	1	0	0	1
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	1
Mandatory Non Credit Courses									
11	22MAN02	Soft / Analytical Skills - 1	MC	-	3	1	0	2	0
12	22MAN03	Yoga – 1 *	MC	-	1	0	0	1	0
				TOTAL	32	16	1	15	22

			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	22CSC02	Data Structures using C *	ESC	22CSC01	3	3	0	0	3
4	22CSC03	Python Programming	ESC	-	3	3	0	0	3
5	22CSC04	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	22CSP02	Data Structures Laboratory *	ESC	22CSP01	4	0	0	4	2
8	22CSP03	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	22MAN04	Soft/Analytical Skills - II	MC	22MAN02	3	1	0	2	0
11	22MAN05	Yoga – II *	MC	-	1	0	0	1	0
				TOTAL	32	16	1	17	23

			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	22CSC05	Algorithms	PCC	22CSC02	3	3	0	0	3
3	22CSC06	Computer Networks	PCC	-	3	3	0	0	3
4	22CSC07	JAVA Programming	PCC	-	3	3	0	0	3
5	22CSC08	Operating Systems	PCC	-	3	3	0	0	3
PRACTICAL									
6	22CSP04	Algorithms Laboratory	PCC	-	4	0	0	4	2
7	22CSP05	Computer Networks Laboratory	PCC	-	4	0	0	4	2
8	22CSP06	JAVA Programming Laboratory	PCC	-	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN07	Soft/Analytical Skills - III	MC	22MAN04	3	1	0	2	0
10	22MAN09	Indian Constitution	MC	-	1	1	0	0	0
				TOTAL	32	17	1	14	22

				SEMESTER: IV						
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22CSC09	Artificial Intelligence and Machine Learning	PCC	-	3	3	0	0	3
2	22CSC10	Theory of Computation	PCC	22MYB05	4	3	1	0	4
3	22CSC11	Database Management System	PCC	-	3	3	0	0	3
4	22CSC12	Advanced Java Programming	PCC	22CSC07	3	3	0	0	3
5	22CSC13	Foundations of Data Science	PCC	-	5	3	0	2	4
6	22CYB07	Environmental Science and Engineering	BSC	-	3	3	0	0	3
PRACTICAL									
7	22CSP07	Database Management System Laboratory	PCC	-	4	0	0	4	2
8	22CSP08	Advanced Java Programming Laboratory	PCC	22CSP06	4	0	0	4	2
9	22GED01	Personality and Character Development	EEC	-	0	0	0	1	0
Mandatory Non Credit Courses									
10	22MAN08	Soft/Analytical Skills - IV	MC	22MAN07	3	1	0	2	0
				TOTAL	32	19	1	13	24

<table>
<tr>
<td colspan="5" align="center">**22EYA01 - PROFESSIONAL COMMUNICATION - I**
(Common to All Branches)</td>
</tr>
<tr>
<td></td>
<td>**L**</td>
<td>**T**</td>
<td>**P**</td>
<td>**C**</td>
</tr>
<tr>
<td></td>
<td>**2**</td>
<td>**0**</td>
<td>**2**</td>
<td>**3**</td>
</tr>
<tr>
<td colspan="5">**PREREQUISITE : NIL**</td>
</tr>
</table>

	Course Objectives		Course Outcomes
1.0	To build essential English skills to address the challenges of communication in today's work environment	1.1	The students will be able to apply knowledge of communication and language processes occur in various work environment
2.0	To comprehend the various dimensions of communication by employing LSRW skills	2.1	The students will be able to involve in diverse discourse forms utilizing LSRW skills
3.0	To deploy students in contextual initiatives by assisting them in developing communication abilities	3.1	The students will be able to participate actively in communication activities that enhance their creative skill
4.0	To facilitate students in comprehending the intent, target audience and environments of various forms of communication	4.1	The students will be able to associate with the target audience and contexts using varied types of communication
5.0	To enhance coherence, cohesion, and proficiency in both verbal and nonverbal communication in the workplace environment	5.1	The students will be able to convey the idea distinctly both in verbal and non verbal communication in work culture

UNIT I –INTRODUCTORY SKILLS	**(6+6)**

Grammar – Parts of Speech – Verb (Auxiliaries – Primary & Modal, Main Verb) -**Listening** – Listening to Short 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** – Listening to Announcements – Listening to Interviews - Listening and Note-taking - **Speaking** – Talking about Holidays & Vacations – Narrating Unforgettable Anecdotes - **Reading** – Skimming – Scanning (Short Texts and 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 to TED/ lnk 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 BOOK:

1. Shoba K N., Deepa Mary Francis, "English for Engineers and Technologists", Volume 1, 3rd Edition, Orient BlackSwan 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).

						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	-	1
2	-	-	-	-	-	-	-	-	3	3	-	2	-	1
3	-	-	-	-	-	-	-	-	3	3	-	2	-	1
4	-	-	-	-	-	-	-	-	3	3	-	2	-	1
5	-	-	-	-	-	-	-	-	3	3	-	2	-	1
CO (W.A)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**-**	**1**

		L	T	P	C

22MYB01-CALCULUS AND LINEAR ALGEBRA
(Common to All Branches)

		L	T	P	C
		3	1	0	4

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To develop the use of matrix algebra techniques needed by engineers for practical applications.	**1.1**	The students will be able to apply the concept of orthogonal reduction to diagonalise a given matrix.
2.0	To use the techniques, skills and engineering tools necessary for engineering practice, with geometric concepts.	**2.1**	The students will be able to identify the geometric aspects of plane, straight line and sphere.
3.0	To improve the ability of the students in solving geometrical applications of differential calculus problems.	**3.1**	The students will be able to evaluate the radius of curvature, circle of curvature and centre of curvature for a given curve.
4.0	To learn the important role of mathematical concepts in engineering applications with the functions of several variables.	**4.1**	The students will be able to calculate the maxima and minima for a given function with several variables by finding the stationary points.
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.	**5.1**	The students will be able to evaluate the area and volume by double and triple integrals.

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", 9 th Rev.Edition, 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	-	1	-	-	-	1	-	2	2	2	1
2	3	2	2	-	1	1	-	-	1	-	-	2	2	-
3	3	2	2	-	1	-	-	-	-	-	-	2	2	-
4	3	2	2	1	1	-	-	-	1	-	-	2	2	-
5	3	2	2	1	1	-	-	-	1	-	1	2	2	1
CO (W.A)	3	2	2	1	1	1	-	-	1	-	2	2	2	1

22PYB01 - SEMICONDUCTOR PHYSICS
(Common to AI&DS, CSE, CSE (CS), CSE (IoT) and IT Branches)

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To expose the concepts of conducting materials	**1.1**	Predict the importance of conducting materials in the communication field.
2.0	To gain fundamental knowledge about electrical properties of semiconductors.	**2.1**	Acquire knowledge about the electrical properties of semiconductors.
3.0	To Understand the basics of semiconductor laser.	**3.1**	Update the knowledge regarding semiconductor lasers
4.0	To expand familiarity in the field of photo detectors	**4.1**	Identify the importance of opto-electronic devices and their applications
5.0	To update the recent developments in the field advanced new engineering materials	**5.1**	Gain knowledge about recent developments in Advanced new engineering materials

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 – 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", 9th Edition. Cengage Learning, 2018.

2. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017.

3. V.Rajendran, "Engineering Physics‖", 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.

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	1	-	-	-	-	-	1	1	-	2	-	-
2	3	2	2	-	-	-	-	-	2	2	-	1	-	1
3	3	3	3	-	-	-	-	-	1	1	-	1	-	-
4	3	2	2	-	-	-	-	-	1	1	-	1	-	-
5	3	3	1	-	-	-	-	-	2	1	-	2	-	-
CO (W.A)	3	2.4	1.8	-	-	-	-	-	1.4	1.2	-	1.0	-	1.0

		L	**T**	**P**	**C**

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

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To make students to learn and understand the basics of Electrical circuits.	1.1	The Students will be able to apply the Ohm's law and Kirchhoff's law and investigates the behavior of electric circuits by analytical techniques.
2.0	To enable the student to understand the analysis of DC and AC circuits using Network theorems.	2.1	The Students will be able to analyze and forecast the Network theorems in DC and AC circuits.
3.0	To enable the student to understand the working of semiconductor devices.	3.1	The Students will be able to understand the characteristics of semiconductor devices.
4.0	To make the students to understand the working of rectifiers, filters and amplifiers.	4.1	The students will be able to understand the concept of rectifiers, filters and amplifiers.
5.0	To make the students to understand the functions of transducer and measuring instruments.	5.1	The students will be able to design transducers, measuring instruments and logic circuits.

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 – Thevenins 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", 8th Edition, Tata McGraw Hill publishers, New Delhi, 2013.

2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGrawHill 4th Edition. 2017.

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.

	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
2	2	2	3	3	-	-	-	-	-	-	-	-	3	2
3	3	-	2	-	3	-	-	-	-	-	-	-	3	3
4	2	-	2	-	2	3	2	-	-	-	-	-	3	3
5	2	-	2	-	-	2	3	-	-	-	-	-	3	3
CO (W.A)	2.4	2	2.2	3	2.5	2.5	2.5	-	-	-	-	-	3	2.6

22CSC01 - PROBLEM SOLVING AND C PROGRAMMING
(Common to All Branches)

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand problem solving, problem solving aspects, programming and to know about various program design tools.	**1.1**	The student will be able to identify the appropriate problem solving techniques to drive the solution for the given problem.
2.0	To learn basic structure and Control Statements in C programming.	**2.1**	The student will be able to implement the appropriate looping and control statements in C for developing applications.
3.0	To learn the manipulation of arrays and strings	**3.1**	The student will be able to develop programs on arrays of different dimensions of arrays and strings concepts.
4.0	To understand the concept of modular programming using user defined functions.	**4.1**	The student will be able to implement programs using user defined functions.
5.0	To acquaint with the use and benefits of Memory Allocation and file handling.	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.

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, if-elif-else 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	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	3	2	3	-	-	-	-	-	3	-	3	3	3	3

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 Objectives		Course Outcomes	
1.0	To make students to examine the basics of Semiconductor Diodes and its characteristics.	**1.1**	The Students will be able to examine Semiconductor Diodes and its characteristics.
2.0	To enable the student to analyze the characteristics of BJT, FET and UJT.	**2.1**	The Students will be able to analyze characteristics of BJT, FET and UJT working principles and operations.
3.0	To make the students to analyze the operation of Rectifier circuit.	**3.1**	The students will be able to analyze the operation of rectifier circuit and its applications
4.0	To motivate the students to learn and practice with measurement of Electrical circuits using various theorems.	**4.1**	The Students will apply the Ohm's law ,Kirchhoff's law and various theorems (Thevenin's, Norton's etc) and investigates the behavior of electric circuits by analytical techniques.
5.0	To motivate the students to design a digital circuits using various basic logic gates.	**5.1**	The Students will be able to Design simple digital circuits by exploring logic gates.

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.Verfication of Thevenin's Theorem
3. Verfication of Norton's Theorem
4.Verification logic gates
TOTAL (P:60) : 60 PERIODS

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2
2	3	2	2	1	-	-	-	-	-	-	-	1	3	1
3	3	-	2	2	-	-	-	-	-	-	-	1	3	1
4	3	-	2	-	-	1	-	-	-	-	-	-	3	2
5	3	-	2	-	-	1	-	-	-	-	-	2	3	1
CO (W.A)	3	2	1.8	1.3	-	1	-	-	-	-	-	1.3	3	1.4

Table title: **Mapping of COs with POs / PSOs**

22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY
(Common to All Branches)

	L	T	P	C
	0	0	4	2

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language.	**1.1**	The student will be able to identify the appropriate programming construct to develop programs for all types of problems.
2.0	To study, analyze and implement the concepts of arrays and strings in C programming.	**2.1**	The student will be able to implement programs on arrays of different dimensions and string concepts.
3.0	To learn the importance user defined functions and pointers.	**3.1**	The student will be able to develop programs using user defined functions and pointers.
4.0	To gain knowledge in user defined data types and file handling functions in C programming	**4.1**	The student will be able to design programs using user defined data types and various file handling functions.
5.0	To acquire skill in dynamic memory allocation	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.

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	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**2.8**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**	**3**

			L	**T**	**P**	**C**

22PYP01 - PHYSICS LABORATORY
(Common to All Branches)

			L	**T**	**P**	**C**
			0	0	2	1

PREREQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To provide the basic practical exposure to all the engineering and technological streams in the field of physics.	**1.1**	The students will be able to apply the concept of stress, strain and elastic limit for a given sample to find their properties.
2.0	To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.	**2.1**	The students will be able to gain the basic knowledge about handling the laser light and Identify the basic parameters of an optical fibre.
3.0	To enable the students to correlate the theoretical principles with application oriented studies.	**3.1**	The students will be able to analyze the properties of matter with sound waves.
4.0	To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics	**4.1**	The students will be able to recall the knowledge of properties of light through spectrometer grating and fiber optic cable.
5.0	To analyze the behavior and characteristics of solar cells and LED	**5.1**	The students will be able to acquire the knowledge in semiconducting devices such as solar cells and LED.

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 (30 P) = 30 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	-	-	-	-	-	-	1	-	2	1	-
2	3	3	2	-	-	-	-	-	-	-	-	1	1	-
3	3	3	2	-	-	-	-	-	1	-	-	1	-	-
4	3	2	3	-	-	-	-	-	-	-	-	2	-	-
5	3	2	2	-	-	-	-	-	-	1	-	1	-	-
CO (W.A)	3.0	2.0	2.4	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0

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

PREREQUISITE : 22EYA01

	Course Objectives		Course Outcomes
1.0	To familiarize the students with the basic structures of English and to train them to use these elements correctly in speaking and writing	**1.1**	The students will be able to frame sentences both in written and spoken forms with accuracy and fluency.
2.0	To acquire proficiency in LSRW skills on par with the expectations of the industry.	**2.1**	The students will be able to attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing.
3.0	To enable students to adopt strategies for enhancing vocabulary, language and fluency and to deliver professional presentations.	**3.1**	The students will be able to gain essential competency to express one's thoughts orally and in writing in a meaningful way.
4.0	To communicate effectively in an academic setting using the language skills as tools.	**4.1**	The students will be able to use linguistic structures to read and understand well-structured texts encountered in academic or social contexts.
5.0	To acquire necessary language skills to follow and comprehend discourse such as lectures, conversations, interviews, and discussions.	**5.1**	The students will be able to perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation.

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	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	-	-	-	-	-	-	-	3	3	-	2	-	1
3	-	-	-	-	-	-	-	-	3	3	-	2	-	1
4	-	-	-	-	-	-	-	-	3	3	-	2	-	1
5	-	-	-	-	-	-	-	-	3	3	-	2	-	1
CO (W.A)	-	-	-	-	-	-	-	-	3	3	-	2	-	1

22MYB03- STATISTICS AND NUMERICAL METHODS
(Common to CSE, IT, AI&DS, CSE(IoT) and CSE(CS) Branches)

		L	T	P	C
		3	1	0	4

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.	1.1	The students will be able to select a hypothesis testing method for the given numerical set of data to analyze the significance .
2.0	To understand the knowledge of design of experiments.	2.1	The students will be able to apply analysis of Variance for the data set of selected number factors for analyzing the significance.
3.0	To introduce the basic concepts of solving algebraic and transcendental equations.	3.1	The students will be able to solve an algebraic or transcendental equation using an appropriate numerical method.
4.0	To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.	4.1	The students will be able to appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
5.0	To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.	5.1	The students will be able to solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

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.

UNIT V - 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.

WEB REFERENCES:

1. https://youtu.be/zmyh7nCjmsg
2. https://youtu.be/NmgbFJ4UwPs
3. https://youtu.be/RgKy7URFx1c
4. https://archive.nptel.ac.in/courses/111/107/111107105/

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	1	1	1	-	-	-	1	1		2		
2	3	3	1	1	1	-	-	-	1	1		2		
3	3	2	1	1	1	-	-	-	1	1		2		
4	3	3	1	1	1	-	-	-	1	1		2		
5	3	2	1	1	1	-	-	-	1	1		2		
CO (W.A)	**3**	**2.6**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**		**2**		

22CSC02 –DATA STRUCTURES USING C
(Common to 22AIC01, 22CCC01, 22CIC01 and 22ITC01)

	L	T	P	C
	3	0	0	3

PREREQUISITE : 22CSC01

	Course Objectives		Course Outcomes
1.0	To learn the concept of pointers and strings	1.1	The student will be able to able to perform array and string operations using pointers
2.0	To be able to implement the abstract data type list as a linked list using the node and reference pattern.	2.1	The student will be able to able to manipulate different operations using linked list
3.0	To understand the Stack and Queue ADT	3.1	The student will be able to able to deploy different operations on stack and queue.
4.0	To gain knowledge on tree data structure.	4.1	The student will be able to determine the structure and operations on trees
5.0	To understand the various operations on graph	5.1	The student will be able to implement the various operations on graph

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.

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:

2. Sumitabha Das, "Computer Fundamentals &C Programming", McGraw Hill Education(India) Private Limited, 1st Edition, 2018.

3. Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.

REFERENCES:

3. Yashavant Kanetkar, "Pointers in C", BPP Publications, 4th Edition, 2017.
4. 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	2	2	2	1	-	-	2	-	2	3	3	3
2	3	3	2	2	2	2	-	-	1	-	2	3	3	3
3	2	3	2	2	2	2	-	-	2	-	2	3	3	3
4	3	3	2	2	2	1	-	-	1	-	2	3	3	3
5	3	3	2	2	2	1	-	-	2	-	2	3	3	3
CO (W.A)	2.8	3	2	2	2	1.4	-	-	1.6	-	2	3	3	3

22CSC03 - PYTHON PROGRAMMING
(Common to 22AIC02, 22CCC02, 22CIC02 and 22ITC02)

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To acquaint with data types, input output statements, decision making, looping in Python	**1.1**	The students will be able to develop understanding of basics of Python Programming constructs.
2.0	To acquire knowledge about manipulation of strings.	**2.1**	The students will be able to impart basic knowledge of all strings functions.
3.0	To be familiarized with programming concepts like list and tuples.	**3.1**	The students will be able to choose most appropriate programming constructs and features to solve the problems with list, tuples and dictionaries.
4.0	To understand the concepts of dictionaries, function and modules.	**4.1**	The students will be able to exhibit the programming skills for the use of the logical constructs of language using function and files.
5.0	To develop the skill of designing Graphical user Interfaces in Python	**5.1**	The students will be able to demonstrate significant experience with the Python program development environment.

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 and Searching Strings - Finding Number- Inserting sub string into a string.

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	2	2	3	3	3	3	-	-	-	-	3	3	3
2	3	2	3	3	3	3	3	-	-	-	-	3	3	3
3	3	2	3	3	3	3	3	3	-	-	3	3	3	3
4	3	2	3	3	3	3	3	3	-	-	3	3	3	3
5	3	2	3	3	3	3	3	3	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**2.8**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**

22CSC04 - DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION
(Common to 22AIC03, 22CCC03, 22CIC03 and 22ITC03)

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To make students to analyze and design combinational circuits	**1.1**	The students will be able to compile the combinational logic circuits.
2.0	To enable the student to analyze and design sequential circuits	**2.1**	The students will be able to design the sequential logic circuits.
3.0	To make the students to understand the basic structure and operation of a digital computer	**3.1**	The students will be able to acquire the computer fundamentals.
4.0	To make the students to study the design of data path unit, control unit for processor and to familiarize with the hazards.	**4.1**	The students will be able to get deep insight into the processor function.
5.0	To make the students to understand the concept of various memories and I/O devices.	**5.1**	The students will be able to catch on to about operation of various types of memories and input output devices.

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

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", 6th Edition, Morgan Kaufmann/Elsevier, 2020
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 10th Edition, Pearson Education, 2016.
3. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th 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	3	3	2	1	-	-	1	2	3	2	3
2	3	3	3	3	2	1	-	-	-	1	2	3	1	2
3	3	3	3	3	2	2	1	1	-	-	2	3	2	3
4	3	3	3	3	1	-	-	-	1	1	1	2	1	3
5	3	3	3	3	1	2	1	-	-	-	-	2	1	2
CO (W.A)	3	3	3	3	1.8	1.8	1	1	1	1	1.8	2.6	1.4	2.6

22CSP02 – DATA STRUCTURES LABORATORY
(Common to 22AIP01, 22CCP01, 22CIP01 and 22ITP01)

	L	T	P	C
	0	0	4	2

PREREQUISITE : 22CSP01

	Course Objectives		Course Outcomes
1.0	To learn the concept of pointers	**1.1**	The students will be able to perform array operations using pointers
2.0	To learn the implementation of all types linked list with its different operations.	**2.1**	The students will be able to explore various operations on linked list.
3.0	To impart the basic stack and queue concepts and its applications.	**3.1**	The students will be able to work with stack and queue concepts.
4.0	To Explore the concepts of tree data structures	**4.1**	The students will be able to construct and manipulate various tree operations.
5.0	To understand the various operations on graph	**5.1**	The students will be able to deploy different operations on graphs.

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

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	1	-	-	2	-	2	3	3	3
2	3	3	3	3	1	2	1	2	1	1	1	2	3	2
3	2	3	2	2	1	-	3	-	2	-	3	1	3	2
4	3	3	3	1	1	2	-	1	1	-	1	-	3	2
5	3	2	3	3	2	1	-	1	-	1	2	2	3	2
CO (W.A)	2.8	2.8	2.6	2.2	1.4	1.5	2	1.3	1.5	1	1.8	2	3	2.2

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

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To impart the fundamental concepts of Python Programming	**1.1**	The students will be able to understand the basics of Python Programming constructs
2.0	To learn the operator concepts of Python Programming	**2.1**	The students will be able to understand the various operators of Python Programming.
3.0	To gain exposure about string manipulation, list, and tuples	**3.1**	The students will be able to realize the need of string manipulation, list, and tuples
4.0	To get knowledge about dictionaries, function and modules	**4.1**	The students will be able to design programs involving dictionaries, function and modules
5.0	To develop the skill of designing Graphical user Interfaces in Python	**5.1**	The students will be able to develop simple programs with GUI

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	2	3	3	3	3	-	-	-	-	3	3	3
2	3	2	3	3	3	3	3	-	-	-	-	3	3	3
3	3	2	3	3	3	3	3	3	-	-	3	3	3	3
4	3	2	3	3	3	3	3	3	-	-	3	3	3	3
5	3	2	3	3	3	3	3	3	-	-	3	3	3	3
CO (W.A)	**3**	**2**	**2.8**	**3**	**3**	**3**	**3**	**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

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To Construct various plane curves drawing by Modeling software with dimensions	**1.1**	The students will be able to construct various plane curves drawing by Modeling software with dimensions
2.0	To Construct the concept of first angle projection of points, lines and plane drawing by Modeling software with dimensions	**2.1**	The students will be able to construct the projection of points, lines and planes drawing by Modeling software with dimensions
3.0	To Develop the projection of solids drawing by Modeling software with dimensions	**3.1**	The students will be able to develop projection of solids drawing by Modeling software with dimensions
4.0	To Solve problems in sectioning of solids and developing the surfaces drawing by Modeling software with dimensions	**4.1**	The students will be able to solve problems in sections of solids and development of surfaces drawing by Modeling software with dimensions
5.0	To Apply the concepts of orthographic and isometric drawing by Modeling software with dimensions	**5.1**	The students will be able to apply the concepts of isometric in engineering practice drawing by Modeling software with dimensions

LIST OF THE 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

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	1	-	3	1	-	-	-	2	-	3	-	2
2	3	2	1	-	3	1	-	-	-	2	-	3	-	2
3	3	2	1	-	3	1	-	-	-	2	-	3	-	2
4	3	2	1	-	3	1	-	-	-	2	-	3	-	2
5	3	3	2	-	3	1	-	-	-	2	-	3	-	2
CO (W.A)	**3**	**2.2**	**1.2**	**-**	**3**	**1**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**2**

	22MYB05 - DISCRETE MATHEMATICS *(Common to CSE, AI&DS, CSE(IoT), CSE(CS) and IT Branches)*				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the basic concepts of logic and their applications.	**1.1**	The students will be able to rephrase real world statements as logical propositions and demonstrate whether the proposition is satisfy, tautology or a contradiction.
2.0	To gain knowledge about these discrete structures including logic, predicate calculus.	**2.1**	The students will be able to infer whether a logical argument is valid from the given set of premises by applying the inference rules of predicate calculus.
3.0	To get exposed to concepts and properties of set theory and functions.	**3.1**	The students will be able to show mathematical reasoning and arrive at conclusions about sets and relations.
4.0	To acquire ideas about the general counting methods involving permutations and combinations. These methods are very useful in constructing computer programs and in mastering many theoretical topics of computer science.	**4.1**	The students will be able to construct the number of arrangements and selections using the principles of counting.
5.0	To understand the concepts of Lattices and its properties.	**5.1**	The students will be able to avail the concept of Lattices and its properties.

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 edition, Tata McGraw Hill, New Delhi, 2008.
3. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 5th edition, 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" ,Cengage Learning India Pvt. Ltd. 2010 .
3. Swapan Kumar Sarkar, "A Text Book of Discrete Mathematics" , S. Chand & Company Ltd., New Delhi.

WEB REFERENCES:

1. https://archive.nptel.ac.in/courses/106/108/106108227/
2. https://www.youtube.com/watch?v=dK8iaQYcbms

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	1	1	1	-	-	-	-	1	-	2	-	-
2	3	2	1	1	1	-	-	-	-	1	-	2	-	-
3	3	1	1	1	1	-	-	-	1	1	-	2	-	-
4	3	2	1	1	1	-	-	-	-	1	-	2	-	-
5	3	1	1	1	1	-	-	-	-	1	2	2	-	-
CO (W.A)	3	2	1	1	1	-	-	-	1	1	2	2	-	-

22CSC05 - ALGORITHMS
(Common to 22AIC06, 22CCC04,22CIC04 and 22ITC04)

	L	T	P	C
	3	0	0	3

PREREQUISITE : 22CSC02

	Course Objectives		Course Outcomes
1.0	To know the fundamental concepts and techniques for problem solving and algorithm design.	1.1	The students will be able to analyze worst, best and average case running times of algorithms using asymptotic notations.
2.0	To learn the different sorting algorithms and the strategy followed.	2.1	The students will be able to use different sorting techniques and strategies.
3.0	To be familiar with dynamic and greedy algorithm design techniques	3.1	The students will be able to design dynamic-programming and greedy algorithms and apply them to test for optimality.
4.0	To learn the different kinds of iterative improvement and limitations of algorithm power	4.1	The students will be able to analyze the notion of tractable and intractable problems.
5.0	To understand backtracking, Branch bound techniques.	5.1	The students will be able to Use the state space tree method for solving problems.

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 colouring problem.
Branch and Bound: Solving 15-Puzzle problem - Assignment problem – Knapsack Problem – Travelling Salesman Problem.

TOTAL (L:45) : 45 PERIODS

TEXT BOOK:

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	2	-	-	-	1	-	-	-	-	-	3	2
2	3	3	2	-	-	-	-	-	-	-	-	-	3	2
3	3	2	1	1	-	-	1	-	-	-	-	-	3	1
4	3	2	1	1	-	-		-	-	-	-	-	3	2
5	3	2	1	1	-	-	1	-	-	-	-	-	3	2
CO (W.A)	3	2.4	1.4	1	-	-	1	-	-	-	-	-	3	1.8

	22CSC06 - COMPUTER NETWORKS (Common to 22AIC12, 22CCC05,22CIC09 and 22ITC07)				
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the concepts of data communications	**1.1**	The students will be able to gain knowledge on Data Communication Concepts
2.0	To impart the fundamental concepts of Data Link Layer	**2.1**	The students will be able to use services of the Data Link Layer.
3.0	To gain exposure about Addressing and Routing Protocols	**3.1**	The students will be able to work with network addressing and Routing Protocols.
4.0	To get knowledge about services in Transport Layer	**4.1**	The students will be able to apply Transport Layer protocols.
5.0	To learn about Application Layer functionalities	**5.1**	The students will be able to work with Application layer protocols

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	-	-	3	-	3	3	3	-	3	3	3
2	3	3	3	-	3	-	-	-	3	-	-	3	3	3
3	3	3	3	3	3	-	-	-	3	3	-	3	3	3
4	3	3	3	2	3	-	-	-	3	3	-	3	3	3
5	3	3	3	2	3	-	-	-	3	3	-	3	3	3
CO (W.A)	3	3	3	2.3	3	3		3	3	3		3	3	3

22CSC07 - JAVA PROGRAMMING
(Common to 22AIC04, 22CCC06,22CIC06 and 22ITC06)

		L	T	P	C
		3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand Object oriented programming concepts and characteristics of Java	1.1	The students will be able to develop Java programs using OOP principles
2.0	To know the principles of Inheritance, abstraction and interfaces	2.1	The students will be able to develop Java programs with the concepts of inheritance
3.0	To define exceptions and use I/O streams	3.1	The students will be able to construct applications with exception handling.
4.0	To understand threads concepts	4.1	The students will be able to develop Java applications using threads
5.0	To design and build simple GUI programs using AWT and Swings.	5.1	The students will be able to develop interactive Java applications using GUI components.

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.

REFERENCE:

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	2	1	-	1	-	-	-	1	-	-	1	3	3
2	3	1	1	-	1	-	-	-	1	-	-	1	3	3
3	3	1	1	-	1	-	-	-	2	-	-	1	3	3
4	3	2	1	-	1	-	-	-	2	-	-	2	3	3
5	3	2	2	2	1	-	-	-	3	1	3	-	3	3
CO (W.A)	3	1.6	1.2	2	1	-	-	-	1.8	1	3	1.25	3	3

22CSC08 - OPERATING SYSTEMS
(Common to 22AIC08, 22CIC07, and 22ITC05)

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn about the basics of operating system and system calls.	**1.1**	The students will be able to perceive knowledge on the systematic approach of the Operating system.
2.0	To impart the knowledge about how the process scheduling work together to perform computing tasks.	**2.1**	The students will be able to apply the concepts of CPU scheduling.
3.0	To Learn about the process synchronization and Deadlock concepts.	**3.1**	The students will be able to use various synchronization and deadlock handling methods.
4.0	To learn the importance of memory management in the operating system.	**4.1**	The students will be able to apply page replacement policies to address demand paging
5.0	To explore the disk and files management of operating systems	**5.1**	The students will be able to work with file and disk organizations for a real time applications.

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 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	2	-	-	-	-	3	2	-	1	3	1
2	2	2	3	1	1	-	-	-	2	1	-	2	3	1
3	1	3	2	2	1	-	-	-	2	2	-	1	3	1
4	1	3	2	2	1	-	-	-	2	2	-	1	3	1
5	1	3	3	3	-	-	-	-	1	2	-	2	3	1
CO (W.A)	1.6	2.4	2.4	2	1	-	-	-	2	1.8	-	1.4	3	1

22CSP04 - ALGORITHMS LABORATORY
(Common to 22AIP05, 22CCP03, 22CIP03, and 22ITP03)

		L	T	P	C
		0	0	4	2

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To make the use of programs using Brute force technique.	**1.1**	The students will be able to implement programs using Brute force technique.
2.0	To gain exposure about the concept of divide and conquer design techniques.	**2.1**	The students will be able to Make use of algorithm design techniques like divide and conquer.
3.0	To understand the dynamic programming technique.	**3.1**	The students will be able to apply dynamic programming to solve problems
4.0	To explore knowledge about greedy techniques.	**4.1**	The students will be able to apply greedy techniques to solve problems
5.0	To understand the knowledge on Backtracking techniques.	**5.1**	The students will be able to apply Backtracking techniques to solve problems

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	2	-	-	-	-	-	-	-	-	-	3	2
2	3	3	2	-	-	-	-	-	-	-	-	-	3	2
3	3	2	1	1	-	-	1	-	-	-	-	-	3	1
4	3	2	1	1	-	-	1	-	-	-	-	-	3	1
5	3	2	1	1	-	-	1	-	-	-	-	-	3	2
CO (W.A)	**3**	**2.4**	**1.4**	**1**	**-**	**-**	**1**	**-**		**-**	**-**	**-**	**3**	**1.6**

		L	**T**	**P**	**C**

22CSP05 - COMPUTER NETWORKS LABORATORY
(Common to 22CCP04, 22CIP06 and 22ITP05)

		L	**T**	**P**	**C**
		0	**0**	**4**	**2**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To know the connectivity of systems with different types of cables	**1.1**	The students will be able to connect a system with various topologies
2.0	To work with addressing protocols	**2.1**	The students will be able to apply addressing protocols
3.0	To gain knowledge about the working of routing algorithms	**3.1**	The students will be able to implement various routing algorithms
4.0	To learn socket programming	**4.1**	The students will be able to program using Sockets
5.0	To use analyzing tools to analyze the performance of protocols in different layers in computer networks	**5.1**	The students will be able to use Analyzer tools

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	3	3	3	-	-	-	-	-	-	-	3	3	3
2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
3	3	3	3	3	-	-	-	-	-	3	-	3	3	3
4	3	3	3	2	-	-	-	-	-	3	-	3	3	3
5	3	3	3	2	3	-	-	-	-	3	-	3	3	3
CO (W.A)	**3**	**3**	**3**	**2.6**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**

22CSP06 - JAVA PROGRAMMING LABORATORY
(Common to 22AIP03, 22CCP05,22CIP05 and 22ITP04)

		L	T	P	C
		0	0	4	2

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To impart fundamental concepts of OOP using java.	**1.1**	The students will be able to create simple Java programs using basic programming elements in Java.
2.0	To gain exposure about inheritance, packages and Interfaces.	**2.1**	The students will be able to develop applications using inheritance, packages and interfaces.
3.0	To explore about the exception handling mechanism.	**3.1**	The students will be able to construct applications with exception handling.
4.0	To understand threads concepts.	**4.1**	The students will be able to build applications using threads and collection framework.
5.0	To know about Event handling using swing components.	**5.1**	The students will be able to create GUIs and event driven programming applications for real world problems.

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

TOTAL (P:60) : 60 PERIODS

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:
- LAN System with 33 nodes (OR) Standalone PCs – 33 No's, Printers – 3 Nos.

Software:
- Java / Equivalent Compiler

	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	2	2	3	3	1	3
2	2	2	3	3	3	1	3	3	2	2	3	3	1	3
3	2	2	3	3	3	1	3	3	2	2	3	3	1	3
4	2	2	3	3	3	1	3	3	2	2	3	3	1	3
5	2	2	3	3	3	2	3	3	2	2	3	3	1	3
CO (W.A)	**2.2**	**2.2**	**3**	**3**	**2.8**	**1.25**	**3**	**2.8**	**2**	**2**	**3**	**3**	**1**	**3**

22CSC09 - ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Common to 22CCC08, 22CIC08 and 22ITC14)

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To study about uninformed and Heuristic search techniques.	1.1	The students will be able to use appropriate search algorithms for problem solving.
2.0	To learn techniques for reasoning under uncertainty.	2.1	The students will be able to apply reasoning under uncertainty.
3.0	To introduce machine Learning and supervised learning algorithms.	3.1	The students will be able to build supervised learning models.
4.0	To study about ensembling and unsupervised learning algorithms.	4.1	The students will be able to build ensembling and unsupervised models.
5.0	To learn the basics of deep learning using neural networks	5.1	The students will be able to develop neural network models.

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.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3	3	-	-	-	-	1	3	3	3	1	2
2	1	1	1	3	1	-	-	-	1	2	1	3	2	3
3	2	1	2	1	1	-	-	-	2	1	1	3	1	1
4	3	1	3	1	-	-	-	-	2	1	2	1	2	2
5	3	1	1	2	2	-	-	-	2	2	2	3	2	2
CO (W.A)	2.4	1.2	2	2	1.3	-	-	-	1.6	1.8	1.8	2.6	1.6	2

Mapping of COs with POs / PSOs

<div align="center">

22CSC10 - THEORY OF COMPUTATION
(Common to 22ITC09)

</div>

	L	T	P	C
	3	1	0	4

PREREQUISITE : 22MYB05

	Course Objectives		Course Outcomes
1.0	To learn the basic concepts in theoretical computer science.	**1.1**	The students will be able to explain the key properties of formal languages and finite automata
2.0	To comprehend complex concepts and formal proofs in theoretical computer science in order to improve reasoning and problem solving skills.	**2.1**	The students will be able to design and describe the strings recognized by regular languages.
3.0	To learn about context free grammar and how to develop context free grammar based on different normal forms.	**3.1**	The students will be able to construct the context-free grammars and explain the languages accepted by CFG
4.0	To study about the turing machine and push down automata.	**4.1**	The students will be able to design a turing machine and push down automata that accomplish a specific task.
5.0	To learn about the different classes of problem.	**5.1**	The students will be able to explain the undecidable and intractable classes of problems

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	2	1	3	3	-	-	-	-	-	-	3	3	1
2	3	2	1	3	3	-	-	-	-	-	-	3	3	1
3	3	2	1	3	-	-	-	-	-	-	-	3	3	1
4	3	2	1	3	-	-	-	-	-	-	-	3	3	1
5	3	2	1	3	3	-	-	-	-	-	-	3	3	1
CO (W.A)	3	2	1	3	3	-	-	-	-	-	-	3	3	1

<table>
<tr><td colspan="5" align="center">22CSC11 - DATABASE MANAGEMENT SYSTEM
(Common to 22CIC10 and 22ITC11)</td></tr>
<tr><td></td><td align="center">L</td><td align="center">T</td><td align="center">P</td><td align="center">C</td></tr>
<tr><td></td><td align="center">3</td><td align="center">0</td><td align="center">0</td><td align="center">3</td></tr>
</table>

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To know the fundamentals of data models.	1.1	The students will be able to identify suitable data models for real time application and conceptualize a database system using ER Diagram
2.0	To learn about Relational database architecture and querying through SQL.	2.1	The students will be able to write queries in relational algebra and SQL.
3.0	To know about normalization	3.1	The students will be able to normalize the database design.
4.0	To understand the storage structures and the queries processing/optimization.	4.1	The students will be able to apply storage structure and process/optimize Queries.
5.0	To gain knowledge about transaction processing, concurrency control and recovery.	5.1	The students will be able to apply concepts of query processing, transaction processing, and concurrency control.

UNIT I - DATABASE 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. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7th Edition, McGraw Hill, 2020.

REFERENCES:
1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 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	3	3	2	3	3	-	3	3	-	3	3	3	3
2	3	3	3	3	2	-	-	-	-	-	3	3	3	3
3	3	3	3	3	2	-	-	2	3	-	3	3	3	3
4	3	3	3	3	3	-	-	2	2	-	3	3	3	3
5	3	3	3	3	3	3	-	3	3	-	3	3	3	3
CO (W.A)	**3**	**3**	**3**	**2.8**	**2.6**	**3**	**-**	**2.5**	**2.75**	**-**	**3**	**3**	**3**	**3**

22CSC12–ADVANCED JAVA PROGRAMMING
(Common to 22CCC14, 22CIC14 and 22ITC13)

	L	T	P	C
	3	0	0	3

PREREQUISITE : 22CSC07

	Course Objectives		Course Outcomes
1.0	To Explore advanced topic of Java network programming for solving problems	1.0	The Students will be able to understand the networking concepts related to Java Technology
2.0	To know the principles of SQL and JDBC connectivity	2.0	The students will be able to develop database connected java programs using SQL and JDBC connectivity
3.0	To Provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business	3.0	The students will be able to develop advanced skills for programming in Java
4.0	To understand servlet life cycle and architecture and created servlet communication programs	4.0	The students will be able to Create dynamic web pages, using Servlets and JSP
5.0	To put into use the advanced features of the Java language to build and compile robust enterprise grade applications	5.0	The students will be able to explore the use of Java Server Programming and make a reusable software component using Java Bean

UNIT I - NETWORK PROGRAMMING IN JAVA	(9)

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection– Reading the header – telnet application – Java Messaging services

UNIT II - DATABASE CONNECTIVITY	(9)

The Design of JDBC: JDBC Driver Types and Typical Uses of JDBC; the Structured Query Language; JDBC Configuration; Working with JDBC Statements; Query Execution; Scrollable and Updatable Result Sets; Row Sets

UNIT III - APPLICATIONS IN DISTRIBUTED ENVIRONMENT	(9)

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation

UNIT IV - SERVLETS AND JSP	(9)

Background; The Life Cycle of a Servlet; A Simple Servlet; The Servlet API; The javax.servlet Package; Reading Servlet Parameters; The javax.servlet.http Package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking; Introduction to JSP; Using JSP; Comparing JSP with Servlet; Java Web Frameworks

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UNIT V - ENTERPRISE APPLICATIONS	(9)

Server Side Component Architecture – Introduction to J2EE – the Java Beans API; Writing JavaBeans Session Beans – Entity Beans–Persistent Entity Beans

TOTAL (L:45) : 45 PERIODS

TEXT BOOKS:

1. Core java Volume I— Fundamentals, Tenth Edition, Cary S. Horstmann, Prentice Hall
2. Core java Volume 11— Advanced Features, Tenth Edition, Cary S. Horstmann, Prentice Hall
3. Java: The Complete Reference, 10th, Herbert Schildt, McGraw-Hill

REFERENCES:

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press
2. Java: Advanced Features and Programming Techniques, Nathan Clark

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	1	-	1	-	-	-	1	-	-	1	3	3
2	3	1	1	-	1	-	-	-	1	-	-	1	3	3
3	3	1	1	-	1	-	-	-	2	-	-	1	3	3
4	3	2	1	-	1	-	-	-	2	-	-	2	3	3
5	3	2	2	2	1	-	-	-	3	1	3	2	3	3
CO (W.A)	**3**	**1.6**	**1.2**	**2**	**1**	**-**	**-**	**-**	**1.8**	**1**	**3**	**1.4**	**3**	**3**

22CSC13 - FOUNDATIONS OF DATA SCIENCE

	L	T	P	C
	3	0	2	4

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the data science fundamentals and process.	**1.1**	The students will be able to Define the data science process
2.0	To learn to describe the data for the data science process	**2.1**	The students will be able to Understand different types of data description for data science process
3.0	To learn to describe the relationship between data.	**3.1**	The students will be able to Gain knowledge on relationships between data
4.0	To utilize the Python libraries for Data Wrangling.	**4.1**	The students will be able to Use the Python Libraries for Data Wrangling
5.0	To present and interpret data using visualization libraries in Python	**5.1**	The students will be able to Apply visualization Libraries in Python to interpret and explore data

UNIT I - INTRODUCTION	(9+6)

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+6)

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+6)

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+6)

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+6)

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.

List of Experiments:

1. Working with Numpy arrays

2. Working with Pandas data frames.

3. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.

4. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:

     a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.

     b. Bivariate analysis: Linear and logistic regression modeling

     c. Multiple Regression analysis

     d. Also compare the results of the above analysis for the two data sets.

5. Apply and explore various plotting functions on UCI data sets.

     a. Normal curves

     b. Density and contour plots

     c. Correlation and scatter plots

     d. Histograms

     e. Three dimensional plotting

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
HARDWARE:
1. Standalone PC's.
SOFTWARE:
1. OS – Windows 7 or higher
2. Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh
3.Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

TOTAL (L:45+P:30) : 75 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) 69

3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCE:

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	2	2	1	2	2	-	-	-	1	1	1	2	2	2
2	2	1	-	1	1	-	-	-	2	1	1	2	3	1
3	2	2	1	2	2	1	1	-	1	2	1	3	2	3
4	3	2	2	1	2	-	-	-	1	1	2	2	3	2
5	2	2	1	2	2	-	-	-	1	1	1	2	2	2
CO (W.A)	**2**	**1.8**	**1.25**	**1.6**	**1.8**	**1**	**1**	**-**	**1.2**	**1.2**	**1.2**	**2.2**	**2.4**	**2**

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

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To recognize the basic concepts of environment, ecosystems and biodiversity.	**1.1**	The students will be able to know the importance of environment and functions ecosystems and biodiversity
2.0	To impart knowledge on the causes, effects and control measures of environmental pollution.	**2.1**	The students will be able to identify the causes, effects of environmental pollution and contribute the preventive measures to the society.
3.0	To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them.	**3.1**	The students will be able to identify and understand the renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
4.0	To familiarize the e–waste, recognize and analyze the challenges of environmental management.	**4.1**	The students will be able to recognize the different methods of management of e-waste and apply them for suitable technological advancement and societal development.
5.0	To impart knowledge on the e-waste and its recycling methods of cell phone, battery, laptop and PCB.	**5.1**	The students will be able to demonstrate the recycling of battery, cell phone, laptop and PCB

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	1	-	-	2	-	-
2	2	2	2	-	-	3	3	2	1	-	-	2	-	-
3	2	2	2	-	-	3	3	2	1	-	-	2	-	-
4	2	2	2	-	-	3	3	2	1	-	-	2	-	-
5	2	2	2	-	-	3	3	2	1	-	-	2	-	-
CO (W.A)	**2**	**2**	**2**	**-**	**-**	**3**	**3**	**2**	**1**	**-**	**-**	**2**	**-**	**-**

22CSP07 - DATABASE MANAGEMENT SYSTEM LABORATORY
(Common to 22CIP07 and 22ITP06)

		L	T	P	C
		0	0	4	2

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To design a database system.	1.1	The students will be able to define database with various integrity constraints.
2.0	To study the usage of DDL and DML commands.	2.1	The students will be able to work with various DDL, DML queries.
3.0	To learn about joins, views, various built in functions and procedures and functions	3.1	The students will be able to create various views and make use of various types of joins and procedures and functions
4.0	To know about normalization	4.1	The students will be able to design and normalize the design.
5.0	To work with database connectivity.	5.1	The students will be able to work with real time data base connectivity

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
5. High level language extension with Triggers
6. Database design using E-R model and Normalization
7. Design and implementation of Payroll processing system

8.	Design and implementation of Banking system
9.	Design and implementation of Library Information System
10.	Design and implementation of Student Evaluation System

TOTAL (P:60) : 60 PERIODS

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

HARDWARE:
1. 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	3	-	-	-	-	-	-	2	-	3	3	3
2	-	3	3	3	2	-	2	-	-	-	-	3	3	3
3	3	3	-	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	-	-	-	-	-	-	-	3	3	3	3
5	3	-	3	-	-	-	-	-	-	2	3	3	3	3
CO (W.A)	**3**	**3**	**3**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**3**	**3**

22CSP08 – ADVANCED JAVA PROGRAMMING LABORATORY
(Common to 22CCP09,22CIP09 and 22ITP07)

		L	T	P	C
		0	0	4	2

PREREQUISITE : 22CSP06

	Course Objectives		Course Outcomes
1.0	To understand creating GUI using AWT and SWING	**1.1**	The Students will be able to design window based applications
2.0	To develop Database applications	**2.1**	The Students will be able to access database through java programs
3.0	To design applications using pre built frameworks.	**3.1**	The Students will be able to invoke the remote methods in an application using Remote Method Invocation (RMI)
4.0	To develop web application using Java Servlet and Java Server Pages technology.	**4.1**	The Students will be able to develop the dynamic web pages using JSP
5.0	To learn how to work with JavaBeans.	**5.1**	The Students will be able to design reusable software components using java beans

LIST OF EXPERIMENTS

1. The laboratory work includes writing Java programs
2. To create GUI applications using swing, event handling, and layout management
3. Use JDBC connectivity and create Table, insert and update data.
4. Write a program in Java to implement a Client/Server application using RMI.
5. Write a program in Java to create a Cookie and set the expiry time of the same.
6. Write a program in Java to create Servlet to count the number of visitors to a web page.
7. Write a program in Java to create a form and validate a password using Servlet.
8. Develop a Java Bean to demonstrate the use of the same.
9. Develop Chat Server using Java

TOTAL (P:60) : 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS SOFTWARE :

HARDWARE:
Standalone desktops 30 Nos.

SOFTWARE:
Java SDK or JRE 1.6 or higher
Java Servlet Container (Free Servlet Container available)
Supported Database and library that supports the database connection with Java.

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

Mapping of COs with POs / PSOs

M.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER: I									
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22CPA01	Theoretical Foundations of Computer Science	FC	-	3	3	0	0	3
2	22CPB01	Networking Technologies	PCC	-	3	3	0	0	3
3	22CPB02	Advanced Data Structures and Algorithms	PCC	-	3	3	0	0	3
4	22CPB03	Advanced Database Technology	PCC	-	3	3	0	0	3
5	22CPB04	Multi core Architecture and Programming	PCC	-	3	3	0	0	3
6	22CPB05	Machine Learning Techniques	PCC	-	3	3	0	0	3
PRACTICAL									
7	22CPP01	Advanced Data Structures Laboratory	PCC	-	4	0	0	4	2
Audit Non Credit Courses									
8	A1	Audit Course	EEC	Ref. AC	2	2	0	0	0
				TOTAL	24	20	0	4	20

		SEMESTER: II							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22CPB06	Big Data Analytics	PCC	-	3	3	0	0	3
2	22CPB07	Security Principles and Practices	PCC	-	3	3	0	0	3
3	22CPB08	Internet of Things	PCC	-	3	3	0	0	3
4	E1	Elective (PEC/OEC)	PEC/OEC	Ref. PE	3	3	0	0	3
5	E2	Elective (PEC)	PEC	Ref. PE	3	3	0	0	3
6	E3	Elective (PEC)	PEC	Ref. PE	3	3	0	0	3
PRACTICAL									
7	22CPP02	Big Data Analytics Laboratory	PCC	-	4	0	0	4	2
8	22CPE01	Technical Term Paper	EEC	-	4	0	0	4	2
				TOTAL	26	18	0	8	22

SEMESTER: III									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	E4	Elective (PEC)	PEC	Ref. PE	3	3	0	0	3
2	E5	Elective (PEC)	PEC	Ref. PE	3	3	0	0	3
3	E6	Elective (PEC)	PEC	Ref. PE	3	3	0	0	3
PRACTICAL									
4	22CPE02	Project Phase I	EEC	-	12	0	0	12	6
				TOTAL	21	9	0	12	15

SEMESTER: IV									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICAL									
1	22CPE03	Project Phase II	EEC	22CPE02	24	0	0	24	12
				TOTAL	24	0	0	24	12

(A) FC, PCC, PEC, OEC, EEC and AC Courses

(a) FOUNDATION COURSES(FC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22CPA01	Theoretical Foundations of Computer Science	FC	NIL	3	3	0	0	3

(b) PROFESSIONAL CORE COURSES (PCC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22CPB01	Networking Technologies	PCC	NIL	3	3	0	0	3
2	22CPB02	Advanced Data Structures and Algorithms	PCC	NIL	3	3	0	0	3
3	22CPB03	Advanced Database Technology	PCC	NIL	3	3	0	0	3
4	22CPB04	Multi core Architecture and Programming	PCC	NIL	3	3	0	0	3
5	22CPB05	Machine Learning Techniques	PCC	NIL	3	3	0	0	3
6	22CPP01	Advanced Data Structures Laboratory	PCC	NIL	4	0	0	4	2
7	22CPB06	Big Data Analytics	PCC	NIL	3	3	0	0	3
8	22CPB07	Security Principles and Practices	PCC	NIL	3	3	0	0	3
9	22CPB08	Internet of Things	PCC	NIL	3	3	0	0	3
10	22CPP02	Big Data Analytics Laboratory	PCC	NIL	4	0	0	4	2

(c) PROFESSIONAL ELECTIVE COURSES (PEC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22CPX01	Cloud Computing	PEC	NIL	3	3	0	0	3
2	22CPX02	Data Warehousing and Data Mining	PEC	NIL	3	3	0	0	3
3	22CPX03	Software Requirement Engineering	PEC	NIL	3	3	0	0	3
4	22CPX04	Agile Software Development Methodologies	PEC	NIL	3	3	0	0	3
5	22CPX05	Advanced Operating Systems	PEC	NIL	3	3	0	0	3
6	22CPX06	Semantic Web	PEC	NIL	3	3	0	0	3
7	22CPX07	Deep Learning	PEC	NIL	3	3	0	0	3
8	22CPX08	Digital Image Processing and Applications	PEC	NIL	3	3	0	0	3
9	22CPX09	Information Retrieval Techniques	PEC	NIL	3	3	0	0	3
10	22CPX10	Web Services	PEC	NIL	3	3	0	0	3
11	22CPX11	Mobile Application Development	PEC	22CPB01	3	3	0	0	3
12	22CPX12	Wireless Sensor Networks	PEC	22CPB01	3	3	0	0	3
13	22CPX13	Natural Language Processing	PEC	NIL	3	3	0	0	3
14	22CPX14	GPU Computing	PEC	NIL	3	3	0	0	3
15	22CPX15	Compiler Construction and Optimization	PEC	NIL	3	3	0	0	3
16	22CPX16	Blockchain Technologies	PEC	NIL	3	3	0	0	3
17	22CPX17	Pattern Recognition	PEC	NIL	3	3	0	0	3
18	22CPX18	Virtualization Techniques	PEC	NIL	3	3	0	0	3
19	22CPX19	Quantum Computing	PEC	NIL	3	3	0	0	3

(d) OPEN ELECTIVE COURSES (OEC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22BAZ01	Research Methodology and IPR	OEC	NIL	3	3	0	0	3
2	22CPZ01	Machine Vision	OEC	NIL	3	3	0	0	3

(e) EMPLOYABILITY ENHANCEMENT COURSES (ECC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	Ref. AC	Audit Course	EEC	NIL	2	2	0	0	0
2	22CPE01	Technical Term Paper	EEC	NIL	4	0	0	4	2
3	22CPE02	Project Phase I	EEC	NIL	12	0	0	12	6
4	22CPE03	Project Phase II	EEC	22CPE02	24	0	0	24	12

(f) AUDIT COURSES (AC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1.	22PGA01	English for Research Paper Writing	EEC	NIL	2	2	0	0	0
2.	22PGA02	Disaster Management	EEC	NIL	2	2	0	0	0
3.	22PGA03	Constitution of India	EEC	NIL	2	2	0	0	0

SUMMARY						
S.No.	SUBJECT AREA	CREDITS AS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1	FC	3	0	0	0	3
2	PCC	17	11	0	0	28
3	PEC	0	9	9	0	18
4	EEC	0	2	6	12	20
TOTAL CREDITS		20	22	15	12	69

TOTAL CREDITS (20+22+15+12) = 69 CREDITS

		22CPA01 - THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE				

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To learn about cardinality, finite and countable infinite sets and to determine their characteristics	**1.1**	The Students will be able to arrive at conclusions about sets and relations, construct the number of arrangements and selections using principles of counting.
2.0	To impart the knowledge of propositional and predicate logics.	**2.1**	The Students will be able to solve propositional logic, including modeling English description with propositions and connectives along with truth analysis and will be conversant in predicate logic.
3.0	To explain about various types of graphs including Regular graphs and Random graphs.	**3.1**	The Students will be able to identify spanning trees, cut sets, isomorphism and different representation of a graph.
4.0	To inculcate more complex queuing systems.	**4.1**	The Students will be able to analyze the basic characteristic features of a queuing system and models.
5.0	To gain knowledge on advanced courses in automation theory, formal languages, algorithms & logic.	**5.1**	The Students will be able to solve problems using formal languages and automata.

UNIT I - FOUNDATIONS	(9)

Sets-Relations-Equivalence relations-Partial orders-Functions-Recursive functions-Sequences-Induction principle- Structural induction-Recursive algorithms-Counting - Pigeonhole principle-Permutations and Combinations (Self study)-Recurrence relations.

UNIT II - LOGIC	(9)

Propositional logic-Logical connectives-Truth tables-Normal forms (conjunctive and disjunctive)-Predicate logic- Universal and existential quantifiers-Proof techniques-Direct and Indirect-Proof by contradiction-Mathematical Induction (Self study).

UNIT III - GRAPH STRUCTURES	(9)

Tree Structures- Graph Structures- Graph Representations-Regular graph structures-Random graphs-Connectivity- Cycles-Graph coloring-Cliques, Vertex Covers, Independent sets-Spanning Trees-Network flows(Self study)- Matching.

UNIT IV - QUEUE MODELS	(9)

Characteristics of Queuing Models- Kendal's Notation-Single and Multi-Server Markovian queuing models – M/M/1, M/M/C(Self study) (finite and infinite capacity) and (M/G/1) :(∞/GD).

UNIT V - MODELING COMPUTATION AND LANGUAGES	(9)

Finite state machines – Deterministic and Non- deterministic finite state machines – Turing Machines – Formal Languages – Classes of Grammars – Type 0 – Context Sensitive – Context Free – Regular Grammars(Self study) – Ambiguity.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, TMH, 2011.
2. M.K. Venkataraman, N. Sridharan and N.Chandrasekaran," Discrete Maths.", The National Publishing Company, 2003.
3. Kishore S Trivedi, "Probability and statistics with reliability, Queuing and computer science applications", PHI, 2006.
4. H. A.Taha, ," Operations Research" - An Introduction,9th Edition, Prentice Hall of India Ltd New Delhi, 2014.
5. Ralph P Girmaldi and B.V. Ramana ,"Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education ,Asia, Delhi, 5th Edition, 2006.

Mapping of COs with POs / PSOs

COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	2	-	1	-	-	2	2	-
2	3	-	1	2	-	2	2	-
3	3	-	1	-	-	2	-	2
4	2	-	-	1	1	2	-	-
5	3	-	1	2	-	2	2	2
CO (W.A)	3	-	1	2	1	2	2	2

		L	T	P	C
		3	0	0	3

22CPB01 - NETWORKING TECHNOLOGIES

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn about integrated and differentiated services architectures.	**1.1**	The student will able to identify the different features of integrated and differentiated services.
2.0	To know about TCP performance & congestion avoidance techniques.	**2.1**	The students will be able to outline an insight of TCP performance, congestion avoidance and control.
3.0	To study the developments in cellular networks and understand the working of wireless network protocols.	**3.1**	The student will able to design and demonstrate protocols for cellular & wireless networks.
4.0	To get familiarized with next generation networks.	**4.1**	The student will able to analyze the use of next generation networks.
5.0	To know the concepts behind software defined networks.	**5.1**	The student will be able to provide solutions using SDN.

UNIT I - NETWORK ARCHITECTURE AND QoS	**(9)**

Overview of TCP/IP Network Architecture – Integrated Services Architecture – Approach – Components – Services – Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT II - TCP PERFORMANCE MODELING	**(9)**

TCP Segment format - TCP Sliding Windows - Congestion Control and Queuing – TCP Congestion Control - Analysis of TCP: Buffer Sizing - Throughput - Fairness - Random Early Detection Gateways for Congestion Avoidance. - Congestion Control for High Bandwidth - Delay Product Networks - Variations of TCP.

UNIT III - CELLULAR AND WIRELESS NETWORKS	**(9)**

GSM – GPRS – UMTS – UTRAN - UMTS Security - IEEE802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX - 802.16e – WLAN: Configuration and Security– IEEE 802.11e and WMM – Comparison of WLAN and UMTS – Bluetooth.

UNIT IV - 4G NETWORKS	**(9)**

LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks –Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced (3GPPP Release 10) – 4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G – Introduction to 5G& XG networks.

UNIT V - SOFTWARE DEFINED NETWORKS	(9)
Introduction – Centralized and Distributed Control and Data Planes – Open Flow – SDN Controllers – General Concepts – VLANs – NVGRE – Open Flow – Network Overlays – Types – Virtualization – Data Plane – I/O – Design of SDN Framework	
	TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. William Stallings, "High Speed Networks and Internets: Performance and Quality of Service", Prentice Hall, 2nd Edition, 2002.
2. James F Kurose, Keith W Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Pearson Education, India, 2012.
3. Martin Sauter, "From GSM to LTE, An Introduction to Mobile Networks and Mobile Broadband", Wiley, 2014.
4. Martin Sauter,"3G, 4G And Beyond–Bringing Networks, Devices And The Web Together" A John Wiley & Sons, Ltd., Publication, 2nd Edition, 2013.
5. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", Wiley, 2015.
6. Paul Goransson, Chuck Black, ‟Software Defined Networks: A Comprehensive Approach‖", Morgan Kaufmann, 2014.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	1	3	2	2	-	3	3	2
2	3	2	2	3	1	2	1	2
3	3	3	-	3	2	1	2	1
4	3	2	1	2	2	2	3	3
5	-	3	3	2	3	3	3	3
CO (W.A)	2.5	2.6	2	2.4	2	2.2	2.4	2.2

22CPB02 - ADVANCED DATA STRUCTURES AND ALGORITHMS

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To extend the students' knowledge on basic techniques of algorithm analysis.	**1.1**	The student will be able to use recursive design.
2.0	To get familiarized with various types of tree structures.	**2.1**	The student will be able to choose appropriate tree data structure as applicable to specified problem definition.
3.0	To learn the usage of graphs and its applications	**3.1**	The student will be able to design algorithms using graph structure to solve real-life problems
4.0	To impart knowledge on different algorithm design techniques.	**4.1**	The student will be able to use different algorithm Design Techniques.
5.0	To learn about advanced algorithms.	**5.1**	The student will be able to apply suitable design strategy for problem solving

UNIT I - ALGORITHM ANALYSIS	(9)

Asymptotic Notations – Properties of Big-oh Notation – Conditional Asymptotic Notation –Algorithm Analysis: Analysis of iterative and recursive Algorithms –Introduction to Linear and Non Linear data structures.

UNIT II - HIERARCHICAL DATA STRUCTURES	(9)

Binary Search Trees – AVL Trees – Red-Black –Properties of Red-Black Trees –Insertion and Deletion- Min/Max heaps– Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps.

UNIT III - GRAPHS	(9)

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components – Minimum Spanning Trees- Single –Source Shortest Paths –All Pairs Shortest Paths – Maximum Flow.

UNIT IV - ADVANCED ALGORITHMS	(9)

Huffman Coding – Convex Hull – Closest pair of points – Tree Vertex Splitting – Activity Networks – Flow Shop Scheduling – Introduction to Randomized algorithms.

UNIT V - NP COMPLETE AND NP HARD	(9)

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducibility - NP Complete Problems - Approximation Algorithms: Travelling Salesman Problem - Sum of Subset Problem - Vertex Cover Problem.

	TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein," Introduction to Algorithms", 4th Edition, Prentice Hall of India, New Delhi, 2022.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson Education, 2014.
3. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press, 2008.
4. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms/C++", 2nd Edition, University Press, 2007.
5. Alfred .V. Aho, John .E. Hopcroft, and Jeffrey .D. Ullman, "Data Structures and Algorithms", Addison-Wesley Publications, 2008.
6. Anany Levitin, "Introduction to the Design and Analysis of algorithms", 3rd Edition, Pearson, USA, 2012.

Mapping of COs with POs / PSOs								
COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	3	3	3	3	3	3	1	1
2	2		2	3	3	3	2	2
3	3	-	3	3	3	3	3	3
4	3	-	3	2	1	3	3	3
5	3	3	3	3	3	3	3	3
CO (W.A)	2.8	3	2.8	2.8	2.6	3	2.4	2.4

22CPB03 - ADVANCED DATABASE TECHNOLOGY				

	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To acquire knowledge on parallel and distributed databases and its applications.	**1.1**	The students will be able to select the appropriate high performance database like parallel and distributed database.
2.0	To study the usage and applications of Object Oriented database.	**2.1**	The students will be able to model and represent the real world data using object oriented database.
3.0	To understand the usage of advanced data models.	**3.1**	The students will be able to design a semantic based database to meaningful data access.
4.0	To gain knowledge about intelligent databases.	**4.1**	The students will be able to embed the rule set in the database to implement intelligent databases.
5.0	To acquire inquisitive attitude towards research topics in database like NoSQL.	**5.1**	The students will be able to demonstrate competency in designing and selecting a particular NoSQL database for specific use cases.

UNIT I - PARALLEL DATABASES	**(9)**

Database System Architectures: Centralized and Client-Server Architectures - Server System Architectures - Parallel Systems- Parallel Databases: I/0 Parallelism - Inter and Intra Query Parallelism - Inter and Intra operation Parallelism- Design of Parallel Systems.

UNIT II - DISTRIBUTED DATABASES	**(9)**

Distributed Database Concepts - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control - Distributed Query Processing.

UNIT III - OBJECT BASED DATABASES	**(9)**

Concepts for Object Databases: Object Identity - Object structure - Type Constructors - Encapsulation of Operations - Methods - Persistence - Type and Class Hierarchies - Inheritance - Complex Objects - Object Database Standards, Languages and Design: ODMGModel - ODL - OQL .

UNIT IV - INTELLIGENT DATABASES	**(9)**

Active Databases: Syntax and Semantics -Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- Deductive Databases: Logic of Query Languages - Data log Recursive Rules-Syntax and Semantics of Data log Languages- Implementation of Rules and Recursion Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures Spatial Access Methods- Mobile Databases.

UNIT V - NOSQL DATABASES	(9)

Introduction to Big Data-Storage- NoSQL Introduction - Differences from relational databases- Column family store- Document stores - key-value databases - Graph databases - Choosing a NoSQL database.

	TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", 7 t h Edition, Pearson Education/Addison Wesley, 2017.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", 6th Edition, Pearson Education, 2015.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", 7th Edition, McGraw Hill, 2019.
4. C. J. Date, A.Kannan and S. Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	2	-	2	3	-	3	2
2	3	2	1	2	3	-	3	2
3	-	-	1	-	-	1	3	3
4	3	3	2	2	3	2	3	3
5	3	3	-	2	3	-	3	3
CO (W.A)	3	2.5	1.33	2	3	1.5	3	2.6

		L	**T**	**P**	**C**
22CPB04 – MULTICORE ARCHITECTURE AND PROGRAMMING		**3**	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives		**Course Outcomes**
1.0	To understand the basic structure and operation of Multicore architecture and parallel processing.	**1.1**	The student will be able to analyze the working principle of ILP.
2.0	To understand parallel programming concepts and threading APIs.	**2.1**	The student will be able to know the concepts of threading and parallel programming constructs.
3.0	To understand Memory Hierarchy Design and virtual machines.	**3.1**	The student will be able to understand the concept of Memory Hierarchy Design and virtual machines.
4.0	To understand MPI programming and multicore debugging techniques.	**4.1**	The student will be able to understand the issues related to processors, memories, I/O devices.
5.0	To provide knowledge of memory technologies, interfacing techniques and subsystem devices.	**5.1**	The student will be able to use memory technologies, interfacing techniques and subsystem devices efficiently.

UNIT I - INTRODUCTION	**(9)**

Classes of Computers-Trends in Technology-Trends in Power and Energy in Integrated Circuits- Instruction Level Parallelism-Basic Compiler Techniques for Exposing ILP-Software and hardware multithreading – SMT and CMP architectures –Design issues – Case studies – Intel Multi-core architecture

UNIT II – PARALLEL PROGRAMMING	**(9)**

Fundamental concepts – Designing for threads – Scheduling - Threading and parallel Programming constructs – Synchronization – Critical sections – Deadlock - Threading APIs

UNIT III – MEMORY HIERARCHY DESIGN	**(9)**

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies .

UNIT IV – MPI PROGRAMMING	**(9)**

MPI Model – Collective communication – Data decomposition – Communicators and topologies – Interconnection networks – Buses, crossbar-Multi-stage switches – Point-to-point communication – MPI Library

UNIT V – MULTI THREAD AND STORAGE APPLICATION	**(9)**

Algorithms, program development and performance tuning-Advanced topics in disk storage-Video control–I/O Performance–SMART technology and fault detection–Processor to network interfaces

	TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. John L. Hennessey and David A. Patterson, "Computer architecture – A quantitative approach", Morgan Kaufmann/Elsevier Publishers, 6th Edition, 2019.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2010.
3. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2004.
4. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A hardware/ Software Approach", Morgan Kaufmann/Elsevier Publishers, 1999.

Mapping of COs with POs / PSOs								
COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	-	-	-	3	-	2	3	3
2	2	-	-	-	3	2	3	3
3	-	-	1	3	3	2	2	2
4	-	-	2	2	2	2	1	1
5	-	-	1	2	2	2	1	-
CO (W.A)	2	-	1.33	2.5	2.5	2	2	2.75

22CPB05 - MACHINE LEARNING TECHNIQUES					

		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the concepts of Machine Learning.	**1.1**	The students will be able to learn the types of machine learning models.
2.0	To appreciate supervised learning and their applications.	**2.1**	The students will be able to use the supervised learning algorithms for any given problem.
3.0	To appreciate the concepts and algorithms of unsupervised learning.	**3.1**	The students will be able to use the unsupervised learning algorithms for any given problem.
4.0	To understand the theoretical and practical aspects of Probabilistic Graphical Models.	**4.1**	The students will be able to apply the graphical models of machine learning
5.0	To appreciate the concepts and algorithms of advanced learning.	**5.1**	The students will be able to identify applications suitable for different types of Machine Learning with suitable justification.

UNIT I - INTRODUCTION	**(9)**

Machine Learning–Types of Machine Learning –Machine Learning process- preliminaries, testing Machine Learning algorithms, turning data into Probabilities, and Statistics for Machine Learning- Probability theory – Probability Distributions – Decision Theory.

UNIT II - SUPERVISED LEARNING	**(9)**

Linear Models for Regression – Linear Models for Classification- Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models – Decision Tree Learning – Bayesian Learning, Naïve Bayes – Ensemble Methods, Bagging, Boosting, Neural Networks, Multi-layer Perceptron, Feed- forward Network, Error Back propagation - Support Vector Machines.

UNIT III - UNSUPERVISED LEARNING	**(9)**

Clustering- K-means – EM Algorithm- Mixtures of Gaussians –Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis

UNIT IV - PROBABILISTIC GRAPHICAL MODELS	**(9)**

Graphical Models – Undirected Graphical Models – Directed Graphical Models –Bayesian Networks – Conditional Independence properties – Markov Random Fields- Hidden Markov Models – Conditional Random Fields(CRFs).

UNIT V - ADVANCED LEARNING	**(9)**

Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non-deterministic Rewards and Actions, Temporal Difference Learning Exploration.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Chapman and Hall, CRC Press, 2nd Edition, 2014.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 3rd Edition, 2014.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 3rd Edition, 2013.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	1	-	2	3	3	2
2	3	1	2	1	2	3	2	2
3	3	2	3	2	3	3	2	3
4	3	1	2	3	2	3	3	2
5	3	3	3	3	3	3	3	3
CO (W.A)	3	1.6	2.2	2.3	2.4	3	2.6	2.4

		L	**T**	**P**	**C**
		0	**0**	**4**	**2**

22CPP01 - ADVANCED DATA STRUCTURES LABORATORY

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To gain knowledge on various basic and advanced data structures.	**1.1**	Student will be able to formulate new solutions for programming problems
2.0	To know various techniques for representation of the data in the real world.	**2.1**	The students will be able to identify the appropriate data structure for given problem.
3.0	To have practical knowledge on data structure applications.	**3.1**	The students will be able to develop the application of data structures.
4.0	To learn about implementation of various tree data structures.	**4.1**	Student will be able to handle operations like searching, insertion, deletion mechanism on tree data structures.
5.0	To have practical knowledge on advanced data structure concepts.	**5.1**	Student will be able to determine and demonstrate advanced data structures.

LIST OF EXPERIMENTS:

1. Implementation of the following Heap data structures

    i)   Min/Max Heap(Insertion, Delete Min, Delete Max)

    ii)   Skew Heap and Fibonacci Heap

2. Implementation of the following Search Structures

    i)   AVL Trees (Insertion, Deletion and Search)

    ii)   Splay Trees (Insertion, Deletion and Search)

    iii)   B-Trees (Insertion, Deletion and Search)

    iv)   Red-Black Trees.

3. Implementation of Topological sort.

4. Implementation of Convex Hull.

5. Solve NP Problems- sum of Subset problem.

TOTAL (P:60) : 60 PERIODS

	Mapping of COs with POs / PSOs								
COs	**POs**							**PSOs**	
	1	2	3	4	5	6	1	2
1	3	-	3	3	1	3	3	3
2	3	-	3	3	-	2	3	3
3	3	-	3	3	-	2	3	3
4	3	-	3	3	-	2	3	3
5	3	-	3	3	-	2	3	3
CO (W.A)	3	-	3	3	1	2	3	3

	22CPB06 - BIG DATA ANALYTICS				

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To provide an overview of an exciting growing field of big data analytics.	1.1	The student will able to understand the fundamentals of various big data analytics techniques.
2.0	To introduce the tools required to manage and analyze big data like Hadoop, NoSql.	2.1	The student will able to acquire fundamental enabling techniques and scalable algorithms like Hadoop, NO SQL in big data analytics
3.0	To teach the fundamental techniques and programming in achieving big data analytics with scalability and streaming capability.	3.1	The student will able to Categorize and summarize the fundamental techniques and programming in Big Data and its importance.
4.0	To introduce programming tools PIG & HIVE in Hadoop echo system	4.1	The student will able to explore on Big Data applications Using Pig and Hive.
5.0	To enable students to learn to use various techniques for mining data stream.	5.1	The student will be able to build a complete business data analytics solution

UNIT I - INTRODUCTION TO BIG DATA AND ANALYTICS	(9)

Introduction to Big Data - Classification of Digital Data, Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data Analytics importance - Data Science- Terminologies used in Big Data Environments - Analytics Tools.

UNIT II - INTRODUCTION TO TECHNOLOGY LANDSCAPE	(9)

NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop – Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System – Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem.

UNIT III - INTRODUCTION TO MONGODB ,CASSANDRA AND MAPREDUCE PROGRAMMING	(9)

MongoDB: Terms used in Mongo DB - Data Types - MongoDB Query Language- Cassandra: Features - CQL Data Types –CRUD Operations – Collections alter Commands - Import and Export - Querying System Tables. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT IV - INTRODUCTION TO HIVE AND PIG	(9)

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having - RCFile Implementation - Hive User Defined Function - Serialization and Deserialization. Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig – Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig – HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo

UNIT V - INTRODUCTION TO DATA ANALYTICS WITH R	(9)

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Associate Rule Making, Decision Tree, Big Data Analytics with BigR.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Seema Acharya, SubhashiniChellappan, "Big Data and Analytics", Wiley Publications, 2nd Edition,2019
2. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc.,2013.
3. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, 4th Edition,2015
4. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications,2014
5. Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc.,2012
6. Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill, 2012
7. Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	1	-	2	3	2	2
2	3	2	2	1	2	3	2	2
3	3	2	3	2	3	3	2	3
4	3	2	2	3	2	3	2	2
5	3	3	3	3	3	3	3	3
CO (W.A)	3	2	2.2	1.8	2.4	3	2.2	2.4

				L	T	P	C

22CPB07 - SECURITY PRINCIPLES AND PRACTICES

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn the core fundamentals of system security concepts.	1.1	The students will be able to comprehend the core fundamentals of system security.
2.0	To have thorough knowledge in the security concepts related to networks.	2.1	The students will be able to apply the security concepts related to networks in wired and wireless scenario.
3.0	To deploy the security essentials in IT Sector.	3.1	The students will be able to implement and manage the security essentials in IT Sector.
4.0	To be exposed to the concepts of Cyber Security and encryption Concepts.	4.1	The students will be able to elucidate the notion of cyber security and encryption concepts.
5.0	To perform a detailed study of Privacy and Storage security and related Issues.	5.1	The students will be able to procure intelligence in the area of privacy and storage security and related issues.

UNIT I - SYSTEM SECURITY	(9)

Building a secure organization- A Cryptography primer- detecting system Intrusion, Preventing system Intrusion - Guarding Against Network Intrusions: Preventive Measures - Intrusion Monitoring and Detection - Reactive Measures.

UNIT II - NETWORK SECURITY	(9)

Internet Security - Botnet Problem- Intranet security- Local Area Network Security - Wireless Network Security - Cellular Network Security – RFID Security.

UNIT III - SECURITY MANEGEMENT	(9)

Information security essentials for IT Managers- Security Management System - Policy Driven System Management- IT Security - Identity Management - Intrusion and Detection and Prevention System.

UNIT IV - CYBER SECURITY AND CRYPTOGRAPHY	(9)

Cyber Forensics- Cyber Forensics and Incidence Response - Security e-Discovery - Network Forensics - Data Encryption- Satellite Encryption –Public key Infrastructure.

UNIT V - PRIVACY AND STORAGE SECURITY	(9)

Privacy in the Digital Society - Privacy Enhancing Technologies - Personal privacy Policies –VoIP Security - Storage Area Network Security - Storage Area Network Security Devices - Risk management - Physical Security Essentials.

	TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. John R.Vacca, "Computer and Information Security Handbook", 3rd Edition, Elsevier 2017.
2. Herbert J. Mattord and Michael E. Whitman, "Principal of Information Security", 6th Edition, Cengage Learning,2017
3. Richard E.Smith, "Elementary Information Security", 3rd Edition, Jones and Bartlett Learning, 2019.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	-	3	3	2	2	3	3
2	3	-	3	3	3	3	3	3
3	3	-	3	3	2	3	3	3
4	3	-	3	3	2	3	3	3
5	3	-	3	3	3	3	3	3
CO (W.A)	3	-	3	3	2.4	2.8	3	3

22CPB08 - INTERNET OF THINGS

		L	T	P	C
		3	0	0	3

PRE REQUISITE : Basic programming skills, Basic electronics skills

	Course Objectives		Course Outcomes
1.0	To learn the basic issues, policy and challenges in the Internet	1.1	The students will be able to identify the components of IOT
2.0	To understand the components and the protocols in Internet	2.1	The students will be able to design a portable IOT using appropriate boards
3.0	To build a small low cost embedded system with the internet	3.1	The students will be able to program the sensors and controller as part of IOT
4.0	To understand the various modes of communications with internet	4.1	The students will be able to develop schemes for the applications of IOT in real time scenarios
5.0	To learn to manage the resources in the Internet	5.1	The students will be able to establish the communication to the cloud through Wi-Fi / Bluetooth

UNIT I - INTRODUCTION	(9)

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security – privacy. Components in internet of things: Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – RF links – Mobile Internet – Wired Communication.

UNIT II – PROGRAMMING THE MICROCONTROLLER FOR IOT	(9)

Basics of Sensors and actuators – Examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors - Communication-Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using WiFi / Ethernet

UNIT III - RESOURCE MANAGEMENT IN THE INTERNET OF THINGS	(9)

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object - Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behavior of Objects.

UNIT IV - BUSINESS MODELS FOR THE INTERNET OF THINGS	(9)

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as a Basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things – Semantic Interoperability as a Requirement for DiY Creation - Ontology- Value Creation in the Internet of Things- Application of Ontology Engineering in the Internet of Things-Semantic Web-Ontology – The Internet of Things in Context of EURIDICE - Business Impact.

UNIT V - FROM THE INTERNET OF THINGS TO THE WEB OF THINGS	(9)

Resource-oriented Architecture and Best Practices- Designing RESTful Smart Things - Web-enabling Constrained Devices - The Future Web of Things - Set up cloud environment – send data from microcontroller to cloud – Case study –CAM:cloud Assisted Privacy– Other recent projects.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2012.
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011
3. Luigi Atzor et.al, "The Internet of Things: A survey", Journal on Networks, Elsevier Publications, October, 2010
4. Huang Lin, Gainesville, Jun Shao, Chi Zhang, Yuguang Fang, "CAM: Cloud-Assisted Privacy Preserving Mobile Health Monitoring", IEEE Transactions on Information Forensics and Security, 2013
5. Pengwei Hu; Fangxia Hu, "An optimized strategy for cloud computing architecture", 3rd IEEE Transactions on Computer Science and Information Technology (ICCSIT), 2010.

Mapping of COs with POs / PSOs

COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	3	2	2	2	3	-	3	2
2	3	2	-	2	3	-	3	2
3	-	-	1	-	-	1	3	3
4	3	3	3	2	3	2	3	3
5	3	3	-	2	3	-	3	3
CO (W.A)	3	2.5	2.33	2	3	1.5	3	2.6

		L	T	P	C
22CPP02 - BIG DATA ANALYTICS LABORATORY		0	0	4	2

PREREQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To understand the installation and configuration procedure for Hadoop and HDFC	**1.1**	The student will able to improve the Knowledge of Hadoop and HDFC file system tools
2.0	To understand and implement Map Reduce programs and R for processing big data.	**2.1**	The student will able to identify problems, analyze, and evaluate using various R, MapReduce Programs.
3.0	To understand and how to run the Hive tools.	**3.1**	The student will able to know various tools in Hive.
4.0	To learn about various queries in Pig.	**4.1**	The student will able to exhibit new ideas and innovations in Hive and Pig.
5.0	To gain knowledge on analyzing big data using linear models, machine learning techniques such as SVM / Decision tree classification and clustering.	**5.1**	The student will able to build and apply linear and logistic regression models and perform data analysis with machine learning method.

LIST OF EXPERIMENTS:

HADOOP,HIVE AND PIG

1. Install, configure and run Hadoop and HDFS

2. Implement word count / frequency programs using MapReduce,Hive.

3. Implement an MR program that processes a weather dataset

4. Design and Implement the following Mapreduce programs

     a) Writing mapper programs b) Writing reducer programs

5. Develop and execute the Partitions and Buckets partitioning program in Hive.

6. Design and Implement the following Hive Tables

     a) Importing Data. b)Querying Data

7. Pig Queries [Hands-on]

R

8.Implement Linear and logistic Regression

9.Implement SVM / Decision tree classification techniques

10.Implement clustering techniques

11.Visualize data using any plotting framework

12. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

TOTAL (P:60) : 60 PERIODS

	Mapping of COs with POs / PSOs								
COs	**POs**							**PSOs**	
	1	2	3	4	5	6	1	2
1	3		3	3	1	3	3	3
2	3	1	3	3	1	2	3	3
3	3	1	3	3	1	2	3	3
4	3	1	3	3	1	2	3	3
5	3	1	3	3	1	2	3	3
CO (W.A)	3	1	3	3	1	2.2	3	3

		L	**T**	**P**	**C**
		0	**0**	**4**	**2**

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To provide exposure to the students to refer, read and review the research articles in referred journals and conference proceedings.	**1.1**	At the end of the course the student will be able to read and review the research articles and publish a technical paper.

METHODOLOGY	• Each student is allotted to a faculty of the department by the Dean/ HOD. • By mutual discussions, the faculty guide will assign a topic in the general / subject area to the student. • The students have to refer the Journals and Conference proceedings and collect the published literature. • The student is expected to collect at least 20 such Research Papers published in the last 5 years. • Using OHP/PowerPoint, the student has to make presentation for 15-20 minutes followed by 10 minutes discussion. • The student has to make two presentations, one at the middle and the other near the end of the semester. • The student has to write a Technical Report for about 30-50 pages (Title page, one page Abstract, Review of Research paper under various sub headings, Concluding Remarks and List of References).The technical report has to be submitted to the Dean/ HOD one week before the final presentation, after the approval of the faculty guide.

EXECUTION	**Week**	**Activity**
	I	Allotment of Faculty Guide by the Dean/ HoD
	II	Finalizing the topic with the approval of Faculty Guide
	III-IV	Collection of Technical papers
	V-VI	Mid semester presentation
	VII-VIII	Report writing
	IX	Report submission
	X-XI	Final presentation

EVALUATION	**100%by Continuous Assessment - 3 Hrs/week and 1 credit**	
	Component	Weight age
	Mid semester presentation	25%
	Final presentation(Internal)	25%
	End Semester Examination Report	30%
	Presentation	20%
	Total	100%

Mapping of COs with POs / PSOs								
COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	3	3	3	3	3	3	3	3
CO (W.A)	3	3	3	3	3	3	3	3

		L	T	P	C
	22CPE02 - PROJECT PHASE I				
		0	0	12	6

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature, the methodology to solve the identified problem and preparing project reports and to face reviews and viva-voce examination.	1.1	At the end of the course the students will have a clear idea of their area of work and they will be in a position to carry out the phase II project work in a systematic way.

SYLLABUS:

- Student individually works on a specific topic approved by the head of the department under the guidance of a faculty member who is familiar in this area.
- The student can select any topic which is relevant to the area of Computer Science and Engineering. The topic may be theoretical or case studies.
- At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work.
- The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL (P:180) : 180 PERIODS

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	3	3	3	3	3	3	3
CO (W.A)	3	3	3	3	3	3	3	3

		L	T	P	C
22CPE03 - PROJECT PHASE II					
		0	0	24	12

PRE REQUISITE : 22CPE02

Course Objectives		Course Outcomes	
1.0	To solve the identified problem based on the formulated methodology.	**1.1**	On completion of the project work students will be in a position to take up any challenging practical problem in the field of engineering design and find better solutions to it.

SYLLABUS:

- Student should continue the phase - I work on the selected topic as per the formulated methodology. At the end of the semester,
- After completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department.
- The students will be evaluated based on the report submitted and the viva -voce examination by a panel of examiners including one external examiner.

TOTAL (P:360) : 360 PERIODS

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	3	3	3	3	3	3	3
CO (W.A)	3	3	3	3	3	3	3	3

22CPX01 - CLOUD COMPUTING

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the concepts of virtualization and virtual machines	**1.1**	The students will be able to employ the concepts of storage virtualization, network virtualization and its management
2.0	To gain knowledge on the concept of virtualization that is fundamental to cloud computing	**2.1**	The students will be able to apply the concept of virtualization in the cloud computing
3.0	To understand the various issues in cloud computing	**3.1**	The students will be able to identify the architecture, infrastructure and delivery models of cloud computing
4.0	To be able to set up a private cloud	**4.1**	The students will be able to develop services using Cloud computing
5.0	To understand the security issues in the grid and the cloud environment	**5.1**	The students will be able to apply the security models in the cloud environment

UNIT – I ELEMENTARY CONCEPTS	**(9)**

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization –– Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization

UNIT – II INFRASTRUCTURE	**(9)**

Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization – Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT – III CLOUD DEPLOYMENT MODELS & ARCHITECTURE	**(9)**

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery –Architectural Design Challenges - Public Cloud Platforms : GAE,AWS – Inter-cloud Resource Management

UNIT – IV PROGRAMMING MODEL	**(9)**

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus

UNIT – V SECURITY IN CLOUD	**(9)**

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management.

TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner"s Guidell", McGraw-Hill Osborne Media, 2009.
2. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2017.
4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2013.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	3	3	2	2	3	3
2	3	2	3	3	3	3	3	3
3	3	-	3	3	2	3	3	3
4	3	2	3	3	2	3	3	3
5	3	1	3	3	3	3	3	3
CO (W.A)	3	1.5	3	3	2.4	2.8	3	3

22CPX02 - DATA WAREHOUSING AND DATA MINING

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the basic principles, concepts and applications of data mining	**1.1**	The students will be able to describe the concepts of data mining and perform statistical analysis of data.
2.0	To enlighten the Data warehousing concepts and preprocessing techniques.	**2.1**	The students will be able to develop and apply preprocessing techniques and design data warehouse.
3.0	To understand and create association rules	**3.1**	The students will be able to apply association rule mining methods to solve the given problem.
4.0	To learn the importance of supervised learning and relevant algorithms,	**4.1**	The students will be able to apply classification techniques to solve real world problems.
5.0	To learn the importance of unsupervised learning algorithms and recent trends.	**5.1**	The students will be able to utilize different clustering methods for various applications.

UNIT I - INTRODUCTION TO DATA MINING	(9)

Data Mining – Steps in Knowledge Discovery Process – Kinds of Data and Patterns –Technologies used – Targeted applications – Major issues in Data Mining – Data objects and Attribute types – Statistical descriptions of data – Measuring data similarity and dissimilarity.

UNIT II – DATA PREPROCESSING AND DATA WAREHOUSING	(9)

Data Preprocessing: Data Cleaning – Data Integration – Data Reduction – Data Transformation and Discretization – Data Warehouse Architecture –Data Warehouse: Concepts – Modeling – Design – Implementation – Need of Data Warehousing

UNIT III - FREQUENT PATTERN MINING	(9)

Basic concepts – Frequent item set mining methods: Apriori Algorithm – A pattern growth approach for Mining frequent item sets – Pattern Evaluation methods – Multilevel – Multi dimensional frequent pattern mining.

UNIT IV - CLASSIFICATION AND PREDICTION	(9)

Basic Concepts – Decision Tree Induction – Bayesian Classification – Classification by Back Propagation – Support Vector Machines – Model Evaluation and Selection – Techniques to Improve Classification Accuracy – Advanced methods.

UNIT V - CLUSTER ANALYSIS AND TRENDS IN DATA MINING	(9)

Basic Concepts – Partitioning Methods – Hierarchical Methods – Density based Methods – Grid based Methods – Data Mining Applications – Data mining Trends: Mining complex Data types.

	TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Han Jiawei, and Kamber Micheline, "Data Mining: Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2012.
2. Alex Berson and Stephen J.Smith,"Data Warehousing , Data Mining and OLAP" , Tata McGraw-Hill Edition,13th Reprint 2008.
3. Deepali Kamthania, "Data Warehousing and Data Mining" 1st Edition, IK International Publishing House Pvt Ltd., 2022.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	-	-	2	3	1	2
2	3	2	2	2	3	3	3	3
3	3	2	2	2	3	3	3	3
4	3	3	-	1	3	3	2	2
5	3	3	3	3	3	3	3	3
CO (W.A)	3	2.2	1.4	1.6	2.8	3	2.4	2.6

				L	T	P	C
22CPX03 - SOFTWARE REQUIREMENT ENGINEERING							
				3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the basic concepts of software requirements engineering.	**1.1**	The students will be able to define a process for requirement engineering.
2.0	To be able to recognize requirements of each type, a prerequisite for effective documentation writing.	**2.1**	The students will be able to understand the professional and ethical responsibilities of a software engineer.
3.0	To gain knowledge on the quality assurance and evolution	**3.1**	The students will be able to check the quality assurance for the project
4.0	Develop the skills for building system models	**4.1**	The students will be able to draw UML diagrams and system models for a respective project.
5.0	To understand the stakeholders involved in requirements engineering.	**5.1**	The students will be able to design a software within realistic constraints.

UNIT I - INTRODUCTION	**(9)**

Introduction – Requirements engineering – categories of requirements –requirements in software life cycle-agile development process and requirement engineering- identifying stake holders-arte-fact driven elicitation techniques- stake holder driven elicitation technique-risk analysis-requirement prioritization.

UNIT II – REQUIREMENT SPECIFICATION AND DOCUMENTATION	**(9)**

Diagrammatic notations: system scope-conceptual structures-activities and data-instruction flow-interaction scenarios-system behavior-stimuli and behavior-formal specification.

UNIT III - QUALITY ASSURANCE AND EVOLUTION	**(9)**

Requirements inspection and review-validation by specification animation-verification through formal checks-evolution: time space dimension-change anticipation-traceability management- control management-runtime monitoring.

UNIT IV - BUILDING SYSTEM MODELS	**(9)**

Modeling system objectives with goal diagrams-building goal models-risk analysis on goal models-modeling conceptual objects with class diagrams.

UNIT V - REASONING ABOUT SYSTEM MODELS	**(9)**

Semiformal reasoning-formal specification of system models-formal reasoning for specification construction and analysis.

TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Axel van Lamsweerde, "Requirements Engineering", Wiley, 2009.
2. Dean Leffingwell and Don Widrig, "Managing Software Requirements: A Use Case Approach", 2nd Edition, Addison- Wesley, 2003.
3. Gerald Kotonya, Ian Sommerville, "Requirements Engineering: Processes and Techniques", John Wiley and Sons, 1998.
4. SEI Report, "Quality Attributes Workshop", http://www.sei.cmu.edu/library/abstracts/reports/03tr016.cfm, 2003.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	-	-	2	3	1	2
2	3	2	2	2	3	3	3	3
3	3	2	2	2	3	3	3	3
4	3	3	-	1	3	3	2	2
5	3	3	3	3	3	3	3	3
CO (W.A)	3	2.2	1.4	1.6	2.8	3	2.4	2.6

22CPX04 – AGILE SOFTWARE DEVELOPMENT METHODOLOGIES

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn the fundamental principles and practices associated with each of the agile development methods.	**1.1**	Analyze existing problems with the team, development process and wider organization
2.0	To apply the principles and practices of agile software development on a project of interest and relevance to the student.	**2.1**	Apply a thorough understanding of Agile principles and specific practices.
3.0	To provide a good understanding of software design and a set of software technologies and APIs.	**3.1**	Select the most appropriate way to improve results for a specific circumstance or need.
4.0	To do a detailed examination and demonstration of Agile development and testing techniques.	**4.1**	Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems.
5.0	To understand Agile development and testing.	**5.1**	Evaluate likely successes and formulate plans to manage likely risks or problems.

UNIT I - AGILE SOFTWARE DEVELOPMENT	(9)

Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges. Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality.

UNIT II – AGILE AND SCRUM PRINCIPLES	(9)

Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values

UNIT III – AGILE PRODUCT MANAGEMENT	(9)

Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue

UNIT IV – AGILE REQUIREMENTS AND AGILE TESTING	(9)

User Stories, Backlog Management. Agile Architecture: Feature Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools. Agile Testing Techniques, Test-Driven Development, User Acceptance Test

UNIT V – AGILE REVIEW AND SCALING AGILE FOR LARGE PROJECTS	(9)

Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, The rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools. Scrum of Scrums, Team collaborations, Scrum, Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Robert C. Martin ,"Agile Software Development, Principles, Patterns, and Practices" Alan Apt Series 2011.
2. Mike Cohn,"Succeeding with Agile : Software Development Using Scrum", Pearson Education, 2013.
3. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
4. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
5. Craig Larman, "Agile and Iterative Development: A Managers Guide", Addison-Wesley, 2004.
6. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

Mapping of COs with POs / PSOs

COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	2
4	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3
CO (W.A)	3	3	3	3	3	3	3	3

22CPX05 ADVANCED OPERATING SYSTEMS				
	L	**T**	**P**	**C**
	3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To understand how an operating system performs its duties is to garner insight into how a computer functions at its innermost levels.	**1.1**	The students will be able to understand the potential benefits of distributed operating systems.
2.0	To learn a multiprogramming system, distributed operating systems.	**2.1**	The students will be able to implement various distributed operating system concepts.
3.0	To learn the principles of managing the main memory, one of the most precious resources in mechanisms of synchronization and resource management,.	**3.1**	The students will be able to allocate various resources efficiently for all the distributed processes.
4.0	To gain knowledge about the fault recovery and fault tolerance mechanisms of operating system.	**4.1**	The students will be able to familiar with protection and security mechanisms of operating system.
5.0	To provide exposure on database operating system.	**5.1**	The students will be able to identify the requirements of database operating systems.

UNIT I - PROCESS SYNCHRONIZATION	(9)

Overview - Functions of an Operating System –Types of Advanced Operating System - Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs – Process Deadlocks - Preliminaries – Models of Deadlocks- Resources – A Graph-Theoretic model of System State – Necessary and Sufficient conditions for a Deadlock – Systems with Single-Unit Requests, Consumable Resources, Reusable Resources

UNIT II - DISTRIBUTED OPERATING SYSTEMS	(9)

Issues – Communication Networks and Primitives – Theoretical Foundations - Inherent Limitations - Lamport¨s Logical Clock- Vector Clock- Causal Ordering of Messages- Global State- Distributed Mutual Exclusion – Classification- Preliminaries - Non-Token Based Algorithms – Lamport¨s Algorithm - Token-Based Algorithms – Suzuki-Kasami¨s Broadcast Algorithm– Distributed Deadlock Detection– Preliminaries – Handling of Deadlocks - Issues –Centralized Deadlock-Detection Algorithms - Distributed Deadlock Detection Algorithms – Hierarchical Deadlock Detection Algorithms.

UNIT III – DISTRIBUTED RESOURCE MANAGEMENT	(9)

Distributed file system - Architecture–Design issues-Distributed Shared Memory- Algorithms for implementing DSM – Memory Coherence and Coherence Protocols – Design Issues- Distributed Scheduling – Issues in Load Distributing – Components of a Load Distributing Algorithm – Stability – Load Distributing Algorithm – Performance Comparison – Selecting a Suitable Load Sharing Algorithm – Requirements for Load Distributing - Task Migration and Issues.

UNIT IV – FAILURE RECOVERY AND FAULT TOLERANCE	(9)
Recovery : Introduction – Basic Concepts – Classification of Failures – Backward and Forward Error Recovery Approaches - Recovery in Concurrent Systems – Synchronous and Asynchronous Check Pointing and Recovery – Check Pointing for Distributed Database Systems - Recovery in Replicated Distributed Databases Systems – Fault Tolerance – Issues- Commit Protocol- Non Blocking Commit Protocol-Voting Protocol - Dynamic Voting Protocol – Dynamic Vote Reassignment Protocol – Failure Resilient Processes – Reliable Communication.	
UNIT V – DATABASE OPERATING SYSTEMS	**(9)**
Introduction- Requirements of a Database Operating System- Concurrency Control: Theoretical Aspects – Database Systems – The Problem of Concurrency Control – Serializability. Theory- Distributed Database Systems- Concurrency Control Algorithms- Basic Synchronization Primitives – Lock Based Algorithms - Timestamp Based Algorithms - Optimistic Algorithms – Data Replication.	
	TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 2011.
2. Abraham Silberschatz, Peter B. Galvin and G. Gagne, "Operating System Concepts", 9th Edition, Addison Wesley Publishing Co., 2013.
3. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition, Addison Wesley, 2001.
4. Pradeep K.Sinha, "Distributed operating system -Concepts and design", PHI, 2007.
5. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2013.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	1	-	2	2	-	-	2	-
2	3	-	3	3	1	-	3	2
3	3	-	3	3	2	-	3	2
4	3	-	3	3	3	2	3	2
5	2	-	3	3	1	-	2	1
CO (W.A)	2.4	-	2.8	2.8	1.75	2	2.6	1.75

		L	**T**	**P**	**C**
		3	0	0	3

22CPX06 – SEMANTIC WEB

PRE REQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To learn fundamental concepts of semantic web.	**1.1**	The students will be able to understand the fundamental concepts of the semantic web.
2.0	To know about different framework used in semantic web.	**2.1**	The students will be able to outline for semantic syntax and schema.
3.0	To learn the methodologies of ontology.	**3.1**	The students will be able to design ontology using Web Ontology Language (OWL).
4.0	To know about ontology management and tools used for Ontology annotation.	**4.1**	The students will be able to differentiate monotonic and non-monotonic rules.
5.0	To comprehend the role of semantics in web services.	**5.1**	The students will be able to apply Semantic web technology to real world application

UNIT I - INTRODUCTION	**(9)**

History – Semantic web layers – Semantic web technologies – Semantics in semantic web – XML – Structuring –Namespaces – Addressing – Querying – Processing XML.

UNIT II – RDF AND QUERYING THE SEMANTIC WEB	**(9)**

RDF data model – syntax – Adding semantics – RDF schema – RDF and RDF schema in RDF schema – An axiomatic semantics for RDF and RDF schema – Querying in SPARQL.

UNIT III – ONTOLOGY	**(9)**

Introduction – Ontology movement – OWL – OWL specification – OWL elements – OWL constructs – Simple and complex – Ontology engineering – Introduction – Constructing ontologies – Reusing ontologies – On-To-Knowledge semantic web architecture.

UNIT IV – LOGIC AND INFERENCE	**(9)**

Logic – Description logics – Rules – Monotonic rules – syntax – semantics and examples – Non-monotonic rules –Motivation – syntax – Examples – Rule markup in XML– Monotonic rules – Non-Monotonic rules.

UNIT V – APPLICATIONS OF SEMANTIC WEB TECHNOLOGIES	**(9)**

Case Study – Horizontal information products at Elsevier – Openacademia – Bibster – Data Integration at Audi – Skill finding at Swiss Life – Think tank portal at Enersearch – e-learning – web services – other scenarios.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Grigorous Antoniou and Van Hermelen, "A Semantic Web Primer", PHI Learning Private Limited, 2nd Edition, 2010.
2. James Hendler, Henry Lieberman and Wolfgang Wahlster, "Spinning the Semantic Web: Bringing the world wide web to its full potential", The MIT Press, 2005.
3. Shelley Powers, "Practical RDF", O'reilly publishers, 2009.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", Chapman & Hall/CRC, 2009.

Mapping of COs with POs / PSOs								
COs	POs						PSOs	
	1	2	3	4	5	6	1	2
1	1	-	2	1	-	-	2	-
2	1	-	2	1	-	-	2	-
3	3	-	3	3	2	-	3	1
4	3	-	2	2	-	-	3	2
5	3	-	3	3	3	-	3	2
CO (W.A)	2.2	-	2.4	2	2.5	-	2.6	1.67

22CPX07 – DEEP LEARNING

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the concepts of Deep Learning.	**1.1**	The students will be able to Understand the basics concepts of deep learning
2.0	To know about the deep neural networks	**2.1**	The students will adapt to the appropriate deep network architecture
3.0	To appreciate the types of deep learning networks	**3.1**	The students will model different types of deep network with its functional components
4.0	To understand the theoretical and practical aspects of CNN and RNN	**4.1**	The students will make use of CNN and RNN for modeling applications.
5.0	To create the applications using deep learning concepts	**5.1**	The students will be able to know the various challenges involved in designing deep learning algorithms for varied applications.

UNIT I - FOUNDATIONS OF DEEP LEARNING	**(9)**

Introduction – Math behind machine learning – Linear Algebra – Statistics –Machine Learning works – Logistic regression – Evaluating Models – Neural Networks – Training Neural Networks – Activation functions – Loss functions – Hyper parameters

UNIT II – ARCHITECTURAL DESIGN	**(9)**

Defining Deep Learning – Common Architectural Principles of Deep Networks: Parameters – Layers - Activation functions - Loss functions - Optimization Algorithms – Hyper parameters. Building blocks of Deep Networks: RBMS - Auto encoders – Variational Auto encoders.

UNIT III – TYPES OF DEEP NETWORKS	**(9)**

Unsupervised pre trained Networks – Convolutional Neural Networks (CNNs) – Recurrent Neural Networks – Recursive Neural Networks – Applications-About Deep Reinforcement Learning. Q-Learning-Implementation of linear regression technique-Program to create a multi-layer neural network

UNIT IV – CONVOLUTIONAL AND RECURRENTNEURAL NETWORKS	**(9)**

Convolutional Neural Networks: Applying Pooling layers – Optimizing with Batch Normalization – Understanding padding and strides – Experimenting with Different types of initialization – Implementing a convolutional auto encoder – Applying a 1D CNN to text. **Recurrent Neural Networks**: Implementing a simple RNN – Adding LSTM – Using GRUs – Implementing Bidirectional RNNs- Character-level text generation.

UNIT V – DEEP GENERATIVE MODELS	(9)

Deep Generative Models: Boltzmann Machines - Restricted Boltzmann Machines - Introduction to MCMC and Gibbs Sampling- gradient computations in RBMs - Deep Belief Networks- Deep Boltzmann Machines- Applications: Large-Scale Deep Learning - Computer - Speech Recognition - Natural Language Processing .

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Josh Patterson and Adam Gibson,"DeepLearning – A Practitioner'sApproach",1st Edition, O'Reilly Series, August2017
2. Indra den Bakker, "Python Deep Learning Cookbook", 1st Edition, Packt Publishing, October 2017.
3. Ian Good fellow, Yoshua Bengio and Aaron Courville, "Deep Learning", 1st Edition, MIT Press, 2016.
4. Nikhil Buduma, Nicholas Locascio " Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms" ,O' Reilly Media, Inc., May-2017

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	1	-	2	3	3	2
2	3	1	2	1	2	3	2	2
3	3	2	3	2	3	3	2	3
4	3	1	2	3	2	3	3	2
5	3	3	3	3	3	3	3	3
CO (W.A)	3	1.6	2.2	2.3	2.4	3	2.6	2.4

22CPX08 – DIGITAL IMAGE PROCESSING AND APPLICATIONS

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.	**1.1**	The students will be able to apply principles and techniques of digital image processing in applications related to digital image system design and analysis.
2.0	To analyze and implement image processing algorithms.	**2.1**	The students will be able to acquire the fundamental concepts of a digital image processing system.
3.0	To gain hands-on experience in using software tools for processing digital images.	**3.1**	The students will be able to analyze and implement image processing algorithms.
4.0	To become familiar with image compression and segmentation techniques.	**4.1**	The students will be able to use image compression and segmentation techniques.
5.0	To get exposed to the applications of Image Processing.	**5.1**	The students will be able to apply all image enhancement techniques.

UNIT I - FUNDAMENTALS OF IMAGE PROCESSING	(9)

Introduction – Image Processing System – Steps in Image Processing Systems – Sampling and Quantization – Color Fundamentals and Models, File formats. Image Transforms: DFT, FFT, DCT, Walsh, Hadamard, Haar, Slant, KL and Radon Transforms.

UNIT II – IMAGE ENHANCEMENT AND RESTORATION	(9)

Histogram processing – Fundamentals of Spatial Filtering – Histogram Processing – Smooth and Sharpening Spatial Filters. Filtering in Frequency Domain: Image Smoothing and Sharpening using Frequency Domain Filters: Noise Models – Inverse Filtering – Geometric Spatial transformation – image rest ration technique.

UNIT III – IMAGE SEGMENTATION AND FEATURE ANALYSIS	(9)

Detection of Isolated Points – Line Detection – Edge Models – Edge Linking and Boundary Detection – Thresholding – Region based Segmentation – The use of motion in Segmentation – Feature analysis and Extraction.

UNIT IV – MULTI RESOLUTION ANALYSIS AND COMPRESSIONS	(9)

Multi Resolution processing: Image pyramids – Sub band coding – Multi resolution Expansions - Wavelet Transform in one dimension and two dimensions – Wavelet Packets. Image Compression: Fundamentals – Models – Elements of Information theory – Lossy compression – Compression Standards – JPEG/MPEG.

UNIT V – APPLICATIONS OF IMAGE PROCESSING	(9)

Representation and Description: Image Recognition – Image Understanding – Image Classification – Video Motion Analysis – Image Fusion – Image Steganography – Color Image Processing.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Rafael C. Gonzales, Richard E. Woods," Digital Image Processing", Pearson Education,3rd Edition, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt.Ltd,2011.
3. Jayaraman S., Esaki Rajan S., T. Veera Kumar, "Digital Image Processing", Tata McGraw Hill Pvt. Ltd., 2nd Reprint,2010.
4. Rafael C. Gonzales, Richard E. Woods, Steven L. Eddins," Digital Image Processing Using MATLAB", Tata McGraw Hill Pvt. Ltd., 3rd Edition, 2011.
5. Bhabatosh Chanda, Dwejesh Dutta Majumder," Digital Image Processing and analysis", PHI Learning Pvt. Ltd., 2nd Edition, 2011.
6. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", PHI Learning Pvt. Ltd., 1st Edition,2011.
7. Annadurai S., Shanmugalakshmi R., "Fundamentals of Digital Image Processing", Pearson Education, 1st Edition, 2007.
8. Web link :https://www.codecool.ir/extra/2020816204611411Digital.Image.Processing.4th.Edition.www.EBooksWorld.ir.pdf

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	2	-	1		1	1	2	2
2	1	-	3	2	1	1	1	1
3	3	-	3	3	2	1	2	2
4	3	-	3	3	2	1	2	2
5	3	-	3	3	2	1	2	2
CO (W.A)	2.4	-	2.6	2.75	1.6	1	1.8	1.8

<table>
<tr><td colspan="5">22CPX09 – INFORMATION RETRIEVAL TECHNIQUES</td></tr>
<tr><td></td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
</table>

PREREQUISITE : NIL

	Course Objectives		**Course Outcomes**
1.0	To gain knowledge of the basics of Information Retrieval with pertinence to modeling,	**1.1**	The student will be able to apply the basics of Information Retrieval with pertinence to various modeling
2.0	To learn about the various components of an Information Retrieval system	**2.1**	The student will be able to design the various components of an Information Retrieval system
3.0	To be familiar with query operations and indexing	**3.1**	The student will be able to describe indexing and query properties
4.0	To explore the machine learning techniques for text classification and clustering which is used for efficient Information Retrieval	**4.1**	The student will be able to apply machine learning techniques for text classification and clustering which is used for efficient Information Retrieval
5.0	To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search and digital libraries	**5.1**	The student will be able to analyze the Web content structure and Design an efficient search engine

UNIT I - INTRODUCTION	**(9)**

Motivation – Basic Concepts – Practical Issues - Retrieval Process – Architecture – Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems– History of Web Search – Web Characteristics–The impact of the web on IR—IR Versus Web Search–Components of a Search Engine.

UNIT II – MODELING	**(9)**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting –Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models –Algebraic Models – Structured Text Retrieval Models – Models for Browsing.

UNIT III – INDEXING	**(9)**

Static and Dynamic Inverted Indices – Index Construction and Index Compression Searching -Sequential Searching and Pattern Matching. Query Operations - Query Languages– Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis –Measuring Effectiveness and Efficiency.

UNIT IV – CLASSIFICATION AND CLUSTERING	**(9)**

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning.

UNIT V – SEARCHING AND RANKING	(9)
Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking -Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries.	
	TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Christopher D. Manning, PrabhakarRaghavan, HinrichSchutze, "Introduction to Information Retrieval", Cambridge University Press, First South Asian Edition 2012. 2. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, "Information Retrieval Implementing and Evaluating Search Engines", The MIT Press, Cambridge, Massachusetts, London, England, 2016. 3. Ricardo Baeza – Yates, BerthierRibeiro – Neto, "Modern Information Retrieval: The concepts and Technology behind Search", Addison Wesley, USA, 2012.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	2	-	2	3	-	3	2
2	3	2	1	2	3	-	3	2
3	-	-	1	-	-	1	3	3
4	3	3	2	2	3	2	3	3
5	3	3	-	2	3	-	3	3
CO (W.A)	3	2.5	1.33	2	3	1.5	3	2.6

		22CPX10 – WEB SERVICES				
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**

PREREQUISITE : NIL

	Course Objectives			Course Outcomes
1.0	To employ basic XML specifications, technologies and applications.	**1.1**		The student will be able to analyze a web page and identify its elements and attributes.
2.0	To understand about the XML schema and query.	**2.1**		The student will be able to Relate to XML Presentation Oriented Publishing (POP) applications and XML Message Oriented Middleware (MOM) applications
3.0	To learn about SOAP and WSDL implementations.	**3.1**		The student will be able to develop web services using SOAP and WSDL technologies.
4.0	To describe web service, supporting specifications and technologies including SOAP and UDDI,JAX-RPC.	**4.1**		The student will be able to build and consume web services using SOAP and UDDI, JAX-RPC.
5.0	To learn to develop applications using JAX and RPC.	**5.1**		The student will be able to implement client server applications using JAX and RPC.

UNIT I - XML	**(9)**
XML Basis – XML Namespace – Working with DTD: Validating your XML document – Defining DTD Entities – Working with Attributes – Adding Style – XSL Transformations.	
UNIT II – XML SCHEMA AND QUERY	**(9)**
Using Schema: Schema Elements, Types and Groups – Defining Schema Attributes – XML Query – XLink – XPointer.	
UNIT III – WEB SERVICES: SOAP & WSDL	**(9)**
Web Services SOAP: – Structure of SOAP – SOAP Namespaces – SOAP Headers – SOAP Body – SOAP Messaging Modes – SOAP Faults – SOAP over HTTP. WSDL: Structure of WSDL – WSDL Declarations – WSDL Abstract Interface – Messaging Exchange patterns – WSDL Implementation.	
UNIT IV – WEB SERVICES: UDDI	**(9)**
UDDI: Introduction – Data structures – Business Entity Structure - Business Service and Binding Template Structures – tModel Structure – UDDI Inquiry API – Operations – UDDI Publishing API.	
UNIT V – WEB SERVICES: JAX – RPC	**(9)**
JAX- RPC: Overview – JAX-RPC Service Endpoints – JAX-RPC EJB Endpoints - JAX-RPC Clients APIs. SAAJ: Creating a SOAP Message – Working with SOAP Documents – Working with SOAP Faults – Sending SOAP messages with SAAJ.	
TOTAL (L:45) : 45 PERIODS	

REFERENCES :
1. Richard Monson-Haefel, "J2EE Web Services", 8th Edition, Person Education, 2012.
2. D.A. Chappell & T. Jewell "Java Web Services", O'Reilly,SPD
3. G. Alonso, F. Casati and others,"Web Services" ,Springer, 2005
4. Heather Williamson, "The Complete Reference XML", TMH, 2001.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	2	-	2	3	-	3	3
2	3	2	1	2	3	-	3	3
3	-	-	1	-	-	1	3	3
4	3	3	2	2	3	2	3	3
5	3	3	-	2	3	-	3	3
CO (W.A)	3	2.5	1.33	2	3	1.5	3	3

		L	**T**	**P**	**C**
22CPX11 – MOBILE APPLICATION DEVELOPMENT					
		3	**0**	**0**	**3**

PREREQUISITE : 22CPB01

	Course Objectives		Course Outcomes
1.0	To understand system requirements for mobile applications.	**1.1**	The students will be able to describe the requirements for mobile applications
2.0	To learn suitable design using specific mobile development frameworks.	**2.1**	The students will be able to explain the challenges in mobile application design and development.
3.0	To create mobile application design.	**3.1**	The students will be able to design mobile applications for specific requirements.
4.0	To understand the design using specific mobile development frameworks.	**4.1**	The students will be able to develop the design using Android SDK and iOS SDK.
5.0	To know the latest technologies available in mobile application.	**5.1**	The students will be able to deploy mobile applications in Android and iPhone.

UNIT I - INTRODUCTION	**(9)**

Introduction to mobile applications – Importance of mobile strategies – Cost of development – Mobile myths – Market and business drivers for mobile applications – Mobile web presence – Mobile applications – Benefits of a mobile app

UNIT II – BASIC DESIGN	**(9)**

Introduction– Mobile user interface design–Understanding mobile application users–Understanding mobile information design – Understanding mobile platforms – Using the tools of mobile interface design.

UNIT III – ADVANCED DESIGN	**(9)**

Choosing a mobile web option – Adaptive mobile websites – Dedicated mobile websites – Mobile web apps with HTML5 – Design patterns for mobile applications – Using Intent Filter, Permissions.

UNIT IV – DEVELOPMENT ENVIRONMENT	**(9)**

Android development practices – Android fundamentals – Android SDK – Common interactions– Offline storage – iOSSDK– Debugging iOS apps – Objective -C basics – iOS features.

UNIT V – TECHNOLOGY	**(9)**

Using Google maps- GPS-Wi-Fi and WiMAX-Integration with social media applications-Foldable displays-Centralized Storage-Mobile Commerce.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012.
4. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.
5. http://developer.android.com/develop/index.html.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	1	3	3			2	2	2
2	3	1	1	3	3	1	2	2
3	1	3	-	2	3	-	2	2
4	0	-	-	1	2	-	-	2
5	1	-	-	-	2	-	-	-
CO (W.A)	1.5	2.33	2	2	2.5	1.5	2	2

22CPX12 – WIRELESS SENSOR NETWORKS

		L	T	P	C
		3	0	0	3

PREREQUISITE : 22CPB01

	Course Objectives		Course Outcomes
1.0	To learn the basics of wireless sensor network	**1.1**	The students will be able to explain about the various applications, Constraints and Challenges of wireless sensor networks.
2.0	To enhance the working knowledge on Localization and Tracking.	**2.1**	The students will be able to work on Localization and Tracking
3.0	To gain knowledge on various routing protocols.	**3.1**	The students will be able to use suitable routing protocols for specific application.
4.0	To learn about Sensor Network Databases.	**4.1**	The students will be able to develop applications on wireless motes, smart phones and other embedded platforms.
5.0	To know recent Tools and Techniques for real time application.	**5.1**	The students will be able to identify suitable tools and techniques for sensor network applications

UNIT I - INTRODUCTION TO SENSOR NETWORKS	(9)
Background of Sensor Network Technology and Their Applications – Constraints and Challenges – Collaborative Processing – Basic Sensor Network Architectural Elements – Basic Wireless Sensor Technology – Hardware Components – Operating System and Execution Environment – Comparison of Wireless Sensor Networks with Mobile Adhoc Networks.	

UNIT II – LOCALIZATION AND TRACKING	(9)
Tracking Scenario – Problem Formulation – Distributed Representation and Interface of States – Tracking Multiple Objects – Sensor Models – Performance Comparison and Metrics.	

UNIT III – NETWORK STANDARDS AND ROUTING PROTOCOLS	(9)
The SMAC Protocol – IEEE 802.15.4 Standard and ZigBee – Routing challenges and design issues in Wireless Sensor Network – Energy Efficient Unicast Routing – Geographical Routing.	

UNIT IV – SENSOR NETWORK DATA BASES	(9)
Sensor Data base challenges–Querying the Physical Environment – Query Interfaces – High level Data Base Organization – Network aggregation – TinyDB Query Processing – Data Centric Storage – Data indices and Range Queries – Distributed Hierarchical Aggregation.	

UNIT V – SENSOR NETWORK PLATFORMS AND TOOLS	(9)
Sensor Node Hardware – Berkeley Motes – Programming Challenges– Node-level Software Platforms – Node-level Simulators – State-centric Programming – Emerging Applications of Wireless Sensor Networks – Case study using SENSE	

	TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. F. Zhao and L. Guibas, "Wireless Sensor Network: Information Processing Approach", Elsevier, 2009.
2. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", Elsevier, 2011.
3. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks - Technology, Protocols, and Applications", John Wiley, 2007.
4. E. H. Callaway, Jr. E. H. Callaway, "Wireless Sensor Networks Architecture and Protocols", CRC Press, 2009

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	2	-	2	2	2	-	3	2
2	3	-	3	3	3	-	2	2
3	3	-	3	3	3	1	3	3
4	3	-	3	3	3	1	3	3
5	3	-	3	3	2	-	3	2
CO (W.A)	2.8	-	2.8	2.8	2.6	1	2.8	2.4

22CPX13 – NATURAL LANGUAGE PROCESSING

		L	T	P	C
		3	0	0	3

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To provide an introduction to the central issues of Natural Language Processing (NLP).	**1.1**	Attain fundamental knowledge in natural language processing.
2.0	To Study the morphological approaches.	**2.1**	Demonstrate an understanding of Morphology and Part of Speech Tagging.
3.0	To Outline different speech techniques.	**3.1**	Familiarize with techniques used for speech recognition.
4.0	To explore semantics of words and semantic role labeling of sentences.	**4.1**	Explain the use of semantic analysis methods.
5.0	To Provide an introduction to advanced topics.	**5.1**	Make use of Computation Phonology and HMM for Speech recognition and Text to Speech conversion.

UNIT I - INTRODUCTION AND WORDS	(9)

Knowledge in speech and language processing – Ambiguity – Models and algorithms –Language, Thought and understanding – History of NLP -Regular expressions and automata – Words and transducers: Finite-state transducers – FSTs formorphological parsing - Human morphological processing

UNIT II – MORPHOLOGY AND PARTS OF SPEECH TAGGING	(9)

Morphology and Finite State Transducers-N-grams and Language Models- Part of speech Tagging-Rule-Based Part of Speech Tagging- Stochastic Part of Speech Tagging -Markov Models- Hidden Markov Models– Transformation based Models-Maximum Entropy Models.

UNIT III – SPEECH	(9)

Phonetics: Speech sounds and phonetic transcription – Articulatory phonetics– Speech synthesis: Text normalization - Automatic speech recognition: Speech recognition architecture – Applying the hidden markov model to speech – Computational phonology: Syllabification – Learning phonology and morphology

UNIT IV – SEMANTIC ANALYSIS	(9)

Semantic analysis-Syntax driven semantic analysis-Lexical semantics–Word-sense disambiguation-Supervised– Dictionary based and Unsupervised Approaches- Compositional semantics-Semantic role labeling and Semantic parsing– Discourse analysis.

UNIT V – ADVANCED TOPICS	(9)
Computational Phonology - HMM and Speech Recognition – Discourse - Dialogue and Conversation - Deep Learning and Natural Language Processing.	

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Daniel Jurafsky and James H. martin, "Speech and Language Processing", 2nd Edition,Pearson Higher Education, 2009.
2. Li Deng and Yang Liu, " Deep Learning in Natural Language Processing",1st Edition, Springer,2018
3. Jacob Eisenstein. "Natural Language Processing ", MIT Press, 2019
4. Daniel Bikel and ImedZitouni, "Multilingual Natural Language Processing Applications:From Theory to Practice", IBM Press.
5. Christopher Manning and HinrichSchuetze," Foundations of Statistical Natural Language Processing", 1st Edition, MIT Press.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	-	1	2	2	2	2	1	2
2	2	3	3	2	2	1	2	2
3	-	3	2	2	3	2	2	1
4	2	1	2	3	2	3	3	2
5	3	-	2	3	3	2	2	3
CO (W.A)	2.3	2	2.2	2.4	2.4	2	2	2

22CPX14 – GPU COMPUTING

		L	T	P	C
		3	0	0	3

PRE REQUISITE : Basic Programming Skills, Basic of Computer Graphics

	Course Objectives		Course Outcomes
1.0	To Comprehend commonly used terms in parallel computing.	**1.1**	The students will be able to define terminology commonly used in parallel computing, such as efficiency and speedup.
2.0	To Understand the GPU architectures and Programming Models.	**2.1**	The students will be able to describe common GPU architectures and programming models
3.0	To build an algorithms efficiently for common application kernels.	**3.1**	The students will be able to implement efficient algorithms for common application kernels, such as matrix multiplication.
4.0	To learn the development of an efficient parallel algorithms to solve given problems.	**4.1**	The students will be able to develop an efficient parallel algorithm to solve a given problem.
5.0	To learn to Develop solutions to solve computationally intensive problems in various fields	**5.1**	The students will be able to implement an efficient and correct code to solve a given problem, analyze its performance, and give convincing written and oral presentations explaining the achievements

UNIT I - INTRODUCTION	(9)

History, GPU Architecture, Clock speeds, CPU/ GPU comparisons, Heterogeneity, Accelerators, Parallel Programming, CUDA OpenCL/ OpenACC, Kernels Launch parameters, Thread hierarchy, Warps/Wavefronts, Threadblocks/Workgroups, Streaming multiprocessors, 1D/2D/3D thread mapping, Device properties, Simple Programs.

UNIT II – MEMORY	(9)

Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories

UNIT III – SYNCHRONIZATION	(9)

Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU. Functions:Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.

UNIT IV – SUPPORT AND STREAM	(9)

Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects. Streams:Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.

UNIT V – ADVANCED TOPICS	(9)

Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing.
Case Studies: Image Processing, Graph algorithms, Simulations, Deep Learning

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Wen-meiHwu, David Kirk, Izzat El Hajj, "Programming Massively Parallel Processors: A Hands-On Approach", 4th Edition, Publisher: Morgan Kaufman, 2022.

2. Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufman; 2014.

3. Wilkinson, M.Allen, "Parallel Programming Techniques and Applications using networked workstations and parallel computers", 2nd Edition, Prentice Hall, 2004.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	-	-	2	3	3	3	2
2	3	2	2	2	3	3	3	2
3	-	-	2	-	-	2	3	3
4	3	2	3	2	3	2	3	3
5	3	3	-	2	3	2	3	3
CO (W.A)	3	2.33	2.33	2	3	2.40	3	2.6

		L	**T**	**P**	**C**
		3	0	0	3

<div align="center">

22CPX15 – COMPILER CONSTRUCTION AND OPTIMIZATION

</div>

PREREQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To understand the optimization techniques used in compiler design.	**1.1**	The students will be able to design Compilers for a programming language.
2.0	To be aware of the various computer architectures that support parallelism.	**2.1**	The students will be able to map the process of Compilation for a programming paradigm and design compiler for the same.
3.0	To become familiar with the theoretical background needed for code optimization.	**3.1**	The students will be able to data log Implementation leads to a more efficient implementation of the dataflow analysis.
4.0	To understand the techniques used for identifying parallelism in a sequential program.	**4.1**	The students will be able to combine different optimization techniques to achieve the overall objective of program efficiency.
5.0	To learn the various optimization algorithms	**5.1**	The students will be able to explore on inter procedural analysis techniques.

UNIT I - INTRODUCTION	**(9)**
Language Processors - The Structure of a Compiler – The Evolution of Programming Languages The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics - The Lexical Analyzer Generator -Parser Generator - Overview of Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Principle Sources of Optimization.	

UNIT II – INSTRUCTION-LEVEL PARALLELISM	**(9)**
Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling – Global Code Scheduling – Software Pipelining.	

UNIT III – OPTIMIZING FOR PARALLELISM AND LOCALITY-THEORY	**(9)**
Basic Concepts – Matrix-Multiply: An Example - Iteration Spaces - Affine Array Indexes – Data Reuse Array data dependence Analysis.	

UNIT IV – OPTIMIZING FOR PARALLELISM AND LOCALITY – APPLICATION	**(9)**
Finding Synchronization – Free Parallelism – Synchronization between Parallel Loops – Pipelining – Locality Optimizations – Other Uses of Affine Transforms.	

UNIT V – INTERPROCEDURAL ANALYSIS	**(9)**
Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A Simple Pointer-Analysis Algorithm – Context Insensitive Interprocedural Analysis - Context Sensitive Pointer-Analysis – Datalog Implementation by Binary Decision Diagrams.	

TOTAL (L:45) : 45 PERIODS

REFERENCES :
1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, "Compilers: Principles, Techniques and Tools", 2nd Edition., Pearson Education,2008.
2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers Elsevier Science, India, Indian Reprint 2003.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	2	-	3	3	-	1	3	2
2	2	-	3	3	1	2	3	-
3	3	-	3	3	-	1	3	1
4	3	-	3	3	1	1	3	1
5	3	-	3	3	-	-	3	-
CO (W.A)	2.6	-	3	3.	1	1.25	3	1.33

<table>
<tr><td colspan="5" align="center">**22CPX16 – BLOCKCHAIN TECHNOLOGIES**</td></tr>
<tr><td></td><td>**L**</td><td>**T**</td><td>**P**</td><td>**C**</td></tr>
<tr><td></td><td>**3**</td><td>**0**</td><td>**0**</td><td>**3**</td></tr>
</table>

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To study the basics of Blockchain technology.	**1.1**	The students will be able to understand and explore the working of Blockchain technology
2.0	To explore various aspects of Bitcoin And Cryptocurrency	**2.1**	The students will be able to analyze the working of Smart Contracts
3.0	To study the working of Ethereum	**3.1**	The students will be able to apply the learning of solidity to build de-centralized apps on Ethereum
4.0	To study the working of Hyperledger & Solidity Programming	**4.1**	The students will be able to understand and analyze the working of Hyperledger
5.0	To have an idea about private and public Blockchain, and smart contract.	**5.1**	The students will be able to develop applications on Blockchain

UNIT I - INTRODUCTION OF CRYPTOGRAPHY AND BLOCKCHAIN	**(9)**

Blockchain introduction– Blockchain Technology Mechanisms and Networks –Blockchain Origins – Objective of Blockchain – Blockchain Challenges – Transactions and Blocks – P2P Systems – Keys as Identity – Digital Signatures – Hashing – public key cryptosystems – private vs. public Blockchain

UNIT II – BITCOIN AND CRYPTOCURRENCY	**(9)**

Bitcoin – The Bitcoin Network – The Bitcoin Mining Process – Mining Developments – Bitcoin Wallets – Decentralization and Hard Forks – Ethereum Virtual Machine (EVM) – Merkle Tree – DoubleSpend Problem – Blockchain and Digital Currency – Transactional Blocks – Impact of Blockchain Technology on Cryptocurrency

UNIT III – INTRODUCTION TO ETHEREUM	**(9)**

Introduction to Ethereum – Consensus Mechanisms – Metamask Setup – Ethereum Accounts – Transactions – Receiving Ethers – Smart Contracts

UNIT IV –INTRODUCTION TO HYPERLEDGER AND SOLIDITY PROGRAMMING	**(9)**

Introduction to Hyperledger – Distributed Ledger Technology and its Challenges – Hyperledger & Distributed Ledger Technology – Hyperledger Fabric – Hyperledger Composer – Solidity – Language of Smart Contracts – Installing Solidity and Ethereum Wallet – Basics of Solidity – Layout of a Solidity Source File and Structure of Smart Contracts – General Value Types.

UNIT V – BLOCKCHAIN APPLICATIONS	**(9)**

Internet of Things – Medical Record Management System – Domain Name Service and Future of Blockchain – Alt Coins

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", 2nd Edition, Packt Publishing, 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016.
3. Antonopoulos, "Mastering Bitcoin", O'Reilly Publishing, 2014.
4. Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018.
5. D. Drescher, "Blockchain Basics", Apress, 2017.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	-	3	3	2	2	3	3
2	3	-	3	3	2	2	3	3
3	3	-	3	3	2	2	3	3
4	3	-	3	3	2	2	3	3
5	3	-	3	3	2	2	3	3
CO (W.A)	3	-	3	3	2	2	3	3

22CPX17 – PATTERN RECOGNITION

		L	T	P	C
		3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To acquire knowledge on the pattern classifier.	**1.1**	Explain about the pattern recognition problems.
2.0	To know about classification problems classifier performance.	**2.1**	Build appropriate clustering techniques for various problems with high dimensional data.
3.0	To describe the various structural pattern recognition techniques.	**3.1**	Gain insight into the principles and commonly used grammars for structural pattern recognition.
4.0	To perceive knowledge on basic feature extraction techniques.	**4.1**	Analyze about feature extraction and subset selection methods for various real world applications.
5.0	To learn about recent advancements in pattern recognition.	**5.1**	Experiment with tools used to study complexity, including evolutionary computing and Fuzzy logic.

UNIT I - PATTERN CLASSIFIER	(9)

Overview of pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum likelihood estimation – Bayesian parameter estimation – Perception algorithm – LMSE algorithm – Problems with Bayes approach – Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT II – UNSUPERVISED CLASSIFICATION	(9)

Clustering for unsupervised learning and classification – Clustering concept – C-means algorithm – Hierarchical clustering procedures – Graph theoretic approach to pattern clustering – Validity of clustering solutions.

UNIT III – STRUCTURAL PATTERN RECOGNITION	(9)

Elements of formal grammars – String generation as pattern description – Recognition of syntactic description – Parsing – Stochastic grammars and applications – Graph based structural representation.

UNIT IV – FEATURE EXTRACTION AND SELECTION	(9)

Entropy minimization – Karhunen – Loeve transformation – Feature selection through functions approximation – Binary feature selection.

UNIT V – RECENT ADVANCES	(9)

Neural network structures for Pattern Recognition – Neural network based Pattern associators – Unsupervised learning in neural Pattern Recognition – Self-organizing networks – Fuzzy logic – Fuzzy pattern classifiers – Pattern classification using Genetic Algorithms.Casestudy : Web Applications- Medical Applications.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Robert J.Schalkoff, "Pattern Recognition Statistical, Structural and Neural Approaches", John Wiley & Sons Inc., New York, 2017.
2. Tou and Gonzales, "Pattern Recognition Principles", Wesley Publication Company, London, 2012.
3. Duda R.O., and Har P.E., "Pattern Classification and Scene Analysis", Wiley, NewYork, 2008.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3		-	2	3	3	3	2
2	3	2	1	2	3	3	3	2
3	-	-	1	-	-	2	3	3
4	3	2	2	2	3	2	3	3
5	3	3	-	2	3	2	3	3
CO (W.A)	3	2.33	1.33	2	3	2.4	3	2.6

<table>
<tr><td colspan="5" align="center">**22CPX18 – VIRTUALIZATION TECHNIQUES**</td></tr>
<tr><td></td><td></td><td>**L**</td><td>**T**</td><td>**P**</td><td>**C**</td></tr>
<tr><td></td><td></td><td>**3**</td><td>**0**</td><td>**0**</td><td>**3**</td></tr>
</table>

PREREQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To learn basics of virtualization.	**1.1**	The students will be able to understand the main concepts, key technologies, strengths, and limitations of virtualization.
2.0	To study how to allocate memory in different environment.	**2.1**	The students will be able to develop the infrastructure of interfacing, including public cloud, private cloud, and hybrid cloud.
3.0	To know the virtual infrastructure management.	**3.1**	The students will be able to manage capabilities for planning, deploying, managing, and optimizing virtual infrastructure.
4.0	To learn how effectively migrate a running production in virtual machine.	**4.1**	The students will be able to solve the appropriate machine learning solutions and then recommend.
5.0	To get knowledge about virtual server	**5.1**	The students will be able to apply the Microsoft Virtual Server Environment in virtual machine.

UNIT I - OVERVIEW OF VIRTUALIZATION	(9)

Basics of Virtualization – Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-leveler Operating Virtualization – Application Virtualization–Virtualization Advantages –Virtual Machine:CPU virtualization –Privileged instructions handling – Hypervisor –Para virtualization– Hardware Assisted virtualization – Booting up – Time keeping – CPU scheduling –Commercial examples.

UNIT II – MEMORY SERVER CONSOLIDATION	(9)

Hardware Virtualization – Virtual Hardware Overview – Sever Virtualization – Physical and Logical Partitioning – Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation –Partitioning – Reclamation – Ballooning – Memory sharing – OS level virtualization –VM Ware –Red Hat Enterprise Virtualization.

UNIT III – NETWORK VIRTUALIZATION	(9)

Design of Scalable Enterprise Networks – Virtualizing the Campus WAN Design – WAN Architecture – WAN Virtualization – Virtual Enterprise Transport Virtualization–VLANs and Scalability – Theory Network Device Virtualization Layer 2 – VLANs Layer3 VRF Instances Layer 2 – VFIs Virtual Firewall Contexts Network Device Virtualization – Data- Path Virtualization Layer 2: 802.1q – Trunking Generic Routing Encapsulation –IPsecL2TPv3 Label Switched Paths – Control-Plane Virtualization–Routing Protocols– VRF – Aware Routing Multi–Topology Routing.

UNIT IV – I/O VIRTUALIZING STORAGE	(9)
SCSI– Speaking SCSI– Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture– Fault tolerance to SAN – Performing Backups – Virtual tape libraries.	

UNIT V – VIRTUALIZEDMACHINE COMPUTING	(9)
Xen Virtual machine monitors– Xen API – VMware – VMware products – VMwareFeatures – Microsoft Virtual Server – Features of Microsoft Virtual Server–Virtual machine based distributed computing, elastic cloud computing, clustering, cold and hot migration – Commercial examples – Challenges and future trends.	

	TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. William von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.

2. Jim Smith, "Virtual Machines: Versatile Platforms for Systems and Processes", Auerbach Publications, 2005.

3. Chris Wol,, " Virtualization: From the Desktop to the Enterprise", Apress Publications, 1st Edition 2005.

4. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann Publications, 2005.

5. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	1	-	2	2	2	2	1
2	2	-	2	2	2	-	1	2
3	-	1	-	3	2	3	3	2
4	2	2	2	3	3	-	2	2
5	3	2	3	3	3	-	3	2
CO (W.A)	2.5	1.5	2.3	2.6	2.4	2.5	2.2	1.8

22CPX19 – QUANTUM COMPUTING

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the fundamental concepts of Quantum computing.	**1.1**	Able to understand the basic principles of quantum computing.
2.0	To explore the quantum mechanics and computational models.	**2.1**	The students will be able to analyze the mathematical framework of quantum mechanics and computational models.
3.0	To understand the concepts of Quantum Computing and algorithms.	**3.1**	The students will be able to understand the basic several Quantum Computing algorithms.
4.0	To understand the various quantum operations.	**4.1**	Able to understand the classes of problems that can be expected to be solved well be quantum computers.
5.0	To understand the various quantum information techniques.	**5.1**	The student will be able to analyze the various compression techniques.

UNIT I - FUNDAMENTAL CONCEPTS	(9)

Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.

UNIT II – MECHANICS AND COMPUTATIONAL MODELS	(9)

Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Super dense Coding – Density Operator – The Schmidt Decomposition and Purifications – EPR and the Bell Inequality – Computational Models: Turing Machines – Circuits – Analysis of Computational Problems.

UNIT III – QUANTUM COMPUTATION AND ALGORITHMS	(9)

Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model of Computation – Simulation – Quantum Fourier Transform and its Applications – Quantum Search Algorithms – Quantum Computers

UNIT IV – QUANTUM INFORMATION	(9)

Quantum Noise and Quantum Operations: Classical Noise and Markov processes – Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy

UNIT V – QUANTUM INFORMATION THEORY	(9)

Quantum States and Accessible Information – Data Compression – Classical and Quantum Information Over Noisy Quantum Channels – Quantum Cryptography.

TOTAL (L:45) : 45 PERIODS

REFERENCES :

1. Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information", 10th Edition, Cambridge University Press, 2010.
2. Scott Aaronson," Quantity Computing Since Democritus", Cambridge University Press, April 2013.
3. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	1	3	1	2	2	2	1	2
2	1	-	2	1	1	3	1	2
3	3	2	2	3	2	2	2	3
4	2	-	2	2	3	1	3	2
5	2	2	3	3	2	2	2	3
CO (weighted average)	**1.8**	**2.3**	**2**	**2.2**	**2**	**2**	**1.8**	**2.4**

<table>
<tr><td colspan="5" align="center">22BAZ01 - RESEARCH METHODOLOGY AND IPR</td></tr>
<tr><td></td><td align="center">L</td><td align="center">T</td><td align="center">P</td><td align="center">C</td></tr>
<tr><td></td><td align="center">3</td><td align="center">0</td><td align="center">0</td><td align="center">3</td></tr>
</table>

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the basic concepts of research and its methodologies, investigation of solutions for research problem, data collection, analysis and interpretation.	**1.1**	Demonstrate the concepts of research and its methodologies, Approaches of information investigation of solutions for research problem, data collection, analysis and interpretation.
2.0	To identify the various procedures to collect literature studies approaches analysis, plagiarism, and research ethics.	**2.1**	Formulate effective literature studies approaches, analysis, plagiarism, and research ethics.
3.0	To inculcate knowledge on Effective technical writing and method to write report.	**3.1**	Identify the design for Effective technical writing and how to write report.
4.0	To provide knowledge process like drawing and drafting tools and reviewing research papers.	**4.1**	Choose the process like drawing and drafting tools and reviewing research papers.
5.0	To summarize the design for Intellectual property rights and code of ethics.	**5.1**	Formulate the design for Intellectual property rights and code of ethics.

UNIT I - RESEARCH PROBLEM FORMULATION	(9)

Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.

UNIT II - LITERATURE REVIEW	(9)

Effective literature studies approaches, analysis, plagiarism, and research ethics

UNIT III - TECHNICALWRITING /PRESENTATION	(9)

Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV - INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)	(9)

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V - INTELLECTUAL PROPERTY RIGHTS (IPR)	(9)
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	
	TOTAL (L:45) : 45 PERIODS

TEXT BOOK:

1. Cooper, D. R. and Schindler, P. S., (2009), "Business Research Methods", Tata McGraw Hill, 9th Edition.
2. Krishnaswamy, K.N., Sivakumar, A.I., and Mathirajan, M., "Management Research Methodology", Pearson Education, 2006.
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.

REFERENCES :

1. Jackson, S.L., "Research Methods and Statistics", Cengage Learning India Private Limited, New Delhi, 2009
2. Lebrun, J-L., "Scientific Writing: A Reader and Writer's Guide", World Scientific Publishing Co. Pte. Ltd., Singapore, 2007.
3. Nicholls, David G, "MLA Handbook for Writers of Research papers", 7th Edition, Affiliated East West Press Pvt Ltd, New Delhi, 2009.
4. Thiel, D. V., "Research Methods for Engineers", Cambridge University Press, 2014.
5. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners" 2nd Edition, 2010.

Mapping of COs with POs / PSOs								
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	2	1	1	2	1	3	-
2	2	3	2	1	-	-	2	1
3	2	3	2	2	1	1	2	1
4	1	3	2	2	2	1	1	2
5	1	1	2	3	2	2	1	2
CO (weighted average)	1.8	2.4	1.8	1.8	1.75	1.25	1.8	1.5

22CPZ01- MACHINE VISION				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE REQUISITE : NIL

	Course Objectives		**Course Outcomes**
1.0	To know the basics of machine vision and computer vision.	**1.1**	The student will be able to apply the vision concepts in various mechatronics applications.
2.0	To study the image acquisition techniques.	**2.1**	The student will be able to recognize the Image acquisition techniques and tools.
3.0	To learn the image processing methods.	**3.1**	The student will be able to apply the image processing tools and libraries.
4.0	To understand the methods used for image analysis.	**4.1**	The student will be able to analyze the images in the case of Robotic or IoT applications.
5.0	To gain exposure on Image processing applications.	**5.1**	The student will be able to select the right machine vision system for implementing in industrial applications.

UNIT I - INTRODUCTION	**(8)**

Human vision – Machine vision and Computer vision – Benefits of machine vision – Block diagram and function of machine vision system implementation of industrial machine vision system – Physics of Light – Interactions of light – Refraction at a spherical surface.

UNIT II - IMAGE ACQUISITION	**(12)**

Scene constraints – Lighting parameters – Lighting sources, Selection – Lighting Techniques – Types and Selection – Machine Vision Lenses and Optical Filters, Specifications and Selection Imaging Sensors – CCD and CMOS, Specifications – Interface Architectures – Analog and Digital Cameras – Digital Camera Interfaces – Camera Computer Interfaces, Specifications and election – Geometrical Image formation models – Camera Calibration.

UNIT III - IMAGE PROCESSING	**(10)**

Machine Vision Software – Fundamentals of Digital Image – Image Acquisition Modes – Image Processing in Spatial and Frequency Domain – Point Operation, Thresholding, Grayscale Stretching – Neighborhood Operations, Image Smoothing and Sharpening – Edge Detection –Binary Morphology – Color image processing.

UNIT IV - IMAGE ANALYSIS	**(6)**

Feature extraction – Region Features, Shape and Size features – Texture Analysis – Template Matching and Classification – 3D Machine Vision Techniques – Decision Making.

UNIT V - MACHINE VISION APPLICATIONS	(9)

Machine vision applications in manufacturing, electronics, printing, pharmaceutical, textile, applications in non-visible spectrum, metrology and gauging, OCR and OCV, vision guided robotics – Field and Service Applications – Agricultural, and Bio medical field, augmented reality, surveillance, bio-metrics.

TOTAL (L:45) : 45 PERIODS

TEXT BOOK:

1. D. A. Forsyth and J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2015.
2. R. Jain, R. Kasturi and B. G. Schunck, "Machine Vision", McGraw-Hill, 1995.
3. Dana H. Ballard & Christopher M. Brown, "Computer Vision", Prentice-Hall, 1982.
4. Alexander Hornberg, "Handbook of Machine Vision", 1st Edition, Wiley 2007.
5. Emanuele Trucco, Alessandro Verri, "Introductory Techniques For 3D Computer Vision", Prentice Hall, 2006

	Mapping of COs with POs / PSOs							
COs	**POs**						**PSOs**	
	1	2	3	4	5	6	1	2
1	3	2	-	1	1	3	2	2
2	3	2	2	1	1	3	2	2
3	3	2	3	2	1	3	2	3
4	3	2	2	1	1	3	2	2
5	3	3	3	3	3	3	3	3
CO (weighted average)	3	2.2	2.5	1.6	1.4	3	2.2	2.4

22PGA01- ENGLISH FOR RESEARCH PAPER WRITING

		L	T	P	C
		2	0	0	0

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To make the students to improve writing skills and level of readability	**1.1**	The students will be able to improve writing skills and level of readability
2.0	To explain the strategic planning process and apply different presentation method	**2.1**	The students will be able to describe what to write in each section
3.0	To foster the ability to understand and to utilize the mechanics of writing.	**3.1**	The students will be able to explain the skills needed for writing quality research paper
4.0	To Infer the skills needed when writing the Conclusion	**4.1**	The students will be able to explore the recent areas of research
5.0	To focus research and its key variables, guiding through research process	**5.1**	The students will be able to illustrate the good quality of paper at very first-time submission

UNIT I - INTRODUCTION	**(6)**

Planning and Preparation - Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT II – PRESENTATION SKILLS	**(6)**

Clarifying Who Did What- Highlighting Findings - Hedging and Criticizing- Paraphrasing - Sections of a Paper – Abstracts – Introduction.

UNIT III – MECHANICS OF RESEARCH	**(6)**

Key skills needed for writing - Title, Abstract, Introduction, Discussion, Conclusion, The Final Check.

UNIT IV – PROCESS OF RESEARCH WRITING	**(6)**

Skills needed for writing Methods - skills needed when writing Results - skills needed when writing Discussion - skills needed when writing Conclusion.

UNIT V – QUALITY RESEARCH PAPER	**(6)**

Useful phrases, Checking Plagiarism - Bibliography- Citation- how to ensure paper is as good as it could possibly be the first- time submission.

TOTAL (L:30) : 30 PERIODS

REFERENCES :

1. Adrian Wallwork ," English for Writing Research Papers", Springer New York Dordrecht Heidelberg London, 2011
2. Day R ,"How to Write and Publish a Scientific Paper", Cambridge University Press 2006
3. Goldbort R "Writing for Science", Yale University Press,2006
4. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM. Highman's book 1998.

<table>
<tr><td colspan="5" align="center">22PGA02 - DISASTER MANAGEMENT</td></tr>
<tr><td></td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To Summarize basics of disaster.	**1.1**	Ability to summarize basics of disaster.
2.0	To Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.	**2.1**	Ability to explain a critical understanding of key concepts in disaster risk reduction and Humanitarian response.
3.0	To Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.	**3.1**	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
4.0	To Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.	**4.1**	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
5.0	To Develop the strengths and weaknesses of disaster management approaches.	**5.1**	Ability to develop the strengths and weaknesses of disaster management approaches.

UNIT I - INTRODUCTION	**(6)**

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II – REPERCUSSIONS OF DISASTERS AND HAZARDS	**(6)**

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III – DISASTER PRONE AREAS IN INDIA	**(6)**

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.

UNIT IV – DISASTER PREPAREDNESS AND MANAGEMENT	**(6)**

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V – RISK ASSESSMENT	(6)
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.	
	TOTAL (L:30) : 30 PERIODS

REFERENCES :
1. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi, 2009. 2. Nishitha Rai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies '"New Royal book Company, 2007. 3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi, 2001.

22PGA03 - CONSTITUTION OF INDIA

	L	T	P	C
	2	0	0	0

PRE REQUISITE : NIL

	Course Objectives		Course Outcomes
1.0	To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.	**1.1**	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2.0	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional	**2.1**	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3.0	To role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.	**3.1**	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution..
4.0	To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution	**4.1**	Discuss the passage of the Hindu Code Bill of 1956.
5.0	To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.	**5.1**	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

UNIT I - HISTORY OF MAKING OF THE INDIAN CONSTITUTION	(6)

History, Drafting Committee, (Composition & Working)

UNIT II – PHILOSOPHY OF THE INDIAN CONSTITUTION	(6)

Preamble, Salient Features

UNIT III – ONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES	(6)

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV – LOCAL ADMINISTRATION	(6)

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayat raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT V – ELECTION COMMISSION	(6)

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL (L:30) : 30 PERIODS

REFERENCES :
1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edition., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.