NANDHA ENGINEERING COLLEGE

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

Curriculum and Syllabi
for
B.Tech – Artificial Intelligence and Data Science [R17]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year 2021-2022 onwards)

SEPTEMBER 2021

VISION OF THE DEPARTMENT

To emerge as a renowned department in providing quality Artificial Intelligence and Data Science education to meet the ever growing needs of the society.

MISSION OF THE DEPARTMENT

Artificial Intelligence and Data Science department is committed

- To provide quality and value based education to produce Artificial Intelligence professionals with ethical and social responsibility.
- To excel in the thrust areas of Artificial Intelligence, Machine Learning and Data Science by imparting programming knowledge and Mathematical skill set to solve real world problems.
- To create a learner centric environment that motivates the students in adopting emerging technologies of the rapidly changing artificial intelligence and data science society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

The graduates of Artificial intelligence and data science will be able

PEO1: Core Competency: To apply mathematical, scientific and engineering concepts for an artificial intelligence and data scientist to remit the various challenges using emerging AI technologies.

PEO2: Research, Innovation and Entrepreneurship: To work productively in multidisciplinary teams and provide innovative ideas for real time problems through research,

PEO3: Ethics, Human values and Life-long learning: To embrace lifelong learning with higher ethical standards and be the source for socio economic growth.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Analytical Skill: Ability to Design and develop innovative automated systems applying mathematical, analytical, programming and operational skills to meet society needs.

PSO2: Knowledge Proficiency: Provide a tangible foundation and enhance the abilities to qualify for employment, higher studies and research in artificial intelligence and data science with ethical values.

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	2	3	3	2	2	2	2	2	3	3
2	3	3	3	3	3	2	2	1	2	1	2	1
3	3	2	2	1	2	3	2	3	2	2	2	2

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	3	3	2	2	1	2	1	2	2
2	3	2	2	3	3	2	3	2	2	2	3	3

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

NANDHA ENGINEERING COLLEGE (AUTONOMOUS), ERODE – 638 052

REGULATIONS – 2017 **CHOICE BASED CREDIT SYSTEM**

B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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

SEMESTER: I									
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**

SEMESTER: II									
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**

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.	17AIC01	Data Structures	PC	17CSC03	5	3	0	2	4
3.	17ITC01	OOPS using JAVA	PC	-	3	3	0	0	3
4.	17AIC02	Introduction to Artificial Intelligence	PC	-	3	3	0	0	3
5.	17CSC05	Operating Systems	PC	-	3	3	0	0	3
6.	17CSC08	Computer Networks	PC	-	3	3	0	0	3
PRACTICAL									
7.	17ITP01	OOPS using JAVA Laboratory	PC	-	4	0	0	4	2
8.	17AIP01	Artificial Intelligence 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.	17AIC03	Introduction to the Design And Analysis of Algorithms	PC	17AIC01	3	3	0	0	3
3.	17CSC07	Database Management System	PC	-	3	3	0	0	3
4.	17AIC04	Data Analytics and Visualization	PC	-	3	3	0	0	3
5.	17AIC05	Machine Learning	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.	17AIP02	Machine Learning Laboratory	PC	-	4	0	0	4	2
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**	**2**	**11**	**22**

SEMESTER: V									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1.	17AIC06	Neural Networks and Deep Learning	PC	-	3	3	0	0	3
2.	17AIC07	Data and information Security	PC	-	3	3	0	0	3
3.	17CSX29	Internet of Things	PC	-	3	3	0	0	3
4.	17AIC08	Web Technology	PC	-	4	2	0	2	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.	17CSP09	Internet of things Laboratory	ES	-	4	0	0	4	2
8.	17AIP03	Neural Networks and Deep Learning 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.	17AIC09	Distributed Computing	PC	-	3	3	0	0	3
2.	17AIC10	Big Data Analytics	PC	-	3	3	0	0	3
3.	17CSC18	Full stack Development	PC	-	3	3	0	0	3
4.	E3	Elective (PSE)	PSE	-	3	3	0	0	3
5.	E4	Elective (OE/PSE)	PSE /OE	-	3	3	0	0	3
6.	E5	Elective (PSE)	PSE	-	3	3	0	0	3
PRACTICAL									
6.	17AIP04	Big Data Analytics Laboratory	PC	-	4	0	0	4	2
7.	17GED06	Comprehension	PC	-	2	0	0	2	0
8.	17GED07	Constitution of India	MC	-	2	2	0	0	0
				TOTAL	**28**	**20**	**0**	**6**	**20**

SEMESTER: VII									
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.	17AIC11	Information Retrieval Techniques	PC	-	3	3	0	0	3
3.	17AIC12	Design thinking	PC	-	3	3	0	0	3
4.	E6	Elective (PSE)	PSE	-	3	3	0	0	3
5.	E7	Elective (OE)	OE	-	3	3	0	0	3
PRACTICAL									
6.	17AID01	Project Work - I	EEC	-	8	0	0	8	4
				TOTAL	**23**	**15**	**0**	**8**	**19**

SEMESTER: VIII									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1.	E8	Elective (OE)	OE	-	3	3	0	0	3
2.	E9	Elective (PSE)	PSE	-	3	3	0	0	3
PRACTICAL									
3.	17AID02	Project Work-II	EEC	-	16	0	0	16	8
				TOTAL	**22**	**6**	**0**	**16**	**14**

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

HUMANITIES AND SOCIAL SCIENCES (HS)									
AICTE NORMS : 5 –10%					**ACTUAL : 5.4 %**				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**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 and Financial Accounting	HS	-	3	3	0	0	3

BASIC SCIENCES (BS)									
AICTE NORMS : 15 –20%					**ACTUAL : 17.0 %**				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**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 and Laplace 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

PROFESSIONAL CORE (PC)									
AICTE NORMS : 30 –40%					**ACTUAL : 42.0%**				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	17AIC01	Data Structures	PC	17CSC03	5	3	0	2	4
2.	17ITC01	OOPS using JAVA	PC	-	3	3	0	0	3
3.	17AIC02	Introduction to Artificial Intelligence	PC	-	3	3	0	0	3
4.	17CSC05	Operating Systems	PC	-	3	3	0	0	3
5.	17CSC08	Computer Networks	PC	-	3	3	0	0	3
6.	17ITP01	OOPS using JAVA Laboratory	PC	-	4	0	0	4	2

7.	17AIP01	Artificial Intelligence Laboratory	PC	-	2	0	0	2	1
8.	17AIC03	Introduction to the Design and Analysis of Algorithms	PC	17AIC01	3	3	0	0	3
9.	17CSC07	Database Management System	PC	-	3	3	0	0	3
10.	17AIC04	Data Analytics and visualization	PC	-	3	3	0	0	3
11.	17AIC05	Machine Learning	PC	-	3	3	0	0	3
12.	17CSP05	Database Management System Laboratory	PC	-	4	0	0	4	2
13.	17AIP02	Machine Learning Laboratory	PC	-	4	0	0	4	2
14.	17AIC07	Data and Information security	PC		3	3	0	0	3
15.	17AIC06	Neural Networks and Deep Learning	PC		3	3	0	0	3
16.	17AIP03	Neural Networks and Deep Learning Laboratory	PC		4	0	0	4	2
17.	17AIC08	Web Technology	PC	-	4	2	0	2	3
18.	17AIC09	Distributed Computing	PC		3	3	0	0	3
19.	17AIC10	Big Data Analytics	PC		3	3	0	0	3
20.	17CSC18	Full stack Development	PC	-	3	3	0	0	3
21.	17AIP04	Big Data Analytics Laboratory	PC		4	0	0	4	2
22.	17GED06	Comprehension	PC	-	2	0	0	2	0
23.	17CSC14	Cloud Computing	PC	-	3	3	0	0	3
24.	17AIC11	Information Retrieval Techniques	PC	-	3	3	0	0	3
25.	17AIC12	Design Thinking	PC	-	3	3	0	0	3

ENGINEERING SCIENCES (ES)									
AICTE NORMS : 15 –20%						**ACTUAL : 11.60 %**			
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.	17CSX29	Internet of Things	ES		3	3	0	0	3
9.	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.	17AID01	Project Work-I	EEC		8	0	0	8	4
2.	17AID02	Project Work-II	EEC	-	16	0	0	16	8

ENGINEERING EMPLOYABILITY COURSE (EEC- Not to be included in CGPA)								
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	17GED01	Soft Skills – Listening and Speaking	EEC	2	0	0	2	0
2.	17GED02	Soft Skills – Reading and Writing	EEC	2	0	0	2	0
3.	17GED03	Personality and Character Development	EEC	1	0	0	1	0
4.	17GED07	Constitution of India	EEC	2	2	0	0	0
5.	17GED08	Essence of Indian Traditional Knowledge	EEC	2	2	0	0	0

LIST OF PROGRAMME SPECIFIC ELECTIVES (PSE)									
AICTE NORMS : 10 –15%					ACTUAL : 10.9 %				
1	17AIX01	Bio-Inspired Optimization Techniques	PSE		3	3	0	0	3
2	17AIX02	Mobile Application Development	PSE		3	3	0	0	3
3	17AIX03	Health Care Analytics	PSE		3	3	0	0	3
4	17AIX04	Natural Language Processing	PSE		3	3	0	0	3
5	17AIX05	Text and Speech Analysis	PSE		3	3	0	0	3
6	17AIX06	Game Theory for AI	PSE		3	3	0	0	3
7	17AIX07	Computer Vision	PSE		3	3	0	0	3
8	17AIX08	Image and Video Analytics	PSE		3	3	0	0	3
9	17AIX09	Devops	PSE	-	3	3	0	0	3
10	17AIX10	Principles of Programming Languages	PSE	-	3	3	0	0	3
11	17AIX11	Software Testing and Automation	PSE	-	3	3	0	0	3
12	17AIX12	R programming	PSE	-	3	3	0	0	3
13	17ITX06	Programming with Java2 Enterprise Edition	PSE	17ITC01	3	3	0	0	3
14	17CSX31	Problem Solving and Programming	PSE	-	3	3	0	0	3
15	17ITX26	Problem Solving and Algorithmic Skills	PSE	-	3	3	0	0	3
16	17CSX30	Agile methodologies	PSE	-	3	3	0	0	3

17	17ITX09	Ruby programming	PSE	-	3	3	0	0	3
18	17CSX33	Google Cloud Platform	PSE	17CSX34	3	3	0	0	3
19	17CSX34	Tableau	PSE	-	3	3	0	0	3
20	17ITX29	IT operations	PSE	-	3	3	0	0	3
21	17ITX30	IT operations Advanced	PSE	17ITX29	3	3	0	0	3
22	17CSX37	Professional Readiness for Innovation, Employability and Entrepreneurship	PSE	-	3	3	0	0	3
23	17ITX32	JAVA - J2EE	PSE	-	3	3	0	0	3
24	17ITX33	JAVA-Full Stack Implementation	PSE	-	3	3	0	0	3
25	17ITX37	Problem solving using JAVA	PSE	-	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
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	VII
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 Day Life	OE	-	3	3	0	0	3	VII
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	17EYZ05	Workplace Communication	OE	-	3	3	0	0	3	VII
59.	17GYZ01	Biology for Engineers	OE	-	3	3	0	0	3	VII
60.	17BMZ01	Health care technology	OE	-	3	3	0	0	3	VII
61.	17BMZ02	Telemedicine	OE	-	3	3	0	0	3	VII
62.	17BMZ03	Epidemiology and Pandemic Management	OE	-	3	3	0	0	3	VII
63	17BMZ04	Medical Ethics	OE	-	3	3	0	0	3	VII
64	17EYX01	Effective Communication	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	VIII
68	17AIZ04	Augmented reality/virtual reality technologies	OE	-	3	3	0	0	3	VII

Honor Degree Courses

Vertical I - Machine Intelligence

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1	17AIX13	Knowledge Engineering	PSE		3	3	0	0	3
2	17AIX14	Recommender Systems	PSE		3	3	0	0	3
3	17AIX15	Soft Computing	PSE		3	3	0	0	3
4	17AIX16	Optimization Techniques	PSE		3	3	0	0	3
5	17AIX17	Business Intelligence	PSE		3	3	0	0	3
6	17AIX18	Ethics of AI	PSE		3	3	0	0	3
7	17AIX19	Cognitive Science	PSE		3	3	0	0	3
8	17AIX20	Robotic Process Automation	PSE		3	3	0	0	3

Vertical II - Digital Frontier

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
1	17AIX21	Augmented Reality/Virtual Reality	PSE		3	3	0	0	3
2	17AIX22	Cyber Security	PSE		3	3	0	0	3
3	17AIX23	Drone Technology	PSE		3	3	0	0	3
4	17AIX24	Cyber forensics	PSE		3	3	0	0	3
5	17AIX25	Quantum Computing	PSE		3	3	0	0	3
6	17AIX26	Crypto currency and Block chain Technologies	PSE		3	3	0	0	3
7	17AIX27	Game Development	PSE		3	3	0	0	3
8	17AIX28	Digital Marketing	PSE		3	3	0	0	3

Minor Degree Courses									
ARTIFICIAL INTELLIGENCE									
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRERQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	17AIM01	Introduction to Artificial Intelligence	PSE		3	3	0	0	3
2.	17AIM02	Fundamentals of Machine Learning	PSE		3	3	0	0	3
3.	17AIM03	Knowledge Representation and Reasoning	PSE		3	3	0	0	3
4.	17AIM04	Fundamentals of Neural Networks	PSE		3	3	0	0	3
5.	17AIM05	Deep Learning	PSE		3	3	0	0	3
6.	17AIM06	Business Analytics	PSE		3	3	0	0	3
7.	17AIM07	Introduction to Robotics	PSE		3	3	0	0	3
8.	17AIM08	Ethics for Artificial Intelligence	PSE		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	19	-	-	-	-	**22**
IV	3	3	16	-	-	-	-	**22**
V	-	-	14	2	-	6	-	**22**
VI	-	-	11	-	-	6	3	**20**
VII	-	-	9	-	4	3	3	**19**
VIII	-	-	-	-	8	3	3	**14**
TOTAL	**9**	**28**	**69**	**19**	**12**	**18**	**9**	**164**
R17%	**5.4**	**17.0**	**42.0**	**11.6**	**7.3**	**10.9**	**5.4**	
AICTE MODEL CURRI %	**5-10**	**15-20**	**30-40**	**15-20**	**10-15**	**10-15**	**5-10**	

Total Credits: 21+24+22+22+22+20+19+14=164Credits

17EYA01 - PROFESSIONAL ENGLISH - I (*Common to All Branches*)				
L	T	P	C	
2	0	2	3	

PREREQUISITE : NIL	QUESTION PATTERN: TYPE - 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To articulate and enunciate words and sentences clearly and efficiently using grammatical structures.	**1.1**	The students will be able to construct clear, grammatically correct sentences using a variety of sentence structures and appropriate vocabulary.	**f, i, j, l**
2.0	To acquire information through listening and apply it to persuade or articulate one‘s own point of view.	**2.1**	The students will be able to utilize listening skills to articulate one‘s own point of view in different circumstances.	**f, i, j, l**
3.0	To enable students to express themselves fluently and appropriately in social and professional contexts.	**3.1**	The students will be able to apply appropriate communication skills across settings, purposes, and audiences.	**f, i, j, l**
4.0	To summarize and paraphrase information in a text through reading skills.	**4.1**	The students will be able to distinguish main ideas and supporting details and employ active reading strategies to understand texts at the maximum level.	**f, i, j, l**
5.0	To understand different techniques and contents based on the written communication.	**5.1**	The students will be able to equip themselves with writing skills needed for academic as well as workplace contexts.	**f, i, j, l**

UNIT I - FOCUS ON LANGUAGE	**(6+6)**
Parts of Speech – Articles - Primary Auxiliaries – Modal Auxiliaries - Questions (_Yes/No‘ & _Wh‘ Type) – Negatives - Prepositions – Conjunctions - Tenses (Simple, Continuous, Perfect, Perfect Continuous) - Vocabulary (Synonyms & Antonyms) - Homophones – Homonyms - One Word Substitution	
UNIT II – LISTENING FOR EFFECTIVENESS	**(6+6)**
Listening to Short Conversations or Monologues - Listening to Verbal and Non-Verbal Communication – Listening to Announcements - Listening and Note-taking – Listening to Telephonic Conversations – Listening to TED/ Ink talks- Intensive listening to fill in the gapped text	
UNIT III – COMMUNICATION BOOSTERS	**(6+6)**
Introducing Oneself – Exchanging Personal information (Likes & Dislikes) – Talking about Family & Friends - Asking about Routine Actions and Expressing Opinions - Participating in Short Conversations - Situational Talk	

UNIT IV – PROFESSIONAL READING	(6+6)
Skimming – Scanning (Short Texts and Longer Passages) – Inferring Technical Texts – Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting – Practicing Speed Reading - Reading Comprehension (Multiple choice / Short / Open ended Questions) - Gap Filling	
UNIT V – TECHNICAL CORRESPONDENCE	**(6+6)**
Seeking Permission for Industrial Visit & In-plant Training – Checklist – Instruction - E-mail Writing - Report Writing (Accident & Survey)	

LIST OF SKILLS ASSESSED IN THE LABORATORY

1. Language Skills.
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.
2. Jackman, Vanessa and Russell, Whitehead, “Cambridge English Business Preliminary Practice Tests”, Oxford University Press, New Delhi, 2016.

REFERENCES:

1. Rizvi, Ashraf M. “Effective Technical Communication”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
2. Hewings M, “Advanced English Grammar”, Cambridge University Press, Chennai, 2000.

17MYB01 - CALCULUS AND SOLID GEOMETRY *(Common to All Branches)*			
L	**T**	**P**	**C**
3	**2**	**0**	**4**

PREREQUISITE : NIL	**QUESTION PATTERN: TYPE - 4**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To develop the use of matrix algebra techniques those are needed by engineers for practical applications.	**1.1**	The students will be able to apply the concept of orthogonal reduction to diagonalise the given matrix.	**a,b,c,e,i,k,l**
2.0	Use the techniques, Skills and Engineering tools necessary for engineering practice, with Geometric concepts.	**2.1**	The students will be able to gain knowledge about the geometrical aspects of sphere.	**a,b,c,e,f,i,l**
3.0	To improve their ability in solving geometrical applications of differential calculus problems.	**3.1**	The students will be able to find the radius of curvature, circle of curvature and centre of curvature for a given curve.	**a,b,c,l**
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 classify the maxima and minima for a given function with several variables, through by finding stationary points.	**a,b,c,d,i,l**
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.	**5.1**	The students will be able to demonstrate the use of double and triple integrals to compute area and volume.	**a,b,c,d,f,i,l**

UNIT I - MATRICES	**(9+6)**
Characteristic Equation-Eigen values and Eigen vectors of a matrix –Properties (statement only)- Cayley Hamilton Theorem and its applications- Orthogonal transformation of a symmetric matrix to a diagonal form - Quadratic form- Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II - ANALYTICAL GEOMETRY OF THREE DIMENSIONS	**(9+6)**
Equation of a Plane – Angle between two planes - Equation of straight lines-Coplanar lines- skew lines- Equation of a sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	**(9+6)**
Curvature – Curvature in Cartesian co-ordinates-Centre and Radius of curvature-Circle of curvature-Evolutes and Involutes-Envelopes.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	**(9+6)**
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+6)**
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:30) = 75 PERIODS	

Note : Simulation of Engineering Problems (Qualitative Analysis) using open source software

TEXT BOOKS:

1. Dr. B.S.Grewal, "Higher Engineering Mathematics", 42nd ed., Khanna publications, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th ed., John Wiley & sons, 2013.
3. Veerarajan.T, "Engineering Mathematics for Semester I & II", 3rd ed., Tata McGraw Hill, 2014.

REFERENCES:

1. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics Sem-II", 5th ed., Laxmi Publications.2011.
2. Kandasamy P, Thilagavathy K, Gunavathy K, "Engineering Mathematics for first Year", 9th ed., R. V. Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7th ed., Wiley India, (2007).

17PYB02 - PHYSICS FOR COMPUTER ENGINEERS *(Common to CSE and IT Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**2**	**4**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 1**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To provide the basic ideas in all the kinds of engineering branches	**1.1**	The students will be able to acquire knowledge regarding Acoustics and ultrasonic	**a,c,d,e,f,l**
2.0	To develop the skills of the students in physics under various applications	**2.1**	The students will be able to applying knowledge in the fields of optics & laser technology	**a,c,d,e,f,l**
3.0	To cultivate the censor designing ability of the students	**3.1**	The students will be able to design the sensors using the knowledge of fiber optics	**a,c,d,e,f,l**
4.0	To provide knowledge in wave and particle physics	**4.1**	The students will be able to gain the knowledge of wave, particle nature and matter waves	**a,b,l**
5.0	To provide the fundamental knowledge in basics of crystals	**5.1**	The students will be able to analyze the different kind of crystal structures and crystal growth	**a,c.e.f,l**

UNIT I - ULTRASONICS	**(9)**
Ultrasonic: Introduction - Properties of Ultrasonics- Magnetostriction and piezo electric methods. Cavitation- Velocity of ultrasonic waves using acoustic grating- SONAR- NDT- Ultasonic Flaw detector- Ultrasonic A, B & C scan methods- Sonogram – Comparison between ECG and PCG- Ultasonic Imaging system(Scanner).	
UNIT II - OPTICS & LASER TECHNOLOGY	**(9)**
Interference: Air wedge – theory – uses – testing of flat surfaces – determination of thickness of a thin wire. Types of lasers – Nd – YAG laser – CO2 laser – semiconductor laser (homojunction & hetrojuction). Applications: Holography – construction – reconstruction – Lasers in industry (Material Processing) and Medical field (Surgery)	
UNIT III - FIBER OPTICS AND SENSORS	**(9)**
Principle of light transmission through fiber – expression for acceptance angle and numerical aperture – Fabrication of optical fibers- Double crucible method – types of optical fibers (material, refractive Index profile and mode) fiber optic communication system. Splicing – Applications of optical fiber – Sensors- temperature- pressure sensor and displacement sensor Medical Endoscope.	
UNIT IV - QUANTUM PHYSICS	**(9)**
Development of quantum theory – de Broglie wavelength – properties of matter waves – G.P Thomson experiment Schrödinger‘s wave equation – time dependent – time independent wave equations – physical significance – applications – particle in a one dimensional potential box - Compton Effect – theory and experimental verification.	
UNIT V - CRYSTALOGRAPHY	**(9)**
Lattice – unit cell – Bravais lattices – lattice planes – Miller indices – ‗d‘ spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques- Bridgemann and Czochralski Methods.	

LIST OF EXPERIMENTS:

1. Determination of Velocity of sound and compressibility of liquid using Ultrasonic Interferometer
2. Determination of Wavelength of Mercury spectrum- Spectrometer-Grating
3. Determination of Thickness of a thin wire- Air wedge Method
4. Determination of Wavelength of given laser, Particle size and Angle of Divergence of laser beam.
5. Determination of Acceptance angle and Numerical of an optical Fiber using a semiconductor laser.

TOTAL (L:45+P:30) = 75 PERIODS

TEXT BOOKS:

1. V. Rajendran, 'Engineering Physics", Tata McGraw-Hill, New Delhi, 2011.
2. K. Tamilarasan, K. Prabu, "Engineering Physics I", 2nd ed., Tata McGraw-Hill. New Delhi. 2011.

REFERENCES:

1. P. K. Palanisami, "Physics for Engineers", Vol. 1, SciTech Pub. (India) Pvt. Ltd., Chennai, 2002.
2. M. N. Avadhanulu and P. G. Kshirsagar, "A Textbook of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2005.
3. V. Rajendran and A. Marikani, "Physics I", TMH, New Delhi, 2004.
4. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2006.
5. Dr. Y. Aparna & Dr. K. Venkateswara Rao, "Laboratory Manual of Engineering Physics.", V.G.S Publishers.
6. G.L. Squires, "Practical Physics", Cambridge University Press, Cambridge, 1985. 11. 12.
7. M.H. Shamos, Holt, "Great Experiments in Physics", Rinehart and Winston Inc., 1959.

17CYB03 - ENVIRONMENTAL SCIENCE *(Common to All Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**				
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives		**Course Outcomes**				**Related Program outcomes**
1.0	To understand the constitutes of the environment	**1.1**	The students will be able to design a system, component, or process to meet desired needs.			**a,b,c,f,g**
2.0	The students should be conversant with valuable resources	**2.1**	The students will be able to identify, formulate, and solve environmental engineering problems			**a,b,c,f,g**
3.0	To know about the role of a human being in maintaining a clean environment.	**3.1**	The students will be able to understand the professional and ethical responsibility as related to the practice of environmental engineering and the impact of engineering solutions in a global context.			**a,b,c,f,g**
4.0	To maintain ecological balance and preserve bio-diversity.	**4.1**	The students will be able to use the techniques, skills, and modern engineering tools necessary for environmental engineering practice.			**a,b,c,f,g**
5.0	To get knowledge about the conservation of environment for the future generation.	**5.1**	The students will be able to acquire the knowledge of information technology in environmental science.			**a,b,c,f,g**

UNIT I - INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	**(9)**
Environment: Scope – importance - need for public awareness - Forest resources - Use-over exploitation-deforestation - Water resources - use-over utilization of surface and ground water - conflicts over water - Mineral resources - use-exploitation-environmental effects of extracting and using mineral resources - Food resources - world food problems changes caused by agriculture - Effects of modern agriculture - fertilizer- pesticide problems - Energy resources - Renewable energy sources - solar energy - wind energy. Land resources - land degradation - soil erosion - Role of an individual in conservation of natural resources.	
UNIT II - ECOSYSTEMS AND BIODIVERSITY	**(9)**
Concepts of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Food chains- food webs - types of ecosystem - structure and functions of forest ecosystem and river ecosystem – Biodiversity - value of biodiversity - consumptive use-productive use - social values - ethical values - aesthetic values - Hotspots of biodiversity -Threats to biodiversity - Habitat loss - poaching of wildlife and man wildlife conflicts- Conservation of biodiversity - In-situ and Ex-situ conservation of biodiversity.	
UNIT III - ENVIRONMENTAL POLLUTION	**(9)**
Pollution: Causes - effects and control measures of Air pollution - Water pollution - Soil pollution and Noise pollution - Solid waste management - Causes - effects -control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster managements - Floods - cyclone- landslides.	

UNIT IV - SOCIAL ISSUES AND THE ENVIRONMENT	(9)
Water conservation - rain water harvesting - global warming - acid rain - ozone layer depletion - Environment protection act - Air (Prevention and control of pollution) Act - Water (prevention and control of pollution) Act - Green Chemistry – Principle of Green chemistry – Application of Green chemistry.	
UNIT V - HUMAN POPULATION AND THE ENVIRONMENT	**(9)**
Population growth - variation among nations - Population explosion - Family welfare programme - Human rights - HIV/AIDS – Human health and environment - women and child welfare - Role of information technology in environment and human health.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Anubha Kaushik and C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, New Delhi, 2015
2. Dr. A.Ravikrishan, "Envrionmental Science and Engineering", Sri Krishna Hitech Publishing co. Pvt. Ltd.,Chennai, 12th ed, 2016.

REFERENCES:

1. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", 2nd ed., Pearson Education, New Delhi ,2012.
2. Santosh Kumar Garg, Rajeshwari Garg, Smf Ranjni Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2014.
3. Miller T.G. Jr., "Environmental Science", 10th ed., Wadsworth Publishing Co., 2015.

17CSC02 - PYTHON PROGRAMMING *(Common to CSE, ECE, EEE, EIE ,IT & BME Branches)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE - 1**		

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To gain knowledge about the basics of computer to solve problems	**1.1**	The students will be able to understand the working of computers.	**a,b,c,d,e,h,j,k,l**
2.0	To impart the fundamental concepts of Python Programming	**2.1**	The students will be able to understand the basics of Python Programming constructs.	**a,b,c,d,e,h,i,j,k,l**
3.0	To gain exposure about string manipulation, list, and tuples	**3.1**	The students will be able to realize the need of strings, list, and tuples.	**a,b,c,d,e,h,i,j,k,l**
4.0	To get knowledge about dictionaries, function and modules	**4.1**	The students will be able to design programs involving dictionaries and function.	**a,b,c,d,e,h,i,j,k,l**
5.0	To learn about exception handling.	**5.1**	The students will be able to develop simple programs using file concept and modules.	**a,b,c,d,e,h,i,j,k,l**

UNIT I - BASICS OF COMPUTERS & PROBLEM SOLVING	**(9)**
Computer Basics - Computer organization - Computer Software- Types of software - Software Development steps - Algorithms - Flowchart.	
UNIT II - INTRODUCTION TO PYTHON	**(9)**
History – Features – Execution of python program – Flavors of Python – Comments - Data Types - Built-in data types– Sequences - Literals– Operators – Input and Output Statements - Conditional Statements : if – if-else – Nested if-else – For – While – Nested loops – Break – Continue - pass - assert - return	
UNIT III - STRINGS, LISTS AND TUPLES	**(9)**
Strings and Characters: Creating – Length – Indexing – Slicing – Repeating – Concatenation – Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing a String with another String - Splitting and Joining Strings - Changing Case of a String - Checking Starting and Ending of a String - Formatting the Strings - Working with Characters - Sorting Strings - Searching - Finding Number. Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a Tuple.	

UNIT IV - DICTIONARIES AND FUNCTIONS	(9)
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. 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.	
UNIT V - FILES AND MODULES	**(9)**
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. - Modules: Importing module – Features – Built in functions.	
	TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2017 Edition.

REFERENCES:

1. Kenneth A. Lambert, 'Fundamentals of Python: First Programs", Cengage Learning, 2012.
2. Wesley J. Chun, "Core Python Programming", Pearson Education, 2nd ed., 2010.

17MEP01 - ENGINEERING GRAPHICS LABORATORY
(Common to CSE and IT Branches)

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To equip the ability of data extraction and transform it into graphic drawings	**1.1**	The students will be able to construct conic sections and special curves of required specifications	**a,b,c,d,e,f,g,h,i,j,l**
2.0	To learn basic engineering drawing and standards related to technical drawing	**2.1**	The students will be able to apply the concept of first angle projection to create project of straight lines, planes, solids and section of solids	**a,b,c,d,e,f,h,i,k,l**
3.0	To understand and practice the engineering drawings	**3.1**	The students will be able to develop a surface drawing of a solid model with given dimensions	**a,b,c,d,e,g,h,j,k,l**
4.0	To learn the steps involved in construction of orthographic and isometric projections	**4.1**	The students will be able to build orthographic, isometric projections of a three dimensional object	**a,b,c,d,e,g,h,i,j,l**
5.0	To understand the practice of creating physical models	**5.1**	The students will be able to make use of the knowledge of engineering drawing to create physical models	**a,b,d,e,g,h,i,l**

LIST OF EXPERIMENTS:

1. Study of basic tools, commands and coordinate system (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 pictorial view.
4. Draw the projections of straight lines.
5. Draw the projections of polygonal surface.
6. Draw the projections of simple solid objects.
7. Draw the sectional view and the true shape of the given section.
8. Draw the development of surfaces like prism, pyramid, cylinder and cone.
9. Draw the isometric projections of simple solids. (Prism and Pyramid).
10. Draw the isometric projections of cylinder and cone.

TOTAL (P:60) = 60 PERIODS

REFERENCE:

1. K.Venugopal, V.Prabhu Raja, "Engineering Graphics II", New Age International (P) Limited, 2013.

17CSP02 - PYTHON PROGRAMMING LABORATORY
(Common to CSE, ECE, EEE, EIE , IT & BME Branches)

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program 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	**a,b,c,d,j**
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.	**a,b,d**
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	**a,b,c,d,i,l**
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	**a,b,c,d,i,k,l**
5.0	To learn about exception handling	**5.1**	The students will be able to develop simple programs with exception handling	**a,b,c,d,f,l,k,l**

PYTHON-PROGRAMMING:

1. Program using Operators
2. Program using Conditional Statements
3. Program using Looping
4. Program using Strings
5. Program using Lists
6. Program using Dictionaries
7. Program using Tuples
8. Program using Functions
9. Program using File handling
10. Program using Modules

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos,Printers – 3 Nos.

Software:

- OS – Windows / UNIX Clone
- Open Source Software – Python

TOTAL (P:60) = 60 PERIODS

17GEP01 - PERSONAL VALUES *(Common to All Branches)*					
			L	**T**	**P**	**C**
			0	**0**	**2**	**0**
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To make students to learn individual in knowing them self	**1.1**	The students will be able to become an individual in knowing the self		**a, f**
2.0	To enable the student to understand Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.	**2.1**	The students will be able to acquire and express Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.		**a, g**
3.0	To enable the student to understand physical exercise and breathing techniques	**3.1**	The students will be able to practice simple physical exercise and breathing techniques		**a, c**
4.0	To make the students to do Yoga asana to enhance the quality of life.	**4.1**	The students will be able to practice Yoga asana which will enhance the quality of life.		**a, c, f**
5.0	To motivate the students to Practice Meditation and get benefited	**5.1**	The students will be able to practice meditation and get benefited.		**a, f**

VALUES THROUGH PRACTICAL ACTIVITIES:

1.KNOWING THE SELF

Introduction to value education - Need & importance of Value education – Knowing the self – realization of human life – animal instinct vs sixth sense.

2. MENTAL HEALTH

Evolution of senses – functioning steps of human mind – Body and Mind coordination - Analysis of thoughts – moralization of desires– autosuggestions – power of positive affirmations. – Meditation and its benefits.

3.PHYSICAL HEALTH

Physical body constitution– Types of food - effects of food on body and mind – healthy eating habits – food as medicine– self healing techniques.

4.CORE VALUE SELF LOVE& SELF CARE

Gratitude - Happiness - Optimistic –Enthusiasm – Simplicity – Punctual - Self Control - Cleanliness & personal hygiene - Freedom from belief systems.

5.FITNESS

Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadi suddhi pranayama – Silent sitting and listening to nature – Meditation.

TOTAL(P:30) = 30 PERIODS

REFERENCES:

1. Know Yourself — Socrates – pdf format at www.au.af.mil/au/awc/awcgate/army/rotc_self-aware.pdf.
2. Steps to Knowledge: the book of Inner Knowing – pdf format at www.newmessage.org/wp content/uploads/pdfs/books/stk_nkl_v1.5.pdf.
3. Promoting Mental Health - World Health Organization – pdf.
4. www.who.int/mental_health/evidence/mh_promotion_book.pdf
5. Learning to be: A Holistic and Integrated Approach to Values – UNESCO pdf format at www.unesdoc.unesco.org/ images/ 0012/001279/127914e.pdf
6. Personality Development by Swami Vivekananda -www.estudantedavedanta.net/personality- development.pdf

17EYA02 PROFESSIONAL ENGLISH – II
(Common to All Branches)

L	T	P	C
2	0	2	3

PREREQUISITE : 17EYA01 | **QUESTION PATTERN : TYPE - 1**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To enable students to get familiar with words, phrases and sentences relevant to the immediate communication tasks.	**1.1**	The students will be able to communicate using a variety of sentence structures and appropriate vocabulary.	**f,i,j,l**
2.0	To help students to develop their listening skills and comprehend them by asking questions.	**2.1**	The students will be able to comprehend conversations and short talks delivered in English and respond accordingly.	**f,i,j,l**
3.0	To enhance students' speaking skills by making them to participate in Technical Presentation, Group Discussion, etc.	**3.1**	The students will be able to speak appropriately and effectively in various situations.	**f,i,j,l**
4.0	To inculcate reading habit and to develop effective reading skills.	**4.1**	The students will be able to employ active reading strategies to understand texts at the maximum level.	**f,i,j,l**
5.0	To foster the ability to write convincing Job Application and effective Formal Letters.	**5.1**	The students will be able to equip themselves with writing formal letters and winning Job Application.	**f,i,j,l**

UNIT I - LANGUAGE DEVELOPMENT **(6+6)**

Vocabulary (Prefixes & Suffixes) - Active Voice and Passive Voice - Impersonal Passive Voice – Conditional Clauses – Subject - Verb Agreement - Direct and Indirect Speech - Idioms and Phrases - Discourse Markers - Error Spotting

UNIT II - LISTENING COMPREHENSION **(6+6)**

Listening for Specific Information and Match / Choose / Fill in the texts - Short Films, News, Biographies, Roles and Responsibilities in Corporate, Funny Shows – Listening to Iconic Speeches and making notes – Listening to Interviews

UNIT III - ACQUISITION OF ORAL SKILLS **(6+6)**

Describing a Person - Making Plans – Asking for and Giving Directions - Talking about Places - Talking over Phone – Narrating Incidents – Introduction to Technical Presentation - Story Telling – Group Discussion

UNIT IV - READING NUANCES **(6+6)**

Intensive Reading – Extensive Reading – Finding key information in a given text - Reading and Understanding Technical Articles - Reading and Interpreting Visual Materials

UNIT V - EXTENDED WRITING **(6+6)**

Job Application with Resume – Recommendation – Inviting Dignitaries - Accepting & Declining Invitation - Paragraph Writing (Topics and Images)

LIST OF SKILLS ASSESSED IN THE LABORATORY

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

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

TEXT BOOKS:

1. Kumar, Suresh. E. “Engineering English”, Orient Blackswan: Hyderabad, 2015.
2. Raman, Meenakshi and Sangeetha Sharma, “Technical Communication Principles and Practice”, Oxford University Press: New Delhi, 2014.

REFERENCES:

1. Board of Editors, “Fluency in English – A Course Book for Engineering and Technology”, Orient Blackswan: Hyderabad, 2016.
2. Comfort, Jeremy, et al., “Speaking Effectively: Developing Speaking Skills for Business English”, Cambridge University Press: Cambridge, 2011.

17MYB02 COMPLEX ANALYSIS AND LAPLACE TRANSFORMS *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**2**	**0**	**4**
PREREQUISITE : 17MYB01	**QUESTION PATTERN : TYPE - 4**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To expose the concepts of differential equations.	**1.1**	The students will be able to predict the suitable method to solve second and higher order differential equations	**a,b,c,d,f,i,k,l**
2.0	To communicate the problem solutions using correct Mathematical terminology of vector calculus.	**2.1**	The students will be able to apply the concepts of Differentiation and Integration to Vectors.	**a,b,c,f,g,l**
3.0	Apply rigorous and analytic approach to analyse the conformal mapping.	**3.1**	The students will be able to compute an analytic function, when its real or imaginary part is known.	**a,b,c,d,e,i,l**
4.0	Acquiring the knowledge of evaluating contour integrals using residue theorem.	**4.1**	The students will be able to identify the Singularities and its corresponding Residues for the given function.	**a,b,c,d,e,h,j,l**
5.0	Apply the concepts of Laplace transforms & its applications to various problems related to Engineering.	**5.1**	The students will be able to predict a suitable method to evaluate the Contour integration.	**a,b,c,d,e,f,i,l**

UNIT I - ORDINARY DIFFERENTIAL EQUATIONS	**(9+6)**
Higher order linear differential equations with constant coefficients - Method of variation of parameters Cauchy's and Legendre's Equations.	
UNIT II - VECTOR CALCULUS	**(9+6)**
Gradient and Directional derivative -Divergence and Curl – Irrotational, solenoidal and scalar potential –Line integral over a plane curve-Surface Integral and Volume Integral-Green's theorem in a plane-Gauss divergence theorem and Stokes Theorem (Excluding Proofs)-Simple Applications Involving Square, Rectangles, Cube and Parallelopiped.	
UNIT III- ANALYTIC FUNCTIONS	**(9+6)**
Functions of a complex variable-Analytic functions– Necessary and sufficient conditions of Cauchy's -Riemann Equations in Cartesian Coordinates (Excluding Proofs) – Properties of Analytic Functions – Harmonic conjugate – Construction of an analytic function by Milne's Thomson Method– Conformal mapping :w = c+z , cz, 1/z and Bilinear Transformation.	
UNIT IV - COMPLEX INTEGRATION	**(9+6)**
Statement and Simple applications of Cauchy's integral theorem and Cauchy's integral formula(Excluding Proofs) – Taylor's and Laurent's Series Expansions - Singularities - Residues – Cauchy's Residue theorem (Statement only) – Evaluation of contour integration over unit circle and semi circle (Excluding poles on Real axis).	
UNIT V- LAPLACE TRANSFORM	**(9+6)**
Condition for existence - Transforms of Elementary functions –Basic Properties- First & Second Shifting Theorems (Statement only) –Transforms of derivatives and integrals- Transform of periodic functions - Initial and Final value Theorems. Inverse Laplace transforms -Convolution theorem (Statement only) –Solution of linear second order Ordinary differential equations with constant coefficients using Laplace transforms.	
TOTAL (L: 45+T:30) = 75 PERIODS	

Note : Simulation of Engineering Problems (Qualitative Analysis) using open source software

TEXT BOOKS:

1. Dr. B. S. Grewal, "Higher Engineering Mathematics", 42nd ed., Khanna publications, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th ed., John Wiley & sons, 2013.
3. Veerarajan.T, "Engineering Mathematics for Semester I & II", 3rd ed., Tata McGraw Hill,2014.

REFERENCES:

1. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics: Sem-II", 5th ed., Laxmi Publications.2011.
2. Kandasamy .P, Thilagavathy .K, Gunavathy .K, "Engineering Mathematics for first Year", 9th Rv. ed. S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7th ed., Wiley India, (2007).

17PYB04 APPLIED PHYSICS *(Common to CSE & IT Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : 17PYB02		**QUESTION PATTERN : TYPE - 1**			

Course Objectives and Outcomes

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To provide the basic ideas in electrical conduction, conductors, semiconductors and nano technology	**1.1**	The students will be able to acquire knowledge about electron theory of metals and conductivity	**a,b,l**
2.0	To understand the fundamental concepts in solid state physics	**2.1**	The students will be able to distinguish between conductors, semiconductors and super conductors	**a,b,d,l**
3.0	To provide the basic knowledge in luminescence and optoelectronic devices	**3.1**	The students will be able to understand the magnetism and its applications	**a,c,d,l**
4.0	To develop logical thinking in designing of sensors compatible with computers	**4.1**	The students will be able to design various optoelectronic devices	**a,b,c,d,l**
5.0	To update the recent development in modern engineering materials	**5.1**	The students will be able to aware of recent trends in nanotechnology	**a,c,d,l**

UNIT I - CONDUCTING MATERIALS	**(9)**

Electron theories of conductivity - postulates of classical free electron theory- derivation of electrical conductivity of metals (Drude- Lorentz theory) - merits and demerits. Derivation of thermal conductivity – Weidman-Franz law- verification. Fermi energy - Importance of Fermi energy - Fermi-Dirac distribution function and its variation with temperature - density of energy states- calculation of density of electron.

UNIT II - SEMICONDUCTING MATERIALS & SUPERCONDUCTING MATERIALS	**(9)**

SEMICONDUCTORS: 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.

SUPERCONDUCTIVITY: Properties - Types of super conductors – BCS theory of superconductivity – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT III - MAGNETIC MATERIALS	**(9)**

Origin of magnetic moment – Bohr magneton – Types of magnetic materials – Domain theory – Hysteresis – soft and hard magnetic materials. Ferrites – applications – magnetic recording and readout – tapes, floppy and magnetic disc drives.

UNIT IV - OPTICAL DEVICES	(9)
Optical properties of semiconductor- Excitons-traps-colourcentre- Types of colourcentres- luminescence-fluorescence and phosphorescence-liquid crystal displays-dynamic scattering display-twisted nematic crystal display - Light emitting diodes- solar cell.	
UNIT V - MODERN ENGINEERING MATERIALS & NANOTECHNOLOGY	**(9)**
Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA. Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: fabrication – arc method – pulsed laser deposition –structure – properties and application.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. V.Rajendran, “Engineering Physics”, Tata McGraw- Hill, New Delhi.2011.
2. P.K.Palanisami, “Physics for Engineers-Volume I”, Scitech publications (India) Pvt. Ltd, Chennai, 2002.

REFERENCES:

1. Jacob Millman, Charistos C Halkilas, SatyabrataJit, “Electronic Devices & Circuits”, Tata McGraw Hill Education Private Limited, 3rd ed., 2010.
2. Ben G.Streetman, Sanjay Banerjee, “Solid State Electronic Devices”, Pearson Education, 5th ed., 2006.
3. G.Senthil Kumar, N.Iyandurai, “Physics-II”, VRB Publishers, Revised Edition, 2005-2006.
4. S.O. Pillai, “Solid State Physics”, New Age International Publications, New Delhi, 2010.
5. Dr. Y. Aparna & Dr. K. Venkateswara Rao , “Laboratory Manual of Engineering Physics”, V.G.S Publishers.

17CYB04 – CHEMISTRY FOR COMPUTER ENGINEERS *(Common to CSE & IT Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**2**	**4**
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**				
Course Objectives and Outcomes					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the principles of water characterization and treatment methods	**1.1**	The students will be able to apply knowledge of fundamental principles of chemistry	**a,b,c,f,g,i,j,k,l**	
2.0	To introduce the basic concepts of electrode potential and batteries	**2.1**	The students will be able to define and solve engineering problems, including the utilization of creative and innovative skills	**a,b,c,d,f,g**	
3.0	To understand the principles and applications of corrosion	**3.1**	The students will be able to gain practical experience with chemical process equipment as well as to analyze and interpret data	**a,b,d,i**	
4.0	To provide the knowledge of surface chemistry.	**4.1**	The students will be able to understand the impact of engineering solutions in a global, economic, environmental and societal content	**a,b,c,g**	
5.0	To study about the e-waste and its management.	**5.1**	The students will be able to understand the management of electronic waste	**a,b,c,k**	

UNIT I - WATER TECHNOLOGY	**(9)**
Hardness - types - estimation by EDTA method - Domestic water treatment - disinfection methods (chlorination, ozonation and UV treatment) - Boiler troubles (scale, sludge, priming, foaming and caustic embrittlement) -Internal conditioning(carbonate, phosphate and calgon) - External conditioning - demineralization process - desalination - reverse osmosis method.	
UNIT II - ELECTROCHEMISTRY	**(9)**
Electrochemistry - electrode potential - Nernst equation and problems - Reference electrode - standard hydrogen electrode - calomel electrode - potentiometric titration (redox) - conductometric titration (strong acid – strong base) - Batteries - types - lead acid battery – fuel cell – hydrogen and oxygen fuel cell.	
UNIT III - CORROSION SCIENCE	**(9)**
Corrosion - definition – types - chemical and electrochemical corrosion (mechanism) – Galvanic corrosion – Differential aeration corrosion - Pitting corrosion – Factors influencing corrosion- Corrosion control - sacrificial anode method.	
UNIT IV - CHEMICAL KINETICS AND SURFACE CHEMISTRY	**(9)**
Order of a reaction (definition) - kinetics of first order reaction – acid catalyzed hydrolysis of ester, - kinetics of second order reaction – base catalysed hydrolysis of ester - Arrhenius equation - effect of temperature on reaction rate - Surface chemistry: Adsorption - types of adsorption - Langmuir adsorption isotherm – role of adsorption in catalytic reactions.	
UNIT V - E – WASTE AND ITS MANAGEMENT	**(9)**
E- Waste – Definition – sources of e-waste – hazardous substances 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.	

LIST OF EXPERIMENTS

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of chloride content of water sample by argentometric method.
4. Conductometric titration of strong acid vs strong base.
5. Estimation of iron content of the given solution using potentiometer.

TOTAL (L:45+P:30) = 75 PERIODS

TEXT BOOKS:

1. J. Glynn Henry and Gary W. Heinke, "Environmental Science and Engineering", Pretice Hall of India, 2014.
2. P.C. Jain and Monica Jain, "Engineering Chemistry",Vol I & II, Dhanpat Rai Pub, Co., New Delhi,15th ed., 2015.

REFERENCES:

1. S.S. Dara, "A Text book of Engineering Chemistry", S.Chand & Co. Ltd., New Delhi, 2014.
2. J. Glynn Henry and Gary W.Heinke ,"Environmental Science and Engineering", Pretice Hall of India, 2014
3. "Electroplating, Anodizing and Metal treatment", Hand book, NIIR board, Delhi, 2004.
4. Ramachandra, T. V. (2013) "Management of Municipal Solid Waste", TERI Press, New Delhi.

17CSC03 STRUCTURED PROGRAMMING *(Common to CSE & IT Branches)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**
PRE REQUISITE : NIL	**QUESTION PATTERN : TYPE - 1**		

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To know the correct and efficient ways of solving problems.	**1.1**	The student will be able to understand the basic terminology used in computer programming.	**a,b,c,d,e,h,j,k,l**
2.0	To learn the basics of C declarations, operators and expressions.	**2.1**	The student can use different data types and operators in a computer program.	**a,b,c,d,e,h,i,j,k,l**
3.0	To work on all the elementary statements (Loop, Branch).	**3.1**	The student will be able to design programs involving decision structures and loops.	**a,b,c,d,e,h,i,j,k,l**
4.0	To learn the manipulation of arrays and strings	**4.1**	The student will be able to write programs using arrays and strings.	**a,b,c,d,e,h,i,j,k,l**
5.0	To learn the manipulation of functions	**5.1**	The student will be able to develop programs using functions by different parameter passing techniques.	**a,b,c,d,e,h,i,j,k,l**

UNIT I -OVERVIEW OF C	**(9)**
Introduction to C - Structure of C program - Programming Rules - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions	
UNIT II -CONTROL STRUCTURES	**(9)**
Managing Input and Output operations - Decision Statements: if Statements - if-else Statement - Nested if-else - if-else-if ladder -goto statement – switch statement - nested switch case - Loop Control: for loop - while loop - do while loop - Nested Loop Statements - break and continue statement	
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 BOOK:
1. Ashok N. Kamthane, “Programming in C”, 2nd ed., Pearson Education, 2013.
REFERENCES:
1. YashavantKanetkar, “Let us C”, BPB publications, New Delhi, 3rd ed., 2011. 2. PradipDey, ManasGhosh, “Fundamentals of Computing and Programming in C”, 1st ed., Oxford University Press, 2009. 3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, 2nd ed., Tata McGraw-Hill, 2006. 4. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, 4th Reprint, 2007.

17ECC04 - BASICS OF ELECTRONICS ENGINEERING *(Common to CSE & IT Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN : TYPE - III**				
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives		**Course Outcomes**		**Related Program outcomes**		
1.0	To make students to learn and understand the basics of Electrical circuits.	**1.1**	The Students can apply the Ohm's law and Kirchhoff's law and investigates the behavior of electric circuits by analytical techniques.	**a,b,c,d**	
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.	**a,b,c,d**	
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	**a,c,e**	
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	**a,c,e,f,g**	
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.	**a,c,f,g**	

UNIT I - BASIC CIRCUITS ANALYSIS	**(9)**
AC & DC : Current, Voltage, Power - Nodes, Paths, Loops and Branches; Ohm's Law – Kirchhoff's laws-Single loop circuit –Single Node Pair- circuit – Series and parallel connected independent sources- Resistors in series and Parallel-Current and voltage division.	
UNIT II - NETWORK THEOREMS FOR DC AND AC CIRCUITS	**(9)**
Source transformation – Mesh analysis-Node Analysis - Thevenins and Norton Theorem – Superposition Theorem – Maximum power transfer theorem.	
UNIT III - SEMICONDUCTOR DEVICES	**(9)**
Passive Components, PN junction diode - Diffusion and Drift Current – Zener diode - Zener Regulator - 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 and π (CLC), Introduction to amplifiers, Applications of Amplifier, UPS	
UNIT V - TRANSDUCERS, MEASURING INSTRUMENTS AND DIGITAL CIRCUITS	**(9)**
LED, Piezo electric Transducers, LCD, Moving Coil and Moving Iron Instrument, Digital Voltmeter, 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 ed., Tata McGraw Hill publishers, New Delhi, 2013.
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill 3rd ed. 2013.

REFERENCES:

1. Gupta.J.B, "Electronic Devices and Circuits," S. K. Kataria & Sons, 2009.
2. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
3. Nageswara Rao.T, "Circuit Theory", A.R. Publications, Chennai, 2014.

17CSP03 STRUCTURED PROGRAMMING LABORATORY *(Common to CSE & IT Branches)*					
			L	**T**	**P**	**C**
			0	**0**	**4**	**2**
PRE REQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program 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 implement programs using decision making statements and looping	**a,b,c,d,j**	
2.0	To study, analyze and understand concepts of arrays and functions in 'C'.	**2.1**	The student will be able to write simple programs on arrays of different dimensions.	**a,b,d**	
3.0	To learn the importance of recursive function and pointers.	**3.1**	The student will be able to develop function programs using recursion and pointers.	**a,b,c,d,i,l**	
4.0	To get knowledge of structures and unions in C	**4.1**	The student will be able to design structure and union programs	**a,b,c,d,i,k,l**	
5.0	To gain experience in handling files and allocate memory to a program dynamically.	**5.1**	The student will be able to handle memory locations manually using dynamic memory allocation functions	**a,b,c,d,f,i,k,l**	

C-Programming:

1. Program Using Operators, Expressions and IO formatting
2. Program Using Decision Making
3. Program Using Looping
4. Program Using Arrays
5. Program Using Strings
6. Program Using Functions
7. Program Using Recursion
8. Program Using Pointers
9. Program Using Structure and Union
10. Program Using files
11. 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:

- Compiler – C

TOTAL (P:60) = 60 PERIODS

17ECP02 – ELECTRONICS LABORATORY *(Common to CSE & IT Branches)*					
			L	**T**	**P**	**C**
			0	**0**	**4**	**2**
PREREQUISITE :NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To make students to learn and practice the basics of Semiconductor Diodes.	**1.1**	The Students can be able to analyze the characteristics of diodes and transistors.	**a,b,e,k**	
2.0	To enable the student to analyze the characteristics of BJT,FET and UJT	**2.1**	The Students will be able to evaluate the characteristics of electronic devices such as BJT,FET and UJT	**a,b,f,k**	
3.0	To provide the student with practice in the experimental setup of basic electronic circuits.	**3.1**	The Students will be able to verify the Half wave and Full wave Rectifier.	**a,b,j,l**	
4.0	To make the students to learn and practice with measurement of electrical networks.	**4.1**	The students will be able to verify the theorems such as Thevenin's theorem, Norton theorems, KVL and KCL	**a,b,d**	
5.0	To motivate the students to implement the project using electronic digital devices.	**5.1**	The Students will be able to verify the Logic Gates.	**a,b,c,g**	

LIST OF EXPERIMENTS:

1. Characteristics of PN junction diode.
2. Characteristics of Zener diode.
3. Input-Output characteristics of common emitter configuration.
4. FET characteristics.
5. UJT characteristics.
6. Verification of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR)
7. Verification of Thevenin's theorem.
8. Verification of Norton's theorem.
9. Verification of KVL, KCL.
10. Verification of Logic Gates

TOTAL (P: 60) = 60 PERIODS

17GEP02 INTERPERSONAL VALUES *(Common to All Branches)*					
			L	**T**	**P**	**C**
			0	**0**	**2**	**0**
PRE REQUISITE : 17GEP01					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To know interpersonal values	**1.1**	The students will be able to develop a healthy relationship & harmony with others	**a, f**	
2.0	To train the students to maneuver their temperaments.	**2.1**	The students will be able to practice respecting every human being	**a, g**	
3.0	To achieve the mentality of appreciating core values of a person.	**3.1**	The students will be able to practice to eradicate negative temperaments	**a, c**	
4.0	To analyze the roots of problems and develop a positive attitude about the life.	**4.1**	The students will be able to acquire Respect, Honesty, Empathy, Forgiveness and Equality	**a, c, f**	
5.0	To understand the effects of physical activities on mental health.	**5.1**	The students will be able to practice Exercises and Meditation to lead a healthy life and Manage the cognitive abilities of an Individual	**a, f**	

UNIT I - INTRODUCTION	**(9)**
Introduction to interpersonal values – Developing harmony with others –Healthy relationship – Need & importance of interpersonal values for dealing with others and team - Effective communication with others.	
UNIT II - MANEUVERING THE TEMPERAMENTS	**(9)**
From Greed to Contentment - Anger to Tolerance -Miserliness To Charity – Ego to Equality - Vengeance to Forgiveness.	
UNIT III - CORE VALUE	**(9)**
Truthfulness - Honesty –Helping–Friendship – Brotherhood – Tolerance –Caring & Sharing – Forgiveness – Charity – Sympathy — Generosity – Brotherhood -Adaptability.	
UNIT IV - PATHWAY TO BLISSFUL LIFE	**(9)**
Signs of anger – Root cause – Chain reaction – Evil effects on Body and Mind – Analyzing roots of worries – Techniques to eradicate worries.	
UNIT V - THERAPEUTIC MEASURES	**(9)**
Spine strengthening exercises - Nero muscular breathing exercises - Laughing therapy - Mindfulness meditation.	
TOTAL (L: 30) = 30 PERIODS	

TEXT BOOKS:

1. Interpersonal Skills Tutorial (Pdf Version) – Tutorials Point
2. www.tutorialspoint.com/interpersonal_skills/interpersonal_skills_tutorial.pdf
3. Interpersonal Relationships At Work - Ki Open Archive – Karolinska.
4. www.publications.ki.se/xmlui/bitstream/handle/10616/39545/thesis.pdf?sequence=1
5. Values Education for Peace, Human Rights, Democracy – UNESCO. www.unesdoc.unesco.org/images/0011/001143/114357eo.pdf
6. Maneuvering Of Six Temperaments - Vethathiri Maharishi. www.ijhssi.org/papers/v5(5)/F0505034036.pdf
7. The Bliss of Inner Fire: Heart Practice of the Six. – Wisdom Publications - www.wisdompubs.org/sites/.../Bliss%20of%20Inner%20Fire%20Book%20Preview.pdf

17MYB04 PROBABILITY AND STASTISTICS *(Common to CSE,AI&DS and IT Branches)*					
		L	**T**	**P**	**C**
		2	**2**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – IV**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	Acquire knowledge of the random variable and moments & moments generating functions.	**1.1**	The students will be able to infer expectation, variance, standard deviation moments and moment generating function for discrete and continuous random variables.		**a,b,l**
2.0	Aware the knowledge of applications of discrete & continuous distributions.	**2.1**	The students will be able to apply the concept of expectation and moment generating functions to discrete and Continuous distributions and find the probability values for the defined distributions.		**a,b,e,l**
3.0	Provide the knowledge of transformation of random variables.	**3.1**	The students will be able to Acquire skills in handling situations involving more than one random variable and functions of random variables		**a,b,l**
4.0	To get knowledge on types of hypothesis tests.	**4.1**	The students will be able to select a hypothesis testing method for the given numerical set of data to analyze the significance		**a,b,d,e,l**
5.0	To understand the knowledge of design of experiments.	**5.1**	The students will be able to apply analysis of Variance for the data set of selected number factors for analyzing the significance.		**a,b,d,e,l**

UNIT I - PROBABILITY AND RANDOM VARIABLES	**(6 + 6)**
Random variables-Probability mass function – Probability density function – Properties - Moments –Moment generating functions.	
UNIT II - STANDARD DISTRIBUTIONS	**(6 + 6)**
Discrete distributions: Binomial, Poisson and Geometric- Continuous distribution: Uniform, Exponential and normal distributions.	
UNIT III - TWO DIMENSIONAL RANDOM VARIABLES	**(6 + 6)**
Joint distributions-Marginal and conditional distributions-Covariance-Correlation and Regression.	
UNIT IV - TESTING OF HYPOTHESIS	**(6 + 6)**
Sampling Distributions-Testing of hypothesis for mean, variance. t -distribution, F – distribution- Chi-square - Test for independence of attributes and Goodness of fit.	
UNIT V - DESIGN OF EXPERIMENTS	**(6 + 6)**
Analysis of variance- Completely randomized design - Randomized block design - Latin square design.	
TOTAL (L:30+T:30) = 60 PERIODS	

TEXT BOOKS:

1. Veerarajan.T, "Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks", 4th ed. ,Tata McGraw-Hill, New Delhi 2016.
2. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi-2014.

REFERENCES:

1. Allen, O. Arnold, "Probability, Statistics and Queuing Theory with Computer Applications ", 2nd ed., Elsevier, New Delhi, 1990.
2. Taha, H.A., "Operations Research - An Introduction", 8th ed., Pearson Education, New Delhi, 2008.
3. Trivedi, S.K, "Probability and Statistics with Reliability, Queuing and Computer Science applications", 2nd Ed. John Wiley & Sons, New Delhi, 2002.
4. Gross, Donald and Harris, M. Carl," Fundamentals of Queuing Theory", 3rd ed., Wiley Publications, New Delhi, 1998.

17AIC01 - DATA STRUCTURES					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : 17CSC03		**QUESTION PATTERN : TYPE – 1**			
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To impart the basic concepts of data structures and algorithms.	**1.1**	The students will be able to understand the basic concepts of data structures and algorithms.		**a,b,c,h,k,l**
2.0	To understand the implementation of all types list with all different operations	**2.1**	The students will be able to Exemplify and implement how linked list can be implemented to manage the memory using static and dynamic allocations.		**a,b,c,h,k,l**
3.0	To efficiently implement the operations of stack and queue	**3.1**	The students will be able to understand and distinguish the conceptual and applicative differences in stack and queue.		**a,b,c,h,k,l**
4.0	To efficiently implement solutions for specific problems by non linear structures	**4.1**	The students will be able to design various trees concepts by using appropriate data structures.		**a,b,c,d,h,k,l**
5.0	To understand graph with different shortest path algorithms	**5.1**	The students will be able to Understand complex data structures like graph and its traversal with algorithms.		**a,b,c,d,g, h,k,l**

UNIT I - INTRODUCTION TO DATA STRUCTURES	**(9+3)**
Need for Data Structures - Types of Data Structures - Abstract Data Type - Primitive and Non Primitive Data structures - Algorithms – Efficiency- Characteristics of Algorithms - Designing recursive algorithms - Recursive examples – Psuedo code.	
UNIT II - LINEAR DATA STRUCTURES - LIST	**(9+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 Manipulation- All operations (Insertion, Deletion, Merge, Traversal)	
UNIT III - LINEAR DATA STRUCTURES – STACK, QUEUE	**(9+6)**
Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – applications of queues	
UNIT IV - NON LINEAR DATA STRUCTURES - TREE	**(9+6)**
Definitions - Binary Trees - The Search tree ADT – Binary Search Trees – AVL Tree – Tree Traversals – B-Tree – B+ Tree - Priority Queues (Heap) – Model – simple implementations of Binary Heap.	
UNIT V – GRAPHS	**(9+6)**
Definitions – Representation of graph – Graph traversal: Depth first search –Breadth first search – Topological Sort - Shortest Path Algorithm: Unweighted Shortest paths – Dijkstra's Algorithm- Minimum Spanning Tree: Prim's Algorithm – Kruskal's Algorithm.	
TOTAL (L:45+P:30) = 75 PERIODS	

LIST OF EXPERIMENTS:

1. Implementation of programs using Arrays vs Lists.
2. Implementation of linked list and its operations.
3. Write a program that implement stack and its operations.
4. Write a program that implement Queue and its operations.
5. Implementation of binary search tree traversals (Inorder,Preorder and Postorder)
6. Implementation of graph traversal techniques BFS and DFS.
7. Implementation of Prim's Algorithm

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos, Printers – 3 Nos.

Software:

- OS – Windows / UNIX Clone Open Source Software Python/ C

TEXT BOOKS:

1. Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.
2. Venkatesan R, S.Lovelyn Rose , "Data Structures", 2 nd Edition, Wiley India Pvt Ltd, 2019

REFERENCES:

1. Advanced Algorithms and Data By Marcello La Rocca, Marcello La Rocca · 2021, ISBN:9781617295485, 1617295485,Published:29 June 2021
2. Data Structures,By E Balagurusamy, E Balagurusamy , Published:13 August 2019- Publisher:McGraw-Hill Education
3. Data Structures and Algorithms,An Easy Introduction, By Rudolph Russell, Rudolph Russell · 2018
4. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

E BOOKS AND ONLINE LEARNING MATERIALS:

1. http://users.cis.fiu.edu/~weiss/
2. http://nptel.ac.in/courses/10610206

17ITC01 – OOPS using JAVA *(Common to CSE,AI&DS and IT Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To impart fundamental concepts of OOP using Java	1.1	The students will be able to explain the basics of object oriented concepts of java.	**a,b,e,g,h,i,j,k,l**	
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.	**a,b,c,d,e,f,g,h ,i,j,k,l**	
3.0	To explore about the exception handling mechanism.	3.1	The students will be able to construct applications with exception handling.	**a,b,c,d,e,f,g,h,i,j ,k,l**	
4.0	To understand threads and collection concepts.	4.1	The students will be able to build applications using threads and collection framework.	**a,b,c,d,e,f,g,h,i,j ,k,l e**	
5.0	To know about GUI components and database connectivity.	5.1	The students will be able to build simple java application with neat GUI and database connectivity.	**a,b,c,d,e,f,g,h,i,j ,k,l**	

UNIT I – INTRODUCTION TO OOP USING JAVA	**(9)**
Elements of Object Oriented Programming – Overview of JAVA – Data types, Variables and Arrays –Operators – Control statements – Introduction to Classes and methods – Keywords: Static, final, this – String – Wrapper Class.	
UNIT II - INHERITANCE, PACKAGES AND INTERFACES.	**(9)**
Inheritance Basics – Using Super – Constructor Call – Method Overriding – Dynamic Method Dispatch – Using Abstract Classes – Using Final with Inheritance – Packages – Access Protection – Interfaces – Exploring Java.io package – File – Byte Streams – Character Streams.	
UNIT III - EXCEPTION HANDLING AND COLLECTIONS	**(9)**
Exception – Handling Fundamentals – Exception Types – Using try and catch – Multiple catch Clauses- Nested try Statements – throw, throws, finally – Collections Overview – Collection Interfaces – Collection Classes.	
UNIT IV – THREADS	**(9)**
Java Thread Model – Main Thread – Creating a Thread - Creating Multiple Thread –Using isAlive() and join() – Thread Priorities – synchronization – Inter thread Communication – Suspending, Resuming and stopping threads – Using Multithreading.	
UNIT V – GUI WITH DATABASE CONNECTIVITY	**(9)**
Applet Basics – AWT classes – Frames – Graphics – AWT controls- Layout managers- Swing – Swing Components: JApplet – Icons and Labels – Text Fields – Buttons – Combo Boxes – Tabbed panes – Scroll Panes – Trees – Tables JDBC: Connecting to querying and manipulating the database(Create, Insert, Update ,Delete).	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Herbert Schildt, “Java: The complete Reference”, McGraw Hill Education 9th ed, 2017.
2. R.M. Menon, “Expert Oracle JDBC Programming”, Apress 1st ed., 2005.

REFERENCE:

1. Cay. S. Horstmann, Gary Cornell, “Core Java-JAVA Fundamentals”, Prentice Hall, 10th ed., 2016.

17AIC02 - INTRODUCTION TO ARTIFICIAL INTELLIGENCE					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	Understand the basic concepts of intelligent agents	1.1	To paraphrase Artificial Intelligence, intelligent agents, and apply blind search to solve problems.	**a,b,j,k,e**	
2.0	Develop general-purpose problem solving agents.	2.1	To demonstrate the effectiveness of heuristics in informed search methods.	**a,b,j,k**	
3.0	Employ AI techniques to solve some of today's real world problems.	3.1	To apply game playing in problem solving.	**a,b,d,i,j**	
4.0	To analyze the agent activities based on knowledge and logical aspects.	4.1	To make use of propositional logic and first order logic in knowledge-based reasoning.	**a,c,i,j**	
5.0	To introduce the most basic concepts, methods, algorithms for planning to achieve the goals.	5.1	To apply knowledge representation and planning to real world problems.	**a,b,j,k,f,l**	

UNIT I – INTRODUCTION	**(9)**
Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents– Problem Solving agents – search algorithms – uninformed search strategies.	
UNIT II – PROBLEM SOLVING	**(9)**
Heuristic search strategies – heuristic functions–Local search and optimization problems – local search in continuous space – search with non- deterministic actions – search in partially observable environments – online search agents and unknown environments.	
UNIT III – GAME PLAYING AND CSP	**(9)**
Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games–Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.	
UNIT IV –LOGICAL AGENTS	**(9)**
Knowledge-based agents – propositional logic – propositional model checking – agents based on propositional logic– First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining.	
UNIT V – KNOWLEDGE REPRESENTATION AND PLANNING	**(9)**
Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories –Classical planning – algorithms for classical planning – time, schedule, and resources –hierarchical planning – Planning and acting in non-deterministic domains.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOK:

1. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Fourth Edition, Pearson Education, 2020.

REFERENCES:

1. Khemani D., “A First Course in Artificial Intelligence”, 1st Edition, 9th reprint, McGraw Hill Education (India) Private Limited, 2019.
2. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence: a logical approach”, Oxford University Press, 2004.
3. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, 4th ed., Pearson Education, 2002.
4. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases - by Dennis Rothman, 2018

17CSC05 OPERATING SYSTEMS
(Common to CSE , AI&DS and IT Branches)

L	T	P	C
3	0	0	3

PRE REQUISITE : NIL | **QUESTION PATTERN: TYPE - I**

COURSE OBJECTIVES AND OUTCOMES:

	Course objectives		Course outcomes	Related program outcomes
1.0	To learn about the basics of operating system hardware, peripherals and troubleshooting.	**1.1**	The students will be able to identify the systematic approach of the system.	**a,b,k**
2.0	To transfer knowledge about how the process scheduling work together to perform computing tasks.	**2.1**	The students will be able to develop real-time operating systems for task scheduling.	**a,b,c,f,g,k,l**
3.0	To learn the importance of memory in the operating system.	**3.1**	The students will be able to analyze the working of memory related hardware	**a,c,h,k,l**
4.0	To explore and demonstrate managing the disk and fills of operating systems	**4.1**	The students will be able to work on design and development of disk and file related hardware.	**a,b,c,j,k,l**
5.0	To study advanced security, authentication and production techniques of operating system	**5.1**	The students will be able to know the real time meaning of security and production in the field of operating system.	**a,c,d,f,j,k,l**

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, operating system structure, virtual machines, operating system generation, system boot.

UNIT II - PROCESS MANAGEMENT **(9)**

Process concept - process scheduling, operations on processes, inter process communication, examples of ipc systems, communication in client server systems; process scheduling - basic concepts, scheduling criteria, scheduling algorithms, thread scheduling, multiple-processor scheduling, operating-system examples, synchronization - the critical-section problem, semaphores, deadlock prevention, deadlock avoidance, deadlock detection.

UNIT III - MEMORY MANAGEMENT **(9)**

Memory management hardware - swapping, paging, segmentation, page replacement, allocation of frames, thrashing, memory mapped files, kernel memory.

UNIT IV - SECONDARY STORAGE MANAGEMENT **(9)**

Secondary storage structure - disk structure, disk attachment, disk scheduling, disk management, swap space management, raid structure, stable storage implementation; file system - file concept, access methods, directory and disk structure, file system mounting; file system implementation – structure, implementation, directory implementation, free space management; i/o systems – i/o hardware, application i/o interface, kernel i/o subsystem, transforming i/o requests to hardware operations.

UNIT V - PROTECTION AND SECURITY **(9)**

System protection - goals, principles, domain, access matrix, access control; system security – problem, threads, cryptography, user authentication, implementing security, firewall, computer security classification; case study: LINUX, Windows and Android.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Silberschatz, P.B. Galvin and G. Gagne, “Operating System Concepts”, 9th ed., 2019.

REFERENCE:

1. W. Stallings, “Operating Systems”, 8th ed., Prentice-Hall, 2014.

17CSC08 COMPUTER NETWORKS
(Common to CSE , AI&DS and IT Branches)

L	T	P	C
3	0	0	3

PRE REQUISITE : NIL	**QUESTION PATTERN : TYPE – 1**

COURSE OBJECTIVES AND COURSE OUTCOMES

	Course Objectives		Course Outcomes	Related Program Outcomes
1.0	To understand the concepts of data communications	**1.1**	The students will be able to familiarize with the Data Communication Concepts	**a,c,f,h,i,j,l**
2.0	To impart the fundamental concepts of Data Link Layer	**2.1**	The students will be able to implement the Data Link Layer Concepts	**a,b,c,e,i,l**
3.0	To gain exposure about Addressing and Routing Protocols	**3.1**	The students will be able to realize the need of Addressing and Routing	**a,b,c,d,e,i,j,l**
4.0	To get knowledge about services in Transport Layer	**4.1**	The students will be able to build a clear concern on Transport Layer Services	**a,b,c,d,e,i,j,l**
5.0	To learn about Application Layer functionalities	**5.1**	The students will be able to work with Application layer protocols	**a,b,c,d,e,i,j,l**

UNIT I – DATA COMMUNICATIONS	**(9)**
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)**
Error Detection and Error Correction – Introduction–Block coding – Linear block codes – cyclic codes – Checksum – Flow Control and Error control Protocols: Stop and Wait – Go back – N ARQ – Selective Repeat ARQ – Piggybacking – Random Access – CSMA/CD,CDMA/CA.	
UNIT III - NETWORK LAYER	**(9)**
Logical addressing – IPV4 – IPV6–Address mapping–ARP, RARP, BOOTP and DHCP–ICMP – Delivery, Forwarding and Unicast Routing protocols – Multicast Routing protocols.	
UNIT IV - TRANSPORT LAYER	**(9)**
Process to Process Delivery – User Datagram Protocol – Transmission Control Protocol – SCTP – Congestion Control – Quality of Service – Techniques to improve QoS.	
UNIT V - APPLICATION LAYER	**(9)**
Domain Name System – DDNS – TELNET – EMAIL – File transfer– HTTP – Network Management System – SNMP.	
	TOTAL (L:45) : 45 PERIODS

TEXT BOOK:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw–Hill, 4th ed., 2012.

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.

17ITP01- OOPS using JAVA LABORATORY
(Common to CSE , AI&DS and IT Branches)

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program Outcomes
1.0	To learn the basic concepts of the java programs.	1.1	The students will be able to design and develop java programs using object oriented programming concepts	**a,b,e,g,h,i,j,k,l**
2.0	To be familiar with the applications program concepts.	2.1	The students will be able to develop simple applications using package, multithreading, and generics concepts	**a,b,c,d,e,f,g, h,i,j,k,l**
3.0	To describe the key elements of GUI Programming applications.	3.1	The students will be able to create GUIs and event driven programming applications for real world problems	**a,b,c,d,e,f,g,h,i,j ,k,l**
4.0	To explore about the exception handling mechanism	4.1	The students will be able to construct applications with exception handling	**a,b,c,d,e,f,g,h,i,j ,k,l e**
5.0	To understand threads and collection concepts.	5.1	The students will be able to build applications using threads and collection framework	**a,b,c,d,e,f,g,h,i,j ,k,l**

LIST OF EXPERIMENTS:

1. Basic programming elements of Java (Arrays, String).
2. Programs using Static, final and this keywords.
3. Programs illustrating the implementation of various forms of inheritance
4. Programs illustrating overloading and overriding methods in Java.
5. Programs to use packages and Interfaces in Java.
6. Develop a Java application using Exception handling.
7. Programs to create and synchronize multiple threads in Java.
8. Programs for collection framework.
9. Programs to use Swing Components.
10. Simple Java application with neat GUI and database connectivity.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE :

1. Java / Equivalent Compiler

HARDWARE:

1. Standalone desktops 30 Nos

TOTAL (L: 60) = 60 PERIODS

17AIP01- ARTIFICIAL INTELLIGENCE LABORATORY					
		L	T	P	C
		0	0	2	1
PRE REQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To design and implement different techniques to develop simple autonomous agents that make effective decisions in fully informed, and partially observable, settings.	1.1	The students will be able to implement simple PEAS descriptions for given AI tasks	**a,b,j,k,e**	
2.0	To apply appropriate algorithms for solving given AI problems.	2.1	The students will be able to develop programs to implement simulated annealing and genetic algorithms	**a,b,j,k**	
3.0	To Design and implement logical reasoning agents.	3.1	The students will be able to demonstrate the ability to solve problems using searching and backtracking	**a,b,d,i,j**	
4.0	To Design and implement agents that can reason under uncertainty.	4.1	The students will be able to implement simple reasoning systems using either backward or forward inference mechanisms	**a,c,i,j**	
5.0	To understand the Implementation of these reasoning systems using either backward or forward inference mechanisms.	5.1	The students will be able to choose and implement a suitable techniques for a given AI task	**a,b,j,k,f,l**	

LIST OF EXPERIMENTS

1. Develop PEAS descriptions for given AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP
8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE :

1. C++ or Java Software

HARDWARE:

2. Standalone desktops 30 Nos

TOTAL (L: 30) = 30 PERIODS

17GED01 – SOFT SKILLS – LISTENING AND SPEAKING					
			L	T	P	C
			0	0	2	0
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To recollect the functional understanding of basic grammar and its structure	**1.1**	The students will be able to apply the knowledge of basic grammar to classify the types of verbs and questions and to construct the sentences	**i,j,l**	
2.0	To acquire the listening skills through note completion, matching and multiple choice modes	**2.1**	The students will be able to develop the listening skills through note completion, matching and multiple choice modes	**i,j,l**	
3.0	To develop speaking skills through self introduction, short talk and topic discussion	**3.1**	The students will be able to organize a presentation on the given topic	**i,j,l**	

UNIT I - GRAMMAR	**(10)**
Tenses - Verb (Auxiliary and Modal) - 'Yes/No' Type Questions - Reported Speech - Gerund - Phrasal Verbs	
UNIT II – LISTENING	**(10)**
Part I : Note completion Part II: Matching Part III: Multiple Choice	
UNIT III -SPEAKING	**(10)**
Part I : Self Introduction Part II: Short talk on business topics Part III: Discussion in pairs	
TOTAL (P:30) : 30 PERIODS	

REFERENCES:

1. Murphy, Raymond, "Essential Grammar in Use", Cambridge University Press, UK, 2007
2. Whitby, Norman,"Business Benchmark Pre- Intermediate to Intermediate Preliminary, 2nd ed., Cambridge University Press, 2013.

17MYB08 DISCRETE MATHEMATICS (Common to CSE , AI&DS and IT Branches)					
		L	T	P	C
		2	2	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – IV**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program 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.		**a,b,d,l**
2.0	To gain knowledge about these discrete structures include 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.		**a,b,d,l**
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.		**a,b,d,l**
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.		**a,b,d,l**
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.		**a,b,d,l**

UNIT I - PROPOSITIONAL CALCULUS	**(6 + 6)**
Propositions-Logical connectives - Compound propositions - Conditional and biconditional propositions -Truth tables-Tautologies and Contradictions - Logical and Equivalences and implications – De Morgan's Laws - Normal forms - Rules of inference – Arguments - Validity of arguments.	
UNIT II - PREDICATE CALCULUS	**(6 + 6)**
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	**(6 + 6)**
Set Operations - Properties-Power set - Relations-Graph and matrix of a relation - Partial Ordering - Equivalence relation - Partitions – Functions - Types of functions - Composition of relation and functions-inverse functions.	
UNIT IV COMBINATORIC	**(6 + 6)**
Basics of counting - Counting arguments - Pigeonhole Principle - Permutations and Combinations - Recursion and recurrence relations - Generating Functions - Mathematical Induction – Inclusion – Exclusion	
UNIT V - LATTICES	**(6 + 6)**
Posets - Lattices as posets - Properties of lattices-Lattices as Algebraic systems – Sub lattices - Direct product and Homomorphism.	
TOTAL (L: 30+T:30) = 60 PERIODS	

TEXT BOOKS:

1. Tremblay J.P and Manohar R,"Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, New Delhi, Reprint 2010.
2. Veerarajan.T, "Discrete Mathematics with Graph Theory and Combinatorics", 4th ed., Tata McGraw Hill, New Delhi, 2008.

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 5th ed., Tata McGraw- Hill publications, New Delhi 2007.
2. Venkatraman M.K.,"Discrete Mathematics", the National Publishing Company, Chennai, 2007.
3. S.Santha, "Discrete Mathematics with Combinatorics and Graph Theory", 2010 Cengag Learning India Pvt. Ltd.
4. Swapan Kumar Sarkar,"A Text Book of Discrete Mathematics", S. Chand & Company Ltd., New Delhi.

17AIC03- INTRODUCTION TO THE DESIGN AND ANALYSIS OF ALGORITHMS					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : 17AIC01		**QUESTION PATTERN : TYPE – 1**			
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To know the fundamental concepts in algorithm analysis	**1.1**	The Student will be able to apply algorithm analysis techniques for a given algorithms		**a,b,c,d,l**
2.0	To gain knowledge about decrease and conquer technique	**2.1**	The Student will be able to design and analyze problems using decrease, transform and conquer techniques.		**a,b,c,d,l**
3.0	To get familiarized with dynamic and greedy algorithm design techniques	**3.1**	The Student will be able to identify optimal solution by applying dynamic techniques.		**a,b,c,d,f,i,k ,l**
4.0	To understand backtracking, Branch and bound techniques	**4.1**	The Student will be able to develop applications using backtracking, branch and bound techniques.		**a,b,c,d,f,i,k ,l**
5.0	To learn the different range of behaviors of algorithms	**5.1**	The Student will be able to summarize the knowledge about P and NP problems.		**b,c,d,e,i,k,l**

UNIT I – INTRODUCTION AND DIVIDE & CONQUER TECHNIQUE	**(9)**
Algorithm Analysis Framework – Asymptotic Notations and Basic Efficiency Classes – Analysis of Non-recursive and Recursive Algorithms – Divide and Conquer: Merge Sort – Quick Sort – Strassen's Matrix Multiplication.	
UNIT II - DECREASE AND CONQUER TECHNIQUE	**(9)**
Depth First Search and Breadth First Search – Decrease and Conquer: Insertion sort – Binary Search – Selection Problem – Transform and Conquer: Presorting – Balanced Search Trees: AVL tree – 2-3 Tree.	
UNIT III - DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	**(9)**
Dynamic Programming: Knapsack Problem – Optimal Binary Search Trees – Warshall's Algorithm – Floyd's Algorithm – Greedy Technique: Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees and Codes.	
UNIT IV - BACKTRACKING,BRANCH AND BOUND TECHNIQUES	**(9)**
Backtracking: 8-Queens – Hamiltonian Circuit – Sum of Subset – Graph Coloring – Branch and Bound: Assignment Problem – Knapsack Problem – Traveling Salesman Problem.	
UNIT V - NP PROBLEMS AND APPROXIMATION ALGORITHMS	**(9)**
P and NP Problems – NP Complete Problems – Approximation Algorithms for NP Hard Problems –Travelling Salesman Problem: Nearest Neighbor Algorithm – Multifragment Heuristic Algorithm – Knapsack Problem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Anany Levitin, Introduction to The Design And Analysis Of Algorithms, Pearson Education, India, Third Edition, 2017. 2. A.V.Aho, J.E. Hopcroft and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education Asia, India, Fourth Edition, 2010.
REFERENCES:
1. Harsh Bhasin, "Algorithms Design and Analysis ", Oxford university press, 2016. 2. S. Sridhar, "Design and Analysis of Algorithms ", Oxford university press, 2014.

17CSC07 - DATABASE MANAGEMENT SYSTEM (Common to CSE , AI&DS and IT Branches)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN : TYPE – 1**			
Course Objectives		**Course Outcomes**			**Related Program 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		**a,b,c,d,e,f,h,i,k,l**
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.		**a,b,c,d,e, i,k,l**
3.0	To know about normalization	**3.1**	The students will be able to normalize the database design.		**a,b,c,d,e,h,i,k,l**
4.0	To understand the storage structures and the queries Processing/optimization.	**4.1**	The students will be able to choose appropriate storage structure and optimize Queries.		**a,b,c,d,e,h,i,k,l**
5.0	To gain knowledge about transaction processing, concurrency control and recovery.	**5.1**	The students will be able to apply concepts of transaction processing, and concurrency control.		**a,b,c,d,e,f,h,k,l**

UNIT I - DATA BASE SYSTEM CONCEPT	**(9)**
Purpose of Database systems – Views of data – Database Languages - Database design – Database system architecture – Data models – Data Dictionary – Database Administration – Entity-Relationship model, EER Model.	
UNIT II - RELATIONAL DATABASE	**(9)**
Structure of Relational Database – Integrity Constraints – Relational Algebra – Relational Calculus – SQL – Views – Joins – Functions and Procedures – Triggers.	
UNIT III - DATABASE DESIGN	**(9)**
Functional Dependencies – Decomposition: Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.	
UNIT IV - PHYSICAL DATABASE DESIGN AND QUERY PROCESSING	**(9)**
Storage and file structure – Indexing and Hashing – Query Processing	
UNIT V -TRANSACTION PROCESSING	**(9)**
Transactions: Desirable properties of Transactions – Serializability – Concurrency Control: Lock-Based Protocols – Timestamp-Based Protocols – Validation-Based Protocols – Recovery systems.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, 6th ed., McGraw Hill, 2011.
REFERENCES:
1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, 5th ed., Pearson Education/Addison Wesley, 2007. 2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, 3rd ed., Pearson Education, 2007.

17AIC04- DATA ANALYTICS AND VISUALIZATION					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	Will gain knowledge in the basic concepts of Data Analysis	**1.1**	Apply the skills of data inspecting and cleansing.	**a,b,j,k,e**	
2.0	To acquire skills in data preparatory and preprocessing steps	**2.1**	Determine the relationship between data dependencies using statistics	**a,b,j,k**	
3.0	To learn the tools and packages in Python for data science	**3.1**	Can handle data using primary tools used for data science in Python	**a,b,d,i,j**	
4.0	To gain understanding in classification and Regression Model	**4.1**	Represent the useful information using mathematical skills	**a,c,i,j**	
5.0	To acquire knowledge in data interpretation and visualization techniques	**5.1**	Can apply the knowledge for data describing and visualization using tools.	**a,b,j,k,f,l**	

UNIT I – INTRODUCTION	**(9)**
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications	
UNIT II – DESCRIBING DATA	**(9)**
Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation.	
UNIT III – PYTHON FOR DATA HANDLING	**(9)**
Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables.	
UNIT IV- STANDARD SCORE AND DESCRIPING RELATIONSHIPS	**(9)**
Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – regression – regression line – least squares regression line – standard error of estimate.	
UNIT V - PYTHON FOR DATA VISUALIZATION	**(9)**
Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and III)
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Parts of chapters 2–4 for Units IV and V)

REFERENCES:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
2. Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O'Reilly Publisher Media.

17AIC05- MACHINE LEARNING					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To understand the basics of Machine Learning (ML)	**1.1**	The students will be able to explain the basics of ML	**a,b,c,d,e,i,k,l**	
2.0	To understand the methods of Machine Learning	**2.1**	The students will be able to explain various Machine Learning methods	**a,b,c,d,e,f,i,k,l**	
3.0	To know about the implementation aspects of machine learning	**3.1**	The students will be able to demonstrate various ML techniques using standard packages.	**a,b,c,d,e,f,i,k,l**	
4.0	To understand the concepts of Data Analytics and Machine Learning	**4.1**	The students will be able to explore knowledge on Machine learning and Data Analytics	**a,b,c,d,e,f,i,k,l**	
5.0	To understand and implement use cases of ML	**5.1**	The students will be able to apply ML to various real time examples	**a,b,c,d,e,f,i,k,l**	

UNIT I - I BASICS	**(9)**
Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.	
UNIT II – METHODS	**(9)**
Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Featurization	
UNIT III - MACHINE LEARNING IN PRACTICE	**(9)**
Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon's Machine Learning Tool Kit: Sagemaker	
UNIT IV – REGRESSION	**(9)**
Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics	
UNIT V - INFERENTIAL STATISTICS	**(9)**
Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020
2. John D. Kelleher, Brain Mac Namee, Aoife D' Arcy, Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies, MIT press,2015

REFERENCES:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publications, 2011
2. Stuart Jonathan Russell, Peter Norvig, John Canny, Artificial Intelligence: A Modern Approach, Prentice Hall, 2020
3. Machine Learning Dummies, John Paul Muller, Luca Massaron, Wiley Publications, 2021

17GEA01 ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING				
	L	T	P	C
	3	0	0	3
PRE REQUISITE : NIL	**QUESTION PATTERN: TYPE – IV**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To manage an Organization; to describe principles of macroeconomics to have the understanding of economic environment of Business.	**1.1**	The students will be able to know the importance of Engineering Economics and Principles of Micro and Macro Economics.	**a,b,c,e,l**
2.0	To understand the Market demand and supply analysis and the ways in which changes in these determinants affect equilibrium price and output	**2.1**	The students will be able to estimate the market position with the knowledge in demand forecasting and supply.	**a,b,c,e,l**
3.0	To know the production and cost function in various market condition.	**3.1**	The students will be able to develop and estimate cost for any project.	**a,b,c,e,l**
4.0	To determine the changes in price of the product, the effect of a price control in different market structure, taxation and services.	**4.1**	The students will be able to fix the price of the product with the knowledge in different market structure and taxation design.	**a,b,c,d,e,f,g,h, l,k,l**
5.0	To acquire a reasonable knowledge in Accounts; to analyze and evaluate Financial Statements.	**5.1**	The students will be able to analyze the financial statement to determine the optimal managerial decisions.	**a,b,c,d,e,f,g,h, l,k,l**

UNIT I - INTRODUCTION	**(9)**
Managerial Economics – Relationship with other disciplines, Firms – Types, Objectives and Goals, Managerial Decisions, Decision Analysis.	
UNIT II - DEMAND AND SUPPLY ANALYSIS	**(9)**
Demand – Types of Demand, Determinants of Demand, Demand Function, Demand Elasticity, Demand Forecasting. Supply – Determinants of Supply, Supply Function, Supply Elasticity.	
UNIT III - PRODUCTION AND COST ANALYSIS	**(8)**
Production Function – Returns to scale, Production Optimization, Isoquants, and Managerial uses of Production Function. Cost Concepts – Cost Function, Determinants of Cost, Estimation of Cost.	
UNIT IV – PRICING AND TAXATION	**(9)**
Determinants of Price, Pricing under different Objectives and different Market Structures, Price Discrimination, Pricing methods in practice. Tax Design: The Structure of Taxation – Taxation of goods and services.	
UNIT V - FINANCIAL ACCOUNTING, CAPITAL BUDGETING AND ACCOUNTING STANDARDS	**(10)**
Introduction to Financial, Cost and Management Accounting, Accounting Concepts and Conventions, Final Accounts, Investments – Evaluation of Investment Decision – Average Rate of Return, Payback Period, Net Present Value. Accounting Standard: History – International Financial Reporting Standards – Indian Accounting Standards.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Anjali Bagad, "Engineering Economics and Financial Accounting", Technical Publications 2nd Revised ed., 2011.
2. B. Senthil Arasu, J. Praveen Paul, "Engineering Economics and Financial Accounting", SchiTech Publication (India) Pvt. Ltd.

REFERENCES:

1. McGuigan, Moyer and Harris, "Managerial Economics; Applications, Strategy and Tactics", Thomson South Western, 10th ed., 2005.
2. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, New Delhi, 2007.

17CSP05 - DATABASE MANAGEMENT SYSTEM LABORATORY (Common to CSE , AI&DS and IT Branches)				
	L	T	P	C
	0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To design a database system.	**1.1**	The students will be able to define database with various integrity constraints.	**b,c,j**
2.0	To study the usage of DDL and DML commands.	**2.1**	The students will be able to working with various DDL, DML queries.	**b,c,d,g**
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	**a,b,d,e**
4.0	To know about normalization	**4.1**	The students will be able to do conceptual design using E-R model and normalize the design.	**a,b,c,k**
5.0	To work with database connectivity.	**5.1**	The students will be able to work with real time data base connectivity	**a,c,j,k**

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

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
Hardware: 1. 33 nodes with LAN connection or Standalone PCs **Software:** 2. Front End: Microsoft Visual Studio 6.0, Microsoft .NET Framework SDK v2.0, Java etc., 3. Back End : ORACLE / SQL SERVER / MYSQL
TOTAL (P: 60) = 60 PERIODS

17AIP02-MACHINE LEARNING LABORATORY					
		L	T	P	C
		0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions	**1.1**	The students will be able to implement procedures for the machine learning algorithms.	**a,b,c,d,e,i,k,l**
2.0	To implement spam mail detection using Support vector machine	**2.1**	The students will be able to design Java/Python programs for various Learning algorithms.	**a,b,d,e,f,i,k,l**
3.0	To implement supervised learning and their applications	**3.1**	The students will be able to apply appropriate Machine Learning algorithms to data sets.	**a,b,c,e,i,k,l**
4.0	To understand unsupervised learning like clustering and EM algorithms	**4.1**	The students will be able to Identify machine learning algorithms to solve real world problems.	**a,b,c,e,i,k,l**
5.0	To understand the theoretical and practical aspects of probabilistic graphical models.	**5.1**	The students will be able to apply machine learning algorithms to solve real world problems.	**a,b,c,d,e,i,k,l**

LIST OF EXPERIMENTS

1. Implement the concept of decision trees with suitable data set from real world problem and classify the data set to produce new sample.
2. Detecting Spam mails using Support vector machine
3. Implement facial recognition application with artificial neural network
4. Study and implement amazon toolkit: Sagemaker
5. Implement character recognition using Multilayer Perceptron
6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Choose best machine learning algorithm to implement online fraud detection.

TOTAL (P: 60) = 60 PERIODS

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

HARDWARE:
LAN System with 33 nodes (OR) Standalone PCs – 33 Nos,
SOFTWARE:
OS – Windows / UNIX Clone , Open Source Software – Python/Java with ML packages.

17GED02 SOFT SKILLS – READING AND WRITING				
	L	T	P	C
	0	0	2	0

PREREQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To recollect the functional understanding of parts of speech and basic grammar	**1.1**	The students will be able to apply the knowledge to identify the parts of speech and construct the sentences	**i,j,l**
2.0	To acquire the reading skills through cloze texts, matching and multiple choice modes	**2.1**	The students will be able to develop the reading skills through cloze texts, matching and multiple choice modes	**i,j,l**
3.0	To enhance the writing skills for a variety of purposes	**3.1**	The students will be able to interpret effectively through writing for a variety of purposes	**i,j,l**

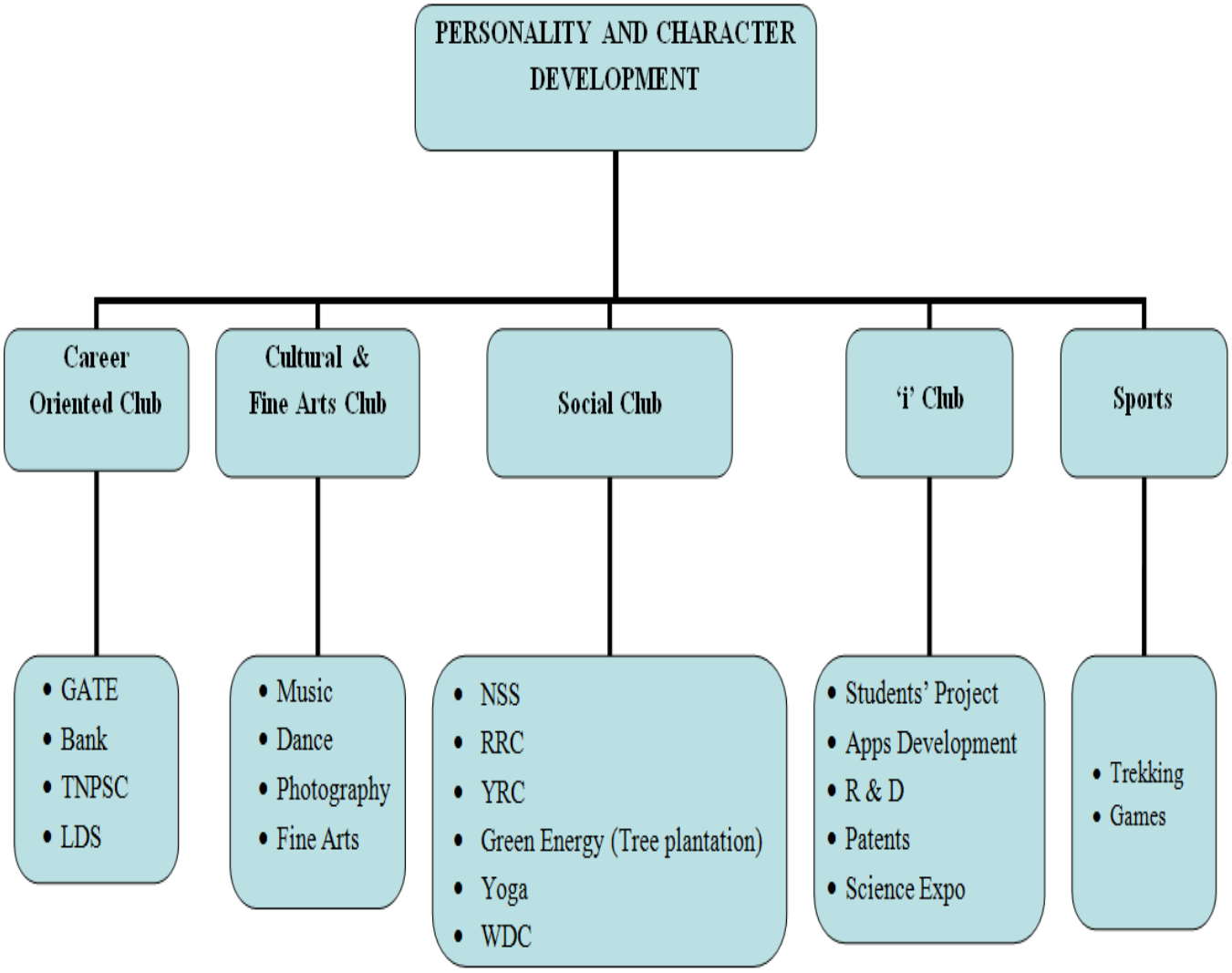
UNIT I - GRAMMAR	**(10)**
Articles - Adjectives - Conjunctions - Prepositions - Idioms & Phrases	
UNIT II – READING	**(10)**
Part I : Matching 7 sentences to four short texts Part II: Text with sentences missing Part III: Text with multiple choice questions Part IV: Text with multiple choice gaps Part V: Identification of additional unnecessary words in text	
UNIT III -WRITING	**(10)**
Part I : E-mail writing, Writing short notes, Memo, Agenda & Minutes Part II: Report Writing, Complaint Letter, Writing Proposals	
	TOTAL (P:30) : 30 PERIODS

REFERENCES:

1. Murphy, Raymond, “Essential Grammar in Use”, Cambridge University Press, UK, 2007.
2. Whitby, Norman, “Business Benchmark Pre - Intermediate to Intermediate Preliminary”, 2nd ed., Cambridge University Press, 2013

17GED03 - PERSONALITY AND CHARACTER DEVELOPMENT

L	T	P	C
0	0	1	0



***LDS - Leadership Development Skills**

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

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

TOTAL [2 x (P: 15)]: 30 PERIODS
(Cumulatively for Two Semesters)

17AIC06 NEURAL NETWORKS AND DEEP LEARNING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To use artificial neural network concepts to solve real world problems	**1.1**	The student will be able to use artificial neural network concepts	**a,b,c,e,l**	
2.0	To solve simple real world problems using deep neural networks	**2.1**	The student will be able to solve and train deep neural networks	**a,b,c,e,l**	
3.0	To use the concepts of RBF and boltzman machines to solve real world problems	**3.1**	The student will be able to explain the concepts of RBF and boltzman machines as non-linear classifier	**a,b,c,e,l**	
4.0	To explicate the concepts of recurrent neural networks	**4.1**	The student will be able to analysis the concepts of recurrent neural network and convolution neural networks.	**a,b,c,e,l**	
5.0	To learn the advanced techniques of deep learning	**5.1**	The student will be able to learn the advanced techniques of deep learning	**a,b,c,e,l**	

UNIT I - NEURAL NETWORKS	**(9)**
Introduction – Basic Architecture of Neural Networks – Training Neural Network with Back propagation - Practical Issues in Neural Network Training - Power of Function Composition – Common Neural Architectures – Neural Architectures : Binary Classification Models – Multiclass Models – Matrix Factorization with Auto encoders: Basic Principles – Nonlinear Activations – Deep Auto encoders	
UNIT II - TRAINING DEEP NEURAL NETWORKS	**(9)**
Introduction – Back propagation- Setup and Initialization Issues – Vanishing and Exploding Gradient Problems – Gradient Descent Strategies – Batch Normalization - Practical Tricks for Acceleration and Compression – Bias- Variance Trade-Off – Generalization Issues in Model Tuning and Evaluation – Penalty-based Regularization – Ensemble Methods – Early Stopping – Unsupervised Pre training – Transfer Learning	
UNIT III - RADIAL BASIS FUNCTION NETWORKS AND BOLTZMANN MACHINES	**(9)**
Radial Basis Function : Introduction - Training an RBF Network – Hopfield Network – The Boltzman Machine – Restricted Boltzman Machine – Applications of Restricted Boltzman Machines	
UNIT IV –RECURRENT NEURAL NETWORK	**(9)**
Introduction – Architecture of Recurrent Neural Networks – Challenges of training Recurrent Networks – Echo-State Networks – Long Short-Term Memory (LSTM) – Gated Recurrent Units (GRUs) – Applications of Recurrent Neural Networks. Convolution Neural Networks-Introduction – Basic Structure of Convolutional Network – Training a Convolutional Network - Case Studies of Convolutional Architectures - Applications of Convolutional Networks - Attention Mechanism – Generative Adversarial Networks(GANs)	

UNIT V - ADVANCED TOPICS IN DEEP LEARNING	(9)
Introduction ,Attention Mechanisms- Recurrent Models of Visual Attention, Neural Networks with External Memory- A Fantasy Video Game, Neural Turing Machines, Differentiable Neural Computer, Generative Adversarial Networks (GANs)- Training a Generative Adversarial Network, Comparison with Variational Auto encoder, Using GANs for Generating Image Data, Conditional Generative Adversarial Networks. Competitive Learning, Limitations of Neural Networks.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Aggarwal, Charu C, “Neural Networks and Deep learning”, Springer, 2018
2. Francois Chollet, “Deep Learning using Python”, Manning Publications, 2017

REFERENCES:

1. Stone, James. (2019). “Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning”, Sebtel Press, United States, 2019
2. Ian Good fellow, Yoshua Bengio, Aaron Courville, “Deep Learning", MIT Press, 2016
3. Vance, William , “Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science” (Hardcover - 2020), Joining the dotstv Limited
4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), “Deep Learning Applications”, Volume 3,Springer Publications 2022
5. Charu C. Aggarwal, ”Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 2018.

17AIC07 DATA AND INFORMATION SECURITY				
L	T	P	C
3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To know the basics of data and information security	**1.1**	The students will be able to understand the basics of data and information security	**a,b,c,d,l,j,k,l**
2.0	To understand the legal, ethical and professional issues in information security	**2.1**	The students will be able to understand the legal, ethical and professional issues in information security	**a,b,c,d,e,l,j,k,l**
3.0	To learn the various authentication schemes to simulate different applications.	**3.1**	The students will be able to understand the various authentication schemes to simulate different applications.	**a,b,c,d,e,l,j,k,l**
4.0	To know various security practices and system security standards	**4.1**	The students will be able to understand various security practices and system security standards	**a,b,c,d,e,l,j,k,l**
5.0	To gain knowledge about the Web security protocols for E-Commerce applications	**5.1**	The students will be able to understand the web security protocols for E-commerce applications	**a,b,c,d,e,l,j,k,l**

UNIT I INTRODUCTION	**(9)**
History, Introduction, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC	
UNIT II - SECURITY INVESTIGATION	**(9)**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies	
UNIT III - DIGITAL SIGNATURE AND AUTHENTICATION	**(9)**
Digital Signature and Authentication Schemes: Digital signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview- Requirements Protocols - Applications - Kerberos -X.509 Directory Services	
UNIT IV –E-MAIL AND IP SECURITY	**(9)**
E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.	
UNIT V -WEB SECURITY	**(9)**
Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication-Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:
1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Course Technology, 6th Edition, 2017. 2. Stallings William. “Cryptography and Network Security: Principles and Practice”, Seventh Edition, Pearson Education, 2017.
REFERENCES :
1. Harold F. Tipton, Micki Krause Nozaki,, “Information Security Management Handbook”, Volume 6, 6th Edition, 2016. 2. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, McGraw- Hill, Seventh Edition, 2012 3. Matt Bishop, “Computer Security Art and Science”, Addison Wesley Reprint Edition, 2015. 4. Behrouz A Forouzan, Debdeep Mukhopadhyay, “Cryptography and network security”, 3rd Edition,McGraw-Hill Education, 2015

17CSX29 INTERNET OF THINGS (Common to AI&DS,CSE and IT Branches)					
			L	T	P	C
			3	0	0	3
PREREQUISITE : 17CSC08		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To learn the microcontroller architecture and the basic issues, policy and challenges in the Internet	**1.1**	The students will be able to explain the internal architecture of microcontroller and the concepts and the cause of technology.		**a,k,l**
2.0	To understand the components and the protocols in Internet	**2.1**	The students will be able to classify the sensors and controller as part of IoT.		**a,b,c,e,j,k,l**
3.0	To build a communication technologies with the internet	**3.1**	The students will be able to plan a Communication framework with fog computing.		**a,b,c,k,l**
4.0	To apply the various data analytical and visualization tools.	**4.1**	The students will be able to plan the data analytical and data visualization platforms		**a,b,c,d,e,g,j,k,l**
5.0	To learn to manage the security concerns in IoT.	**5.1**	The students will be able to discover Knowledge on security in IoT.		**a,b,c,d,e,f,g,h,l**

UNIT I - INTRODUCTION TO IOT AND MICROCONTROLLER	**(9)**
Basics of Embedded Systems - Definition of IoT - Evolution of IoT - IoT and related terms – Key Drivers of IoT Discipline– The Diversity of IoT data sources – Architecture of 8051 – 8051 Addressing modes – Interfacing of LCD, Sensors and Servo motor – Popular M2M applications – Emerging IoT Flavors.	
UNIT II - ELEMENTS AND IOT GATEWAYS	
Introduction to Elements of IoT - Sensors & Actuators - Gateways - Layered architecture of IoT - IoT Communication Model – 6LoWPAN – Mobile Technologies for IoT.	
UNIT III - COMPUTING AND CONNECTING TECHNOLOGIES	**(9)**
Cloud Computing in IoT – Introduction of Fog/Edge Computing – Use Cases of Fog/Edge computing – IoT Communication protocol requirements - BLE, ZigBee , Z-Wave - LPWAN – Sigfox - LoRa – Cloud Connectivity	
UNIT IV - DATA ANALYTICS AND IOT PLATFORMS	**(9)**
Big Data Analytics - Real Time and Streaming Analytics – Key Drivers for IoT Data analytics – Emergence of Edge Clouds – Renowned Edge Analytics Use Cases - Data Visualization Platform – Modules of IoT Data Analytics Platform– Renowned Use Cases for IoT Data Analytics.	
UNIT V - SECURITY CONCERNS OF IOT PLATFORM	**(9)**
Security Requirements of an IoT Infrastructure – AAA Framework – Security concerns of Cloud Platforms – Security concerns in IoT components – Smart Use Cases of IoT.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
1. Pethuru Raj and Anupama C.Raman, "The Internet of Things – Enabling Technologies, Platforms and Use Cases", CRC Press, 2017. 2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd ed., Pearson education, 2011.	
REFERENCES:	
1. Raj Kamal, "Internet of Things Architecture and Design Principles", Tata McGraw Hill Edition, Tata McGraw Hill Publication, 2017. 2. Fortino, Giancarlo, Liotta, Antonio, "Internet of Things", Springer.	

17AIC08 WEB TECHNOLOGY					
		L	T	P	C
		2	0	2	3
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE – 1**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To discuss the concepts of HTML 5 and CSS.	**1.1**	The students will be able to design a web page using HTML 5 and CSS	**a,c,d,e,f,g,i,k,l**
2.0	To infer the basics of JavaScript	**2.1**	The students will be able to make use of JavaScript client side coding	**a,b,c,d,e,f,g,i,k,l**
3.0	To know about basics Java Servlets	**3.1**	The students will be able to apply servlets for their web development	**a,b,c,d,e,f,g,i,k,l**
4.0	To know about basic concepts of JSP	**4.1**	The students will be able to make use of JSP	**a,b,c,d,e,f,g,i k,l**
5.0	To know about XML and Web services	**5.1**	The students will be able to make use of XML and Web Services	**a,b,c,d,e,f,g,i,k,l**

UNIT I - HTML 5 and CSS	**(6+6)**
HTML Elements –HTML Forms – Introduction to HTML5 new elements – Semantic elements- CSS-Features–Syntax– Box Model- Selectors – Display Positioning – CSS Floats – CSS Colors – CSS text fonts.	
UNIT II -JAVASCRIPT	**(6+6)**
JavaScript Introduction - Basic Elements - Variable - Data Types - Operators and Literals – Functions -Objects- Arrays–Built-in- Object – Event Handling – Validation	
UNIT III - SERVLETS	**(6+6)**
Java Servlets: Architecture–Overview – Servlet Generating Dynamic Content-Life Cycle-Parameter Data-Sessions- Cookies	
UNIT IV - JSP	**(6+6)**
JSP: Overview –Basic JSP: Architecture- Lifecycle– Directives – Actions- Implicit Objects– Java Beans Classes and JSP – MVC Paradigm	
UNIT V - XML and WEB SERVICES	**(6+6)**
XML: Namespaces- XML Processing- -XML Documents- XSL – XSLT; Web Services: WSDL-XML Schema–SOAP-WCAG	

List of Experiments:

1. Programs with HTML and CSS.
2. Programs with Java script.
3. Programs on basic JSP tags
4. Programs for creating web applications using JSP.
5. Programs on HTTP Servlet.
6. Programs for creating web application using Servlets.
7. Creation of 3 tier Application.
8. Programs on XML

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS: HARDWARE:

1. System with 1 GB RAM minimum.

SOFTWARE:

1. OS – Windows 7 or higher
2. Notepad++
3. Net beans

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

TEXT BOOKS:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Deitel Deitel Nieto, “Internet &World Wide Web How To Program”, Prentice Hall, 5th ed., 2012.

REFERENCES:

1. Thomas A. Powell, “The Complete Reference HTML &CSS”, New Riders, 5th ed., 2010.
2. Steve Suehring, “JavaScript– Step by Step”, PHI, 2nd ed., 2010.
3. https://www.w3schools.com
4. https://www.tutorialspoint.com/jsp

17CSP09 INTERNET OF THINGS LABORATORY (Common to AI&DS, CSE and IT Branches)					
			L	T	P	C
			0	0	4	2
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To understand the fundamentals of LED and light intensity control.	**1.1**	The Students will be able to acquire knowledge about Arduino, LED and control intensity of light.		**a,k,l**
2.0	To understand about the components such as Buzzer and LCD.	**2.1**	The Students will be able to implement buzzer and LCD in applications.		**a,k,l**
3.0	To understand how to work with sensors such as temperature and LDR.	**3.1**	The Students will be able to implement LM35sensor, LDR in applications.		**a,b,c,e,k,l**
4.0	To understand about key input and servo motor.	**4.1**	The Students will be able to implement the way to blink LED through key input and working with servo motor.		**a,b,c,k,l**
5.0	To understand the concept NODEMCU with app and sensor value to upload in Cloud.	**5.1**	The Students will be able to implement applications with NODEMCU with Blynk app and upload sensor value in Cloud.		**a,b,c,d,e,g,j,k,l**

LIST OF EXPERIMENTS

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

HARDWARE OR SOFTWARE REQUIREMENT:

HARDWARE:

1. 36 nodes with WiFi connection or Standalone PCs
2. Temperature sensor, LDR, LCD, Servo motor, Buzzer, LEDs, Arduino Board, IoT Core board, ESP01 ESP8266.

SOFTWARE:

1. Arduino 1.8.5
2. Arduino Library

TOTAL (P: 60) = 60 PERIODS

17AIP03 NEURAL NETWORKS AND DEEP LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To learn deep neural networks and apply for simple problems	**1.1**	The students will be able to apply deep neural network for simple problems	**a,b,c,d,e,l**
2.0	To Learn and apply Convolution Neural Network for image processing	**2.1**	The students will be able to apply convolution neural network for image processing	**a,b,c,d,e,l**
3.0	To Learn and apply Recurrent Neural Network and its variants for text analysis	**3.1**	The students will be able to apply recurrent neural network and its variants for text analysis	**a,b,c,d,e,l**
4.0	To augment data using generative models	**4.1**	The students will be able to apply generative models for data augmentation	**a,b,c,d,e,l**
5.0	To explore real world applications with deep neural networks	**5.1**	The students will be able to develop a real world application using suitable deep neural networks	**a,b,c,d,e,l**

LIST OF EXPERIMENTS:

1. Create a multi-layer neural network and apply it to MNIST dataset.
2. Implement Logistic Regression.
3. Develop an application for outlier detection using auto encoder
4. Implement Convolutional neural networks and use them to classify images
5. Implement a movie recommender system using RBM
6. Implement Recurrent neural networks to generate new text.
7. Implement Stock Price prediction application using LSTM
8. Develop a image captioning application using RNN
9. Develop a image recognition application using CNN
10. Implement GAN model to simulate realistic images

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

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

Software:

1. Understanding on Working of Colab and Transfer Learning Networks
2. High end GPU Systems (Huge Computation)

TOTAL (P:60) = 60 PERIODS

17GED08 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					
			L	T	P	C
			2	0	0	0
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To Understand the basics of Indian tradition and Indian traditional knowledge systems	1.1	The students will be able to Gain Knowledge about of Indian tradition and Indian traditional knowledge systems		**a,f,h**
2.0	To know about basics of technologies and its scientific perspectives.	2.1	The students will be able to Understand basics of technologies and its scientific perspectives.		**a,f**
3.0	To study the basics of Indian traditional health care ,	3.1	The students will be able to study the basics of Indian traditional health care		**a,f,l**
4.0	To know the basics of Indian artistic tradition knowledge	4.1	The students will be able to know the basics of Indian artistic tradition		**a,f,l**
5.0	To develop the basics of linguistic tradition	5.1	The students will be able To develop the basics of linguistic tradition		**a,f,h**

UNIT I - INDIAN TRADITION	**(6)**
Fundamental unity of India, India's heroic role in world civilization, The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values.	
UNIT II - INDIAN KNOWLEDGE SYSTEM AND MODERN SCIENCE	**(6)**
Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists	
UNIT III - INDIAN TRADITIONAL HEALTH CARE	**(6)**
Importance and Practice of Yoga, Pranayam and other prevailing health care techniques	
UNIT IV - INDIAN ARTISTIC TRADITION	**(6)**
Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc	
UNIT V - INDIAN LINGUISTIC TRADITION	**(6)**
Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics	
	TOTAL = 30 PERIODS
TEXT BOOKS:	

1. Sivaramakrishnan, V., "Cultural Heritage of India- Course Material", Bharatiya Vidya Bhavan, Mumbai 5th Edition, 2014.
2. Swami Jitatmananda, "Modern Physics and Vedanta", Bharatiya Vidya Bhavan, 2004.
3. Raman V.V., "Glimpses of Indian Heritage", Popular Prakashan, 1993.
4. Jha V.N., "Language, Thought and Reality".
5. Krishna Chaitanya, "Arts of India", Abhinav Publications, 1987.

17AIC09 DISTRIBUTED COMPUTING				
	L	T	P	C
	3	0	0	3
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE – 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To introduce the computation and communication models of distributed systems	**1.1**	The students will be able to explain the foundations of distributed systems	**a,b,c,d,e,i,j,k,l**
2.0	To illustrate the issues of synchronization and collection of information in distributed systems	**2.1**	The students will be able to solve synchronization and state consistency problems	**a,b,c,d,e,i,j,k,l**
3.0	To describe distributed mutual exclusion and distributed deadlock detection techniques	**3.1**	The students will be able to use resource sharing techniques in distributed systems	**a,b,c,d,e,i,j,k,l**
4.0	To elucidate agreement protocols and fault tolerance mechanisms in distributed systems	**4.1**	The students will be able to apply working model of consensus and reliability of distributed systems	**a,b,c,d,e,i,j,k,l**
5.0	To explain the cloud computing models and the underlying concepts	**5.1**	The students will be able to explain the fundamentals of cloud computing	**a,b,c,d,e,i,j,k,l**

UNIT I INTRODUCTION	**8**
Introduction: Definition-Relation to Computer System Components – Motivation – Message - Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.	
UNIT II LOGICAL TIME AND GLOBAL STATE	**10**
Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.	
UNIT III DISTRIBUTED MUTEX AND DEADLOCK	**10**
Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm — Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.	
UNIT IV CONSENSUS AND RECOVERY	**10**
Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Check pointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm - - Algorithm for Asynchronous Check pointing and Recovery	
UNIT V CLOUD COMPUTING	**7**
Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services	
TOTAL (L:45):45 PERIODS	

TEXT BOOKS:

1. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems",Cambridge Press, 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 1994.

REFERENCES :

1. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2. Pradeep L Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Tanenbaum A S, Van Steen M, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
4. Liu M L, "Distributed Computing: Principles and Applications", Pearson Education, 2004.
5. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, 2003.
6. Arshdeep Bagga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", Universities Press, 2014.

17AIC10 BIG DATA ANALYTICS					
			L	T	P	C
			3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**				
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives		**Course Outcomes**			**Related Program outcomes**	
1.0	To understand big data.	**1.1**	The student will be able to describe big data and use cases from selected business domains.		**a,b,c,d,e,l,j,k,l**
2.0	To learn and use NoSQL big data management	**2.1**	The student will be able to explain NoSQL big data management.		**a,b,c,d,e,l,j,k,l**
3.0	To learn the basics of Hadoop and designing HDFS.	**3.1**	The student will be able to understand the basics of Hadoop.		**a,b,c,d,e,l,j,k,l**
4.0	To learn map reduce analytics using Hadoop related tools	**4.1**	The student will be able to perform map-reduce analytics using Hadoop.		**a,b,c,d,e,l,j,k,l**
5.0	To understand the usage of Hadoop related tools for Big Data Analytics	**5.1**	The student will be able to use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.		**a,b,c,d,e,l,j,k,l**

UNIT I -UNDERSTANDING BIG DATA	**9**
Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.	
UNIT II -NOSQL DATA MANAGEMENT	**9**
Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients	
UNIT III -BASICS OF HADOOP	**9**
Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.	
UNIT IV -MAP REDUCE APPLICATIONS	**9**
Map Reduce workflows – unit tests with MR Unit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – Map Reduce types – input formats – output formats	
UNIT V -HADOOP RELATED TOOLS	**9**
Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.	
TOTAL (L:45):45 PERIODS	

TEXT BOOKS:
1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013. 2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012. 3. Sadalage, Pramod J. “NoSQL distilled”, 2013
REFERENCES:
1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011. 3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010 4. Alan Gates, "Programming Pig", O'Reilley, 2011.

17CSC18 FULL STACK DEVELOPMENT (Common to AI&DS, CSE and IT Branches)				
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 build strong expertise in developing front end application using HTML5 and CSS3	**1.1**	The students will be able to understand and develop web page using HTML and CSS	**a,c,j,k**
2.0	To develop front end application using JavaScript.	**2.1**	The students will be able to design and develop front end application using JavaScript	**a,c,j,k**
3.0	To become proficient in Bootstrap concepts and to develop web pages based on Bootstrap.	**3.1**	The students will be able to design and develop front end application using Bootstrap.	**a,b,c,k**
4.0	To build strong expertise in developing front end application with jQuery.	**4.1**	The students will be able to implement MVC and responsive design to scale well across PC, tablet and Mobile Phone using jQuery.	**a,b,c,j,k**
5.0	To build strong expertise in developing front end application 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 - HTML5 AND CSS3
Introduction to HTML - HTML Basic Tags - HTML Formatting Tags - HTML Color Coding –HTML Grouping Using Div Span – Lists – Tables – Images – Hyperlink – Iframe – Headers – Classes – Responsive – Layout – HTML Javascript – Entities and URI code - Charset and Forms. Introduction to CSS3 – CSS3 Syntax - Selectors - Color Background Cursor -Text Fonts - Lists Tables - Box Model - Display Positioning - CSS Floats – Animations – Buttons – Pagination - User Interface – Filters – Responsive.
UNIT II - CLIENT SIDE PROGRAMMING
Introduction to JavaScript - Language Basics - JavaScript Objects - Scope – Events - Strings – Numbers – Math – Arrays – Boolean – Comparisons – Conditions – Switch - Loops - Type Conversion – RegExp – Errors - Debugging – Hoisting - Strict Mode - Functions – Objects – Forms - JavaScript HTML DOM - JavaScript BOM.
UNIT III - BOOTSTRAP
Introduction to Bootstrap - Bootstrap Basics - Bootstrap Grids - Bootstrap Themes - Bootstrap CSS - Bootstrap JS,Node.js – MySQL - MongoDB
UNIT IV- JQUERY
Introduction to jQuery - jQuery Syntax - jQuery Selectors - jQuery Events - jQuery Effects - jQuery HTML - jQuery Traversing - jQuery AJAX & Misc
UNIT V- JQUERY MOBILE
Introduction to jQuery Mobile - jQuery Mobile Pages - jQuery Mobile Transitions - jQuery Mobile Buttons - Mobile Icons - Mobile Popups - Mobile Toolbars - Mobile Navbars - Mobile Panels - Mobile Collapsibles - Mobile Tables - Mobile Grids - Mobile Lists - Mobile Forms - jQuery Mobile Themes - jQuery Mobile Events.
TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:
1. Kogent Learning Solutions Inc. “HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQUERY”, Wiley India Pvt. Limited, 2011. 2. Deitel and Deitel and Nieto, “Internet and World Wide Web – How to Program”, Prentice Hall, 5th Edition, 2011.
REFERENCES:
1. Silvio Moreto, Matt Lambert, Benjamin Jakobus, Jason Marah, “Bootstrap 4–Responsive Web Design” Packt Publishing (6 July 2017) 2. Adriaan de Jonge, Phil Dutson, “jQuery jQuery UI and jQuery Mobile - Recipes and Examples”, Pearson Education India. 3. Thomas Powell, “Web Design: The Complete Reference” ,Osborne / McGraw-Hill 4. https://www.w3schools.com/

17AIP04 BIG DATA ANALYTICS LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE – 1**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To get familiar with Hadoop distributions, configuring hadoop and performing file management tasks	**1.1**	The student will be able to install, configure, and run Hadoop and hdfs.	**a,b,c,d,e**
2.0	To experiment MapReduce in Hadoop frameworks	**2.1**	The student will be able to develop problem solving and critical thinking skills in fundamental enable techniques like Hadoop & MapReduce.	**a,b,e**
3.0	To implement MapReduce programs in variety applications	**3.1**	The student will be able to implement MapReduce programs in various applications.	**a,b,c,d,e**
4.0	To install Hive and HBase along with practice examples.	**4.1**	The student will be able to apply different data processing tools like Hive and HBase.	**a,b,c,d,e**
5.0	To import and export data from various databases.	**5.1**	The student will be able to analyze huge data set using Hadoop distributed file systems and MapReduce	**a,b,c,d,e**

LIST OF EXPERIMENTS:

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Develop a MapReduce program to find the grades of student's.
4. Implement of Matrix Multiplication with Hadoop Map Reduce
5. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
6. Installation of Hive along with practice examples.
7. Installation of HBase, Installing thrift along with Practice examples
8. Practice importing and exporting data from various databases.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

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

Software Requirements:

Hadoop, Java, Hive and HBase.

TOTAL(P:60)=60 PERIODS

17GED06 COMPREHENSION				
	L	T	P	C
	0	0	2	0

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise	**1.1**	The student will be able to figure out and solve any given problem related to computer science & engineering field.	**a, b, c, e, k, l**

METHOD OF EVALUATION

The student will be assessed for his understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be evaluated by a committee comprising of the faculty members of the department. The committee will conduct three assessments of objective question type from the subjects as follows

- Test 1 - C Programming, Data Structures, Operating systems, Computer Networks.
- Test 2 - Java Programming, Database Systems, Computer Architecture, Software Engineering.
- Test 3 – Internet and web programming, Object Oriented Analysis and Design, Internet of Things.

The end semester examination, which carries a total of 50 marks, will be an objective question type examination conducted by a committee of one internal examiner appointed by the COE of our college.

TOTAL: 30 PERIODS

17GED07 CONSTITUTION OF INDIA				
	L	T	P	C
	2	0	0	0

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To educate about the Constitutional Law of India	1.1	The students will be able to Gain Knowledge about the Constitutional Law of	f, h, l
2.0	To motivate students to Understand the Fundamental Rights and Duties of a citizen	2.1	The students will be able to Understand the Fundamental Rights and Duties of a citizen	f, g, h
3.0	To make students to understand about Federal structure of Indian Government	3.1	The students will be able to Apply the concept of Federal structure of Indian Government	f, g, h
4.0	To understand about Amendments and Emergency provisions in the Constitution	4.1	The students will be able to Analyze the Amendments and Emergency provisions in the Constitution	f, g, h
5.0	To educate a holistic approach in their life as a Citizen of India	5.1	The students will be able Develop a holistic approach in their life as a Citizen of India	f, h, l

UNIT I - INTRODUCTION TO INDIAN CONSTITUTION	**(6)**
Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution - Salient features and characteristics of the Constitution of India	
UNIT II - FUNDAMENTAL RIGHTS	**(6)**
Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - 102 Scope of the Right to Life and Liberty - Fundamental Duties and its legal status - Directive Principles of State Policy – Its importance and implementation	
UNIT III - FEDERAL STRUCTURE	**(6)**
Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India - The constitutional powers and status of the President of India	
UNIT IV - AMENDMENT TO CONSTITUTION	**(6)**
Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India	
UNIT V - EMERGENCY PROVISIONS	**(6)**
National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India.	
	TOTAL = 30 PERIODS

REFERENCES:

1. Constitution of India - Ministry of Law & Justice – PDF format awmin.nic.in/coi/coiason29july08.pdf
2. Introduction to the Constitution of India by Durgadas Basu.
3. The Constitution of India – Google free material - www.constitution.org/cons/india/const.html

17AIX01 BIO-INSPIRED OPTIMIZATION TECHNIQUES					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To understand fundamental topics in bio-inspired optimization techniques	**1.1**	The student will be able to familiarity with the basics of several biologically inspired optimization techniques.	**a,b,c,d,e,l,j,k,l**	
2.0	To Learn the collective systems such as ACO, PSO, and BCO	**2.1**	The student will be able to familiarity with the basics of several biologically inspired computing paradigms.	**a,b,c,d,e,l,j,k,l**	
3.0	To develop skills in biologically inspired algorithm design with an emphasis on solving real world problems	**3.1**	The student will be able to ability to select an appropriate bio-inspired computing method and implement for any application and data set.	**a,b,c,d,e,l,j,k,l**	
4.0	To understand the most appropriate types of algorithms for different data analysis problems and to introduce some of the most appropriate implementation strategies.	**4.1**	The student will be able to theoretical understanding of the differences between the major bio-inspired computing methods	**a,b,c,d,e,l,j,k,l**	
5.0	To implement the Bio-inspired technique with other traditional algorithms.	**5.1**	The student will be able to learn other swarm intelligence algorithms and implement the bio-inspired technique with other traditional algorithms.	**a,b,c,d,e,l,j,k,l**	

UNIT I – INTRODUCTION	**(9)**
Optimization Techniques: Introduction to Optimization Problems – Single and Multi- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function –differences between GA and Traditional optimization methods – Applications – Bio- inspired Computing (BIC): Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.	
UNIT II – SWARM INTELLIGENCE	**(9)**
Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behavior – Towards Artificial Ants – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Meta heuristic: Combinatorial Optimization – ACO Meta heuristic – Problem solving using ACO – Tabu Search – Local search methods – Scope of ACO algorithms- Particle Swarm – Particle Swarm Optimization (PSO).	
UNIT III – NATURAL TO ARTIFICIAL SYSTEMS	**(9)**
Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging –Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting .	
UNIT IV- SWARM ROBOTICS	**(9)**
Foraging for food – Clustering of objects – Collective Prey retrieval –Scope of Swarm Robotics – Social Adaptation of Knowledge:– Artificial Bee Colony (ABC) Optimization biologically inspired algorithms in engineering.	
UNIT V -CASE STUDIES	**(9)**
Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACO and PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems – Travelling Salesman problem.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. A. E. Elben and J. E. Smith, “Introduction to Evolutionary Computing”, 2nd Edition, Springer, 2015.
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007.

REFERENCES:

1. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, “Swarm Intelligence: FromNatural to Artificial Systems”, Oxford University press, 2000.
2. Christian Blum, Daniel Merkle (Eds.), “Swarm Intelligence: Introduction and Applications”, Springer Verlag, 2008.
3. Leandro N De Castro, Fernando J Von Zuben, “Recent Developments in Biologically Inspired Computing”, Idea Group Inc., 2005.
4. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
5. C. Ebelhart et al., “Swarm Intelligence”, Morgan Kaufmann, 2001.

17AIX02 MOBILE APPLICATION DEVELOPMENT					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand system requirements for mobile applications	**1.1**	The student will be able to describe the requirements for mobile applications	**a,b,c,d,e,l,j,k,l**
2.0	To generate suitable design using specific mobile development frameworks	**2.1**	The student will be able to design user interface for mobile applications	**a,b,c,d,e,l,j,k,l**
3.0	To generate mobile application design	**3.1**	The student will be able to store mobile data of android applications	**a,b,c,d,e,l,j,k,l**
4.0	To implement the design using specific mobile development frameworks	**4.1**	The student will be able to evaluate native capabilities of android applications	**a,b,c,d,e,l,j,k,l**
5.0	To deploy the mobile applications in marketplace for distribution	**5.1**	The student will be able to design ios applications with tools	**a,b,c,d,e,l,j,k,l**

UNIT I – INTRODUCTION	**(9)**
Web Vs mobile App – Cost of Development – Myths - Mobile Applications – Marketing - Mobile User Interface Design - Effective Use of Screen – Mobile Users - Mobile Information Design - Mobile Platforms - Tools of Mobile Interface Design.	
UNIT II - ANDROID USER INTERFACE DESIGN	**(9)**
Android Architecture – Android SDK Tools - Application Components - Intents - Content providers - Broadcast receivers – Services - User Interface Design - Views - View Groups – Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Notifications - Android Localization.	
UNIT III - ANDROID DATA STORAGE	**(9)**
Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - Shared Preferences - Storage External - Network Connection - SQLite Databases.	
UNIT IV - ANDROID NATIVE CAPABILITIES	**(9)**
Camera – Audio - Sensors and Bluetooth - Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with Location Manager, Working with Google Maps extensions - Maps via intent - Map Activity - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location.	
UNIT V -IOS DESIGN	**(9)**
iPhone Craze – iOS Features – iOS Tools - iOS Project – Objective C Basics – Building iOS App – Actions and Outlets – Delegates - User Interface Elements – Accelerometer – Location Handling - SQLite Database.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.

REFERENCES:

1. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012.
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.
4. http://developer.android.com/develop/index.html.

17AIX03 HEALTH CARE ANALYTICS					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To Understand the health data formats, health care policy and standards	**1.1**	The student will be able to use machine learning and deep learning algorithms for health data analysis	**a,b,c,d,e,i,j,k,l**	
2.0	To Learn the significance and need of data analysis and data visualization	**2.1**	The student will be able to apply the data management techniques for healthcare data	**a,b,c,d,e,i,j,k,l**	
3.0	To Understand the health data management frameworks.	**3.1**	The student will be able to evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications	**a,b,c,d,e,i,j,k,l**	
4.0	To Learn the use of machine learning and deep learning algorithms in healthcare.	**4.1**	The student will be able to design health data analytics for real time applications	**a,b,c,d,e,i,j,k,l**	
5.0	To Apply healthcare analytics for critical care applications	**5.1**	The student will be able to design emergency care system using health data analysis	**a,b,c,d,e,i,j,k,l**	

UNIT I – INTRODUCTION TO HEALTHCARE ANALYSIS	**(9)**
Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem.	
UNIT II – ANALYTICS ON MACHINE LEARNING	**(9)**
Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.	
UNIT III – HEALTH CARE MANAGEMENT	**(9)**
IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.	
UNIT IV- HEALTHCARE AND DEEP LEARNING	**(9)**
Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.	
UNIT V -CASE STUDIES	**(9)**
Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:
1. Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015
REFERENCES:
1. Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018. 2. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018. 3. Hui Jang, Eva K.Lee, “HealthCare Analysis : From Data to Knowledge to Healthcare Improvement”, First Edition, Wiley, 2016. 4. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, “Big Data Analytics in HealthCare”, Springer, 2020.

17AIX04 NATURAL LANGUAGE PROCESSING			
L	T	P	C
3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To Understand the fundamental mathematical models and algorithms in the field of NLP.	**1.1**	The Student will be able to understand the fundamental mathematical models and n-gram language models.	**a,b,c,d,e,f**
2.0	To apply the sentiment and logistic regression.	**2.1**	The Student will be able to learn naïve bayes classification and models.	**a,b,c,d,e,f**
3.0	To Implement a annotating linguistic structure and parsing.	**3.1**	The Student will be able to Implement CFG and dependency parsing.	**a,b,c,d,e,f**
4.0	To Understand the concept of computational semantics and logical representations.	**4.1**	The Student will be able to understand computational segmentation and WordNet.	**a,b,c,d,e,f**
5.0	To apply the principles of language resource annotation and its use in machine learning applications	**5.1**	The Student will be able to understand lexicon for sentiment and and coreference resolution	**a,b,c,d,e,f**

UNIT I - INTRODUCTION	**(9)**
Introduction - Mathematical Foundations - Elementary Probability Theory - Essential Information Theory – Linguistic Essentials- Parts of Speech and Morphology- Phrase Structure- Semantics and Pragmatics - Regular Expressions, Text Normalization, Edit Distance - N-gram Language Models.	
UNIT II – SENTIMENT CLASSIFICATION AND LOGISTIC REGRESSION	**(9)**
Naive Bayes Classification and Sentiment - Logistic Regression- Vector Semantics -Neural Nets and Neural Language Models - Sequence Labeling for Parts of Speech- Deep Learning-Architectures for Sequence Processing.	
UNIT III - ANNOTATING LINGUISTIC STRUCTURE	**(9)**
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar- Ambiguity – Cocke Kasami Younger (CKY) algorithm - Partial Parsing - Statistical Parsing- Dependency Parsing- Dependency Formalisms-Treebanks- Transition-Based Dependency Parsing- Graph-Based Dependency Parsing	
UNIT IV - COMPUTATIONAL SEMANTICS AND LOGICAL REPRESENTATIONS	**(9)**
Computational Desiderata for Representations- Model-Theoretic Semantics- First-Order Logic- Event and State Representations- Logics -Relation Extraction- Relation Extraction Algorithms- Word Senses Relations between Senses- WordNet: A Database of Lexical Relations- Disambiguation- Alternate WSD algorithms and Tasks -Semantic Role Labeling.	
UNIT V -DISCOURSE COHERENCE AND COREFERENCE RESOLUTION	**(9)**
Lexicons for Sentiment, Affect, and Connotation, Discourse Coherence -Coherence Relations- Discourse Structure Parsing- Centering and Entity-Based Coherence- Representation learning models for local coherence- Co reference Resolution- Co reference Tasks and Datasets- Architectures for Co reference Algorithms- A neural mention-ranking algorithm.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin—"Speech and Language Processing: An Introduction to Natural Language Processing", Computational Linguistics and Speech, Pearson Publication, 2014.
2. "Foundations of Statistical Natural Language Processing" by Christopher D. Manning and Hinrich Schuetze, MIT Press, 2018
3. Steven Bird, Ewan Klein and Edward Loper "Natural Language Processing with Python", O'Reilly Media; 1 edition, 2009

REFERENCES:

1. Breck Baldwin, —"Language processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.
2. Richard M Reese, —"Natural Language Processing with Javall", O'Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, —"Handbook of Natural Language Processing", Second
4. Edition, Chapman and Hall/CRC Press, 2010.
5. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval",
6. Oxford University Press, 2008.

17AIX05 TEXT AND SPEECH ANALYTICS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To explore various text extraction techniques.	**1.1**	The Student will be able to explore various text extraction techniques.		**a,b,c,d,e,i,j**
2.0	To apply visualization techniques and perform anomaly & trend detection	**2.1**	The Student will be able to apply visualization techniques and perform experimental study of mining process		**a,b,c,d,e,i,j**
3.0	To perform event operations in Text streams	**3.1**	The Student will be able to perform event operations in Text streams and LDA models		**a,b,c,d,e,i,j**
4.0	To decide on the appropriate modeling technique necessary for a given language and application	**4.1**	The Student will be able to decide on the appropriate modeling technique.		**a,b,c,d,e,i,j**
5.0	To work with speech data analysis.	**5.1**	The Student will be able to work with speech data analysis and issues.		**a,b,c,d,e,i,j**

UNIT I - TEXT EXTRACTION	**(9)**
Introduction- Rapid automatic keyword extraction: candidate keywords - keyword scores - adjoining keywords – extracted keywords - Benchmark evaluation: precision and recall – efficiency - stoplist generation - Evaluation on new articles - algebraic techniques for multilingual document clustering	
UNIT II – ANOMALY AND TREND DETECTION	**(9)**
Text visualization techniques: Visualization in text analysis - Tag clouds - authorship and change tracking - Data Exploration and the search for noval patterns - sentiment tracking, visual analytics and FutureLen - scenario discovery - adaptive threshold setting for novelty mining: Introduction - adaptive threshold for anomaly - Experimental study.	
UNIT III - TEXT STREAMS	**(9)**
Events and trends in text streams: Introduction - Text streams - Feature extraction and data reduction - Event detection – Trend detection - Event and trend descriptions - Embedding semantics in LDA topic models: Introduction - vector space modeling - latent semantic analysis - probabilistic latent semantic analysis - Latent Dirichlet allocation - embedding external semantics from Wikipedia - data-driven semantic embedding	
UNIT IV - SPEECH PROCESSING	**(9)**
Phonetics - Articulatory Phonetics - Phonological Categories - Acoustic Phonetics and Signals - Speech Synthesis – Text Normalization - Phonetic and Acoustic Analysis - Diphone Waveform synthesis – Evaluation - Automatic Speech Recognition - Architecture - Hidden Markov Model to Speech - MFCC vectors - Acoustic Likelihood Computation - Evaluation.	
UNIT V -SPEECH MODELING	**(9)**
Hidden Markov Models: Markov Processes - HMMs - Evaluation, Optimal State Sequence - Viterbi Search, Baum-Welch Parameter Re-estimation - Implementation issues.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Michael W. Berry & Jacob Kogan,"Text Mining Applications and Theory", Wiley publications, 2010.
2. Jurafsky and Martin, “Speech and Language Processing”, Pearson Prentice Hall, Second Edition, 2008.

REFERENCES:

1. Aggarwal, Charu C., and Cheng Xiang Zhai, eds., “Mining text data”, Springer Science & Business Media, 2012.
2. Miner, Gary, et al., “Practical text mining and statistical analysis for non-structured text data applications”, Academic Press,2012.
3. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.

17AIX106 GAME THEORY FOR AI					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To Understand the fundamentals of Game theory for AI.	**1.1**	Illustrate the foundation of game theory and AI.	**a,b,c,d,e,i,j,k,l**
2.0	To Explore how game theory can be applied in different ambit of AI.	**2.1**	Outline the techniques involved in game AI.	**a,b,c,d,e,i,j,k,l**
3.0	To Analyse the different path finding techniques in game theory.	**3.1**	Identify how the game theory works with different path finding techniques.	**a,b,c,d,e,i,j,k,l**
4.0	To Acquire the knowledge of decision-making techniques used in game theory.	**4.1**	Examine how the decision-making algorithms works with game theory.	**a,b,c,d,e,i,j,k,l**
5.0	To Understand the different board games from the Game AI techniques.	**5.1**	Outline the different board games from the Game AI techniques.	**a,b,c,d,e,i,j,k,l**

UNIT I – INTRODUCTION	**(9)**
Introduction to AI and Games: Academic AI- Game AI- Model of Game AI: Movement- Decision Making- strategy- Infrastructure- Agent-based AI- GAME AI: The complexity fallacy- The perception window- changes of behavior- Speed and Memory- Processor issues- memory concerns- PC constraints- console constraints.	
UNIT II – GAME AI TECHNIQUES	**(9)**
AI Techniques: Hard-coded AI- Randomization- weighted randoms. Finite state machines- decision trees- fuzzy logic- utility theory- goal-oriented action planning-AI ENGINE: structure of an AI engine- toolchain concerns.	
UNIT III – PATHFINDING TECHNIQUES	**(9)**
Pathfinding: The pathfinding graph- Dijkstra - data structure and interfaces, performance of dijkstra - A* - data structure and interfaces, algorithm performance of A*- node array A*- Open goal path pathfinding- dynamic pathfinding-low memory algorithms- interruptible pathfinding-pooling planners- Continuous time pathfinding.	
UNIT IV- DECISION MAKING	**(9)**
Decision trees: the algorithms- implementation nodes- performance of decision trees- balancing the trees- random decision tree. State machines: Data structure and interfaces-hard-coded FSM- Hierarchical state machines- Combining decision trees and state machines. Fuzzy Logic: Fuzzy logic decision making- fuzzy state machines. Markov Processes- Markov State machines.	
UNIT V - BOARD GAMES	**(9)**
Types of games- the game tree- Minimaxing: The static evaluation function- minimaxing- the minimaxing algorithm- megamaxing- AB pruning- The search window- Negascout. Transposition tables and memory: Hashing Game states- Hash table implementation- Replacement strategies-transposition tables and its issues. Memory-enhanced test algorithms: The MTD algorithm.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Lan Millington, John Funge, “Artificial Intelligence for Games (Second Edition)”, Morgan Kaufmann, (2009).

REFERENCES:

1. Toni Lääveri “Integrating AI for Turn-Based 4X Strategy Game” Helsinki Metropolia University of Applied Sciences, 2017.
2. Mike McShaffry, David Rez Graham, “Game Coding complete fourth edition”, Delmar Learning, (2012).
3. Bourg, David M., and Glenn Seemann, “AI for Game Developers”. Sebastopol CA: O'Reilly, (2004).
4. Russell, Stuart J. and Peter Norvig. “Artificial intelligence - a modern approach, 2nd Edition.” Prentice Hall series in artificial intelligence (2003).
5. Leyton-Brown, Kevin, and Shoham, Yoav. “Essentials of Game Theory: A Concise Multidisciplinary Introduction”. United States, Morgan & Claypool Publishers, 2008.

17AIX07 COMPUTER VISION				
L	T	P	C
3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand the fundamental concepts related to Image formation and processing.	**1.1**	The Student will be able to understand basic knowledge, theories and methods in image processing and image formation.	**a,b,c,d,e,i,j,k,l**
2.0	To learn feature detection, matching and detection	**2.1**	The Student will be able to understand feature detection, matching and segmentation and alignments.	**a,b,c,d,e,g,i,j,k,l**
3.0	To become familiar with feature based alignment and motion estimation	**3.1**	The Student will be able to apply 2D a feature-based based motion estimations, image stitching.	**a,b,c,d,e,i,j,k,l**
4.0	To develop skills on 3D reconstruction	**4.1**	The Student will be able to apply 3D image reconstruction techniques.	**a,b,c,d,e,i,j,k,l**
5.0	To understand image based rendering and recognition	**5.1**	The Student will be able to design and develop innovative image processing and computer vision applications.	**a,b,c,d,e,f,i,j,k,l**

UNIT I - INTRODUCTION TO IMAGE FORMATION AND PROCESSING	**(9)**
Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.	
UNIT II – FEATURE DETECTION AND FEATURE-BASED ALIGNMENT	**(9)**
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods- 2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration	
UNIT III - MOTION ESTIMATION & IMAGE STITCHING	**(9)**
Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion - Motion models - Global alignment - Compositing	
UNIT IV - 3D RECONSTRUCTION	**(9)**
Photometric calibration - High dynamic range imaging - Super-resolution and blur removal - Image matting and compositing - Texture analysis and synthesis - Shape from X - Active rangefinding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.	
UNIT V – IMAGE-BASED RENDERING AND RECOGNITION	**(9)**
View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering- Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.
2. “Computer Vision: A Modern Approach”, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.

REFERENCES:

1. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; “Pattern Recognition and Machine Learning”, Springer, 2006
3. E. R. Davies, “Computer and Machine Vision”, Fourth Edition, Academic Press, 2012.

17AIX08 IMAGE AND VIDEO ANALYTICS				
L	T	P	C
3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand the basics of image processing techniques for computer vision.	**1.1**	The Student will be able to Understand the basics of image processing techniques for computer vision and video analysis.	**a,b,c,e,i,j,k,l**
2.0	To learn the techniques used for image pre-processing.	**2.1**	The Student will be able to interpret the techniques used for image pre-processing.	**a,b,c,e,i,j,k,l**
3.0	To discuss the various object detection techniques.	**3.1**	The Student will be able to Develop various object detection techniques.	**a,b,c,e,i,j,k,l**
4.0	To understand the various Object recognition mechanisms.	**4.1**	The Student will be able to Understand the various face recognition mechanisms.	**a,b,c,e,i,j,k,l**
5.0	To elaborate on the video analytics techniques	**5.1**	The Student will be able to Elaborate on deep learning-based video analytics.	**a,b,c,e,i,j,k,l**

UNIT I - INTRODUCTION	**(9)**
Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.	
UNIT II – IMAGE PRE-PROCESSING	**(9)**
Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.	
UNIT III - OBJECT DETECTION USING MACHINE LEARNING	**(9)**
Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) - Non-max suppression –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures – SDD - Transfer Learning	
UNIT IV - FACE RECOGNITION AND GESTURE RECOGNITION	**(9)**
Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition Deep Face solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNetGesture Recognition.	
UNIT V -VIDEO ANALYTICS	**(9)**
Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3 - End-to-End Model Development: project requirements, Process - Business problem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4nd edition, Thomson Learning, 2013. 2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)
REFERENCES:
1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London, Limited,2011. 2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012 3. D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003 4. E. R. Davies, (2012), “Computer & Machine Vision”, Fourth Edition, Academic Press.

17AIX09- DEVOPS (Common to 17CSX38)					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To introduce Devops terminology, definition & concepts	**1.1**	The student 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 student 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 student will be able to ability 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 student will be able to ability 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 student 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 - INTRODUCTION TO DEVOPS	**(9)**
Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.	
UNIT II - COMPILE AND BUILD USING MAVEN & GRADLE	**(9)**
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle	
UNIT III - CONTINUOUS INTEGRATION USING JENKINS	**(9)**
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.	
UNIT IV – CONFIGURATION MANAGEMENT USING ANSIBLE	**(9)**
Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in Ansible	
UNIT V - BUILDING DEVOPS PIPELINES USING AZURE	**(9)**
Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

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

REFERENCES:

1. “Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback” – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.
3. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
4. Mariot Tsitoara, “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/

17AIX10- PRINCIPLES OF PROGRAMMING LANGUAGES					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand and describe syntax and semantics of programming languages	**1.1**	The student will be able to describe syntax and semantics of programming languages	**a,b,c,d,e,l**
2.0	To understand data, data types, and basic statements	**2.1**	The student will be able to explain data, data types, and basic statements of programming languages	**a,b,c,d,e,l**
3.0	To understand call-return architecture and ways of implementing them	**3.1**	The student will be able to design and implement subprogram constructs	**a,b,c,d,e,l**
4.0	To understand object-orientation, concurrency, and event handling in programming languages	**4.1**	The student will be able to apply object-oriented, concurrency, and event handling programming constructs and develop programs in scheme, ml, and prolog	**a,b,c,d,e,f**
5.0	To develop programs in non-procedural programming paradigms	**5.1**	The student will be able to understand and adopt new programming languages	**a,b,c,d,e,f,g,h,i,j,k,l**

UNIT I- SYNTAX AND SEMANTICS	**(9)**
Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing	
UNIT II - DATA, DATA TYPES, AND BASIC STATEMENTS	**(9)**
Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements	
UNIT III - SUBPROGRAMS AND IMPLEMENTATIONS	**(9)**
Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping	
UNIT IV – OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING	**(9)**
Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling	
UNIT V - FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES	**(9)**
Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:	
	1. Robert W. Sebesta, “Concepts of Programming Languages”, Twelfth Edition (Global Edition), Pearson, 2022 2. Michael L. Scott, “Programming Language Pragmatics”, Fourth Edition, Elsevier, 2018.
REFERENCES:	
	1. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, Prentice Hall, 2011. 2. Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Pearson, 1997. 3. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003.

17AIX11- SOFTWARE TESTING AND AUTOMATION				
	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand the basics of software testing	**1.1**	The student will be able to understand the basic concepts of software testing and the need for software testing	**a,b,c,d,e,i,j,k,l**
2.0	To learn how to do the testing and planning effectively	**2.1**	The student will be able to design test planning and different activities involved in test planning	**a,b,c,d,e,i,j,k,l**
3.0	To build test cases and execute them	**3.1**	The student will be able to design effective test cases that can uncover critical defects in the application	**a,b,c,d,e,i,j,k,l**
4.0	To focus on wide aspects of testing and understanding multiple facets of testing	**4.1**	The student will be able to carry out advanced types of testing	**a,b,c,d,e,i,j,k,l**
5.0	To get an insight about test automation and the tools used for test automation	**5.1**	The student will be able to automate the software testing using selenium and testing	**a,b,c,d,e,i,j,k,l**

UNIT I - FOUNDATIONS OF SOFTWARE TESTING	**(9)**
Need for software testing, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing	
UNIT II - TEST PLANNING	**(9)**
The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.	
UNIT III - TEST DESIGN AND EXECUTION	**(9)**
Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.	
UNIT IV – ADVANCED TESTING CONCEPTS	**(9)**
Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.	
UNIT V - TEST AUTOMATION AND TOOLS	**(9)**
Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes,Packages, Methods to Test, Test Reports	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018

REFERENCES:

1. Glenford J. Myers, Corey Sandler, Tom Badgett, “The Art of Software Testing”, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, “Software testing”, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, S”oftware Testing: A Craftsman’s Approach, Fourth Edition”, 2014, Taylor & Francis Group.
4. Carl Cocchiaro, “Selenium Framework Design in Data-Driven Testing”, 2018, Packt Publishing
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, “Implementing Automated Software Testing”, 2009, Pearson Education, Inc.
6. Satya Avasarala, “Selenium WebDriver Practical Guide”, 2014, Packt Publishing.
7. Varun Menon, “TestNg Beginner's Guide”, 2013, Packt Publishing.

17AIX12-R PROGRAMMING					
		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 Learn Fundamentals of R and environmental setup	**1.1**	The students will be able to know installation and basic data types and syntax in R.	**a,b,c,e,i,k**
2.0	To get knowledge about operators and control statements	**2.1**	The students will be able to understand decision making, loops, vectors and arrays	**a,b,c,e,i,k**
3.0	To learn about Exploring Data in R	**3.1**	The students will be able to realize data frames and exploring data.	**a,b,c,e,i,k**
4.0	To understand linear regression and logistic regression	**4.1**	The students will be able to understand assuming and validating linear and logistic regression.	**a,b,c,e,i,k**
5.0	To learn the steps involved in decision tree and time series	**5.1**	The students will be able to build decision tree algorithm and understand time series.	**a,b,c,e,i,k**

UNIT I - INTRODUCTION	**(9)**
Introduction to R - Downloading and Installing R - IDEs and Text Editors - Environment Setup -Basic Syntax - Data Types – Variables	
UNIT II - OPERATORS AND CONTROL STATEMENTS	**(9)**
Operators - Decision Making –- Loops - Loop Control Statements– Function - Calling a Function– Strings - String Manipulation- Vectors - Vector Creation - Accessing Vector Elements– Lists –Matrices - Arrays	
UNIT III - EXPLORING DATA IN R	**(9)**
Data Frames - R Functions for Understanding Data in Data Frames - Load Data Frames - Exploring Data- Data Summary - Finding the Missing Values - Invalid Values and Outliers - Descriptive Statistics - Spotting Problems in Data with Visualization	
UNIT IV – LINEAR REGRESSION AND LOGISTIC REGRESSION	**(9)**
Model Fitting - Linear Regression - Assumptions of Linear Regression - Validating Linear Assumption -Logistic Regression - Binary Logistic Regression - Diagnosing Logistic Regression	
UNIT V - DECISION TREE AND TIME SERIES	**(9)**
Decision Tree - Basic Decision Tree Learning Algorithm - Measuring Features - Issues in Decision Tree Learning - Time Series Data - Reading Time Series Data - Plotting Time series Data - ARIMA Models	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

3. Seema Acharya, “Data Analytics using R”, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8
4. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), “R Programming”, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.

REFERENCES:

3. Sandip Rakshit,” R Programming for Beginners”, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
4. Andrie de Vries, Joris Meys, “R for Dummies A Wiley Brand”, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

17ITX06 PROGRAMMING WITH JAVA2 ENTERPRISE EDITION (Common to AI&DS,CSE and IT Branches)			
L	T	P	C
3	0	0	3

PRE REQUISITE : 17ITC01	QUESTION PATTERN: TYPE - I

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To design interactive applications with GUI Components such as JavaFX.	1.1	The students will be able to design GUI components with Java FX.	**b,c**
2.0	To develop database applications using JDBC.	2.1	The students will be able to develop database applications using JDBC.	**b,c,k**
3.0	To implement Java networking APIs to communicate with processes.	3.1	The students will be able to implement Java networking APIs.	**b,c,j,k**
4.0	To develop JSP and Servlet application.	4.1	The students will be able to develop JSP and Servlet application.	**b,c,j,k**
5.0	To learn about Java Reflection API and XML.	5.1	The students will be able to learn Java Reflection API and XML.	**c,k**

UNIT I - JAVA GUI PROGRAMMING USING JAVA FX	(9)
Basics of Java FX – Java FX and Containers – Frames – layout Managers – Menus – Toolbars – Event Handling.	
UNIT II - JAVA DATABASE CONCEPTS & EJB	(9)
Database Architecture : Components of JDBC – Two Tier/Three Tier Architecture Processing SQL Statements - Establish Connection ,Types – Concurrency – Read column values from rows – Updating rows in a result set - Exceptions – Prepared Statement Object – EJB – Stateless and Statefull Entity Bean – Message Driven Bean.	
UNIT III - NETWORKING IN JAVA	(9)
URL: Creating and Parsing URL – URL Connection: Connecting to a URL - Reading from and Writing to aURLConnection – Socket - InetAddress. Datagram's: Writing a datagram client and server - Datagram Socket, Datagram Packet – Broadcasting to multiple Recipients - Multicast Socket-SSL and HTTPS in Java, RMI	
UNIT IV - SERVER SIDE TECHNOLOGIES WITH JAVA	(9)
Overview of JSP2.2 and Servlet 3.1 - Creating dynamic WebPages using JSP and Servlet- Standard Tag Library - Java Beans - Custom Tags - Expression Language – Annotations - Filters-Event handling-Exception Handling – Asynchronous processing.	
UNIT V - REFLECTION & JAVA XML	(9)
Introduction – Introspection – Dynamic Proxies – Dynamic class loading and reloading – Java XML: XML Processing –DOM and SAX Parser.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Carl Dea, Mark Heckler, GerritGrunwald, José Pereda, Sean Phillips "JavaFX 8: Introduction by Example" Apress 2nd Edition 2014.
2. Kogent Learning Solutions Inc, "Java Server Programming Java EE 7 (J2EE 1.7), Black Book", dreamtechpress 2015.
3. Elliotte Rusty Harold, "Java Network Programming, 4th Edition Developing Networked Applications "O'Reilly Media, Final Release Date: October 2013

REFERENCES:

1. http://pdf.coreservlets.com/
2. https://docs.oracle.com/javase/tutorial.

17CSX31- PROBLEM SOLVING AND PROGRAMMING (Common to AI&DS,CSE and IT Branches)					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : 17CSC01 / 17CSC02		**QUESTION PATTERN : TYPE 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program Outcomes**
1.0	To gain knowledge about the basics of programming	1.1	The students will be able to understand the basics of Python Programming constructs.		**a,c,l**
2.0	To gain exposure about selection structure	2.1	The students will be able to design programs involving selection structure		**a,b,c,d,l**
3.0	To get knowledge about repetition structure, function and modules	3.1	The students will be able to design programs involving function, modules and loops.		**a,b,c,d,k,l**
4.0	To gain exposure about string	4.1	The students will be able to realize the need of strings.		**a,b,c,d,k,l**
5.0	To get knowledge about mutable and Immutable types	5.1	The students will be able to realize the need of list, tuples and dictionary.		**a,b,c,d,k,l**

UNIT I - INTRODUCTION TO BASICS OF PROGRAMMING	**(9)**
Basics - Variables and Assignment - Basic Data Types- Comments - Operators - print() - Floats	
UNIT II - SELECTION STRUCTURE	**(9)**
Introduction to Selection Structure - if statements, else statements, nested elif statements, truthy and falsey values, Control Structure	
UNIT III - VALUE – REPETITION AND RETURNING STRUCTURE	**(9)**
Loops - while loops, for loops - Nested Loops - Functions - modules - variable scope	
UNIT IV - DATA AND STRING PROCESSING	**(9)**
Strings - Accessing the Strings - Traversing the Strings - Working with Strings - Formatting Strings	
UNIT V - MUTABLE AND IMMUTABLE TYPES AND METHODS	**(9)**
Introduction to lists, indexing and slicing of list, del and list methods, Tuples, Dictionary and its methods.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
Dr. R. Nageswara Rao, —"Core Python Programming, Dreamtech Press", 2017 Edition. Reema Thareja – "Problem Solving and Programming – Python", Oxford University Press, 2nd Edition.	
REFERENCES:	
1. Wesley J. Chun, —"Core Python Programming", Pearson Education, 2nd edition, 2010.	

17ITX26 - PROBLEM SOLVING AND ALGORITHMIC SKILLS (Common to AI&DS,CSE and IT Branches)				
L	T	P	C	
3	0	0	3	
PREREQUISITE: NIL	**QUESTION PATTERN : TYPE - 1**			

COURSE OBJECTIVES AND OUTCOMES

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To impart fundamental concepts of OOP using python	**1.1**	The students will be able to understand the basics of object oriented concepts in python.	**a,c,l**
2.0	To gain exposure about inheritance and polymorphism	**2.1**	The students will be able to develop applications using inheritance and polymorphism	**a,b,c,d,e,k,l**
3.0	To understand the abstract data types and tree data structures	**3.1**	The students will be able to implement the ADTs and trees	**a,b,c,d,e,k,l**
4.0	To see how graphs and heaps can be used to solve a wide variety of problems	**4.1**	The students will be able to design graph abstract data type and heap	**a,b,c,d,e,k,l**
5.0	To understand the sorting techniques and shortest path algorithms.	**5.1**	The students will be able to implement the sorting techniques and shortest path algorithms.	**a,b,c,d,e,k,l**

UNIT I - MOTIVATION OF FUNDAMENTAL CONCEPT IN PROGRAMMING	**(9)**
Implementation of Classes and Objects in Python - Class Attributes and Instance Attributes - 'self ' parameter - Static Methods and Instance Methods - init() method	
UNIT II - ADVANCED FEATURES IN CONCEPT OF PROGRAMMING	**(9)**
Performing Abstraction and Encapsulation in Python - Single Inheritance - Multiple Inheritance - Multilevel Inheritance - Public, Protected and Private - Naming Conventions. Polymorphism- Overriding and the super() method - Diamond Shape Problem in Multiple Inheritance - Overloading an Operator - Implementing an Abstract Base Class (ABC)	
UNIT III - INTRODUCTION TO ALGORITHMIC THINKING AND PEAK FINDING	**(9)**
Array data structure - Linked List Data Structure and Its Implementation - Stacks and Queues - Binary Search Trees - Balanced Trees: AVL Trees and Red-Black Trees	
UNIT IV - MAPPING VALUES AND PRINCIPLE OF OPTIMALITY	**(9)**
Heaps - Heap sort Algorithm - Associative Arrays and Dictionaries - Ternary Search Trees as Associative Arrays - Basic Graph Algorithms - Breadth - First And Depth - First Search - Spanning Trees	
UNIT V - ANALYZING NUMBER OF EXCHANGES IN CRAZY-SORT	**(9)**
Shortest Path Algorithms, Dijkstra's Algorithm - Bellman-Ford Algorithm - Kruskal Algorithm - Sorting Algorithms- Bubble Sort, Selection Sort and Insertion Sort - Quick sort and Merge Sort, Non-Comparison Based Sorting Algorithms, Counting Sort and Radix Sort	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Dusty Phillips, “Python 3 Object-oriented Programming, Packt Publishing”, Second Edition.
2. Bradley N. Miller, David L. Ranum,- “Problem Solving with Algorithms and Data Structures Using Python”, Franklin, Beedle & Associates, 2011.

REFERENCES :

1. Mark Summerfield - Programming in Python 3, Pearson Education, 2nd Edition
2. Michael T. Goodrich, Irvine Roberto Tamassia, Michael H. Goldwasser, - Data Structures and Algorithms in Python, 2013 edition

17CSX30 AGILE METHODOLOGIES (Common to AI&DS,CSE and IT Branches)				
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 students with a theoretical as well as practical understanding of Agile software development practices and how small teams can apply them to create high-quality software	**1.1**	The student will able to interact with business stakeholders in determining the requirements for a software system.	**a,b,c,d,j,k**
2.0	To provide a good understanding of software design and a set of software technologies and APIs	**2.1**	The student will able to perform iterative software development processes: how to plan them, how to execute them.	**a,b,j,k**
3.0	To do a detailed examination and demonstration of Agile development and testing techniques	**3.1**	The student will able to point out the impact of social aspects on software development success.	**a,b,c,j,k**
4.0	To understand the benefits and pitfalls of working in an Agile team	**4.1**	The student will able to develop techniques and tools for improving team collaboration and software quality.	**a,b,c,j,k**
5.0	To understand Agile development and testing	**5.1**	The student will be able to perform Software process improvement as an ongoing task for development teams.	**a,c,k**

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

TEXT BOOKS:

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

REFERENCES:

1. CraigLarman, —Agile and Iterative Development: A manager s Guide, Addison-Wesley, 2004.
2. .Kevin C. Desouza, —Agile information systems: conceptualization, construction, and management, Butterworth- SHeinemann, 2007.

17ITX09 RUBY PROGRAMMING (Common to AI&DS,CSE and IT Branches)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - I**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand basic programming constructs of Ruby.	**1.1**	The students will be able to recall and describe basic of ruby programming.	**a,b,c,e,i,k,l**
2.0	To understand the concepts of operators, statements and control structures.	**2.1**	The students will be able to know the concepts of operators, statements and control structures.	**a,b,c,d,e,i,l**
3.0	To define classes and modules.	**3.1**	The students will be able to develop a program based on classes and modules	**a,b,c,d,e,f,i,k,l**
4.0	To describe the Reflection and Metaprogramming.	**4.1**	The students will be able to generate a Metaprogramming.	**a,b,c,e,f,g,k,l**
5.0	To deploy Ruby environment	**5.1**	The students will be able to design a Ruby environment	**a,b,c,d,e,f,g,i,k,l**

UNIT I - BASICS OF RUBY PROGRAM	**(9)**
The Structure and Execution of Ruby Programs: Lexical Structure, Syntactic Structure, File Structure, Program Encoding, Program Execution. Datatypes and Objects: Numbers, Text, Arrays, Hashes, Ranges, Symbols, True, False, and Nil, Objects	
UNIT II - OPERATORS, STATEMENTS AND CONTROL STRUCTURES	**(9)**
Expressions and Operators: Literals and Keyword Literals, Variable References, Constant References, Method Invocations, Assignments. Operators. Statements and Control Structures : Conditionals, Loops, Iterators and Enumerable Objects, Blocks, Altering Control Flow, Exceptions and Exception Handling, BEGIN and END, Threads, Fibers, and Continuations	
UNIT III - METHOD, CLASSES AND MODULES	**(9)**
Parentheses, Method Arguments, Procs and Lambdas, Closures, Method Objects, Functional Programming. Classes and Modules : Defining a Simple Class, Method Visibility: Public, Protected, Private, Subclassing and Inheritance, Object Creation and Initialization, Modules, Loading and Requiring Modules, Singleton Methods and the Eigenclass, Method Lookup, Constant Lookup	
UNIT IV - REFLECTION AND METAPROGRAMMING	**(9)**
Reflection and Metaprogramming : Types, Classes, and Modules, Evaluating Strings and Blocks, Variables and Constants, Methods, Hooks, Tracing, ObjectSpace and GC, Custom Control Structures, Missing Methods and Missing Constants, Dynamically Creating Methods, Alias Chaining, Domain-Specific Languages	
UNIT V - RUBY PLATFORM AND ENVIRONMENT	**(9)**
The Ruby Platform: Strings, Regular Expressions, Numbers and Math, Dates and Times, Collections, Files and Directories, Input/Output, Networking, Threads and Concurrency. The Ruby Environment: Invoking the Ruby Interpreter, The Top-Level Environment, Practical Extraction and Reporting Shortcuts, Calling the OS, Security	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOK:
1.David Flanagan, Yukihiro Matsumoto, “The Ruby Programming Language - Everything You Need to Know”, O'Reilly Media, 2008.
REFERENCES:
1. Timothy Fisher, “Ruby on Rails Bible”, Wiley India Pvt. Ltd., 2009. 2. Chad Pytel, Tammer Saleh, ”Rails Anti Patterns: Best Practice Ruby on Rails Refactoring”, 1st ed., Addison- Wesley, 2010. 3. David A. Black, “The Well-Grounded Rubyist”, Manning Publications, 2nd ed., 2014. 4. Peter Cooper, “Beginning Ruby: From Novice to Professional”, Apress, 3rd ed., 2016.

17CSX33 GOOGLE CLOUD PLATFORM (Common to AI&DS and CSE Branches)				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE: 17CSC05	**QUESTION PATTERN: TYPE - III**

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To Learn the basic concepts of Google Cloud Platform.	1.1	The students will be able to recall and describe GoogleCloud Platform products and services.	**a,j,l**
2.0	To be familiar with the containerize workloads in Docker containers, deployment of Kubernetes clusters provided by Google.	2.1	The students will be able to describe about container basics, containerize an existing application and Kubernetes concepts and principles.	**a,e,j,l**
3.0	To know the configuration of VPC networks, virtual machines and cloud IAM.	3.1	The students will be able to Configure VPC networks, virtual machines and cloud IAM.	**a,b,c,e,j,l**
4.0	To Implement data storage services in GCP Manage and examine billing of GCP resources Monitor resources using Stack driver services.	4.1	The students will be able to Manage and examine billing of GCP resources and Monitor resources using Stack driver services.	**a,b,c,e,j,l**
5.0	To configure the load balancers ,auto scaling for VM instances , deploy the GCP infrastructure services and Leverage managed services in GCP	5.1	The students will be able to deploy the load balancers and auto scaling for VM instances	**a,b,c,d,e,i,j,k,l**

UNIT I – INTRODUCTION TO GOOGLE PLATFORM	**(9)**
Introduction: Advantages of Google Cloud Platform – components of Google's network infrastructure – Getting Started with Google Cloud Platform – Google App Engine and Google Cloud Data store– Google Cloud Platform Storage Options– Google Container Engine– Google Compute Engine and Networking– Big Data and Machine Learning	
UNIT II - GETTINGSTARTEDWITH GOOGLEKUBERNETESENGINE	**(9)**
Introduction to Containers and Docker: Create a container, Package a container using Docker – Kubernetes Basics – Deploying to Kubernetes – Continuous Deployment with Jenkins.	
UNIT III - VIRTUAL NETWORKS, VIRTUAL MACHINES AND CLOUD IAM	**(9)**
Virtual Networks: VPC objects in GCP– Types of VPC networks Implement VPC networks and firewall rules - Virtual Machines: CPU and memory options disk options - VM pricing and discounts - create and customize VM instances – Cloud IAM: – Cloud IAM resource hierarchy - Types of IAM roles- Types of IAM members - Implement access control for resources using Cloud IAM.	
UNIT IV – STORAGE AND DATABASE SERVICES, RESOURCE MANAGEMENT AND MONITORING	**(9)**
Cloud Storage, Cloud SQL, Cloud Spanner, Cloud Firestore and Cloud Bigtable – data storage services – Resource Management: cloud resource manager hierarchy – protect GCP customers - organize resources - budget alerts in GCP - billing data with BigQuery - Resource Monitoring: Stackdriver services for monitoring, logging, error reporting, tracing, and debugging	

UNIT V - LOAD BALANCING AND AUTOSCALING, INFRASTRUCTURE AUTOMATION, MANAGED SERVICES	(9)
Various load balancing services- Determine which GCP load balancer to use in specific circumstances - Auto scaling behavior - Configure load balancers and auto scaling - Automate the deployment of GCP services using Deployment Manager or Terraform - GCP Marketplace- Managed services for data processing in GCP	
TOTAL (L: 45) = 45 PERIODS	

WEB REFERENCES:

1. https://cloud.google.com/certification/cloud-engineer
2. https://cloud.google.com/blog/topics/developers-practitioners/what-compute-engine-use-cases-security- pricing-and-more/
3. https://g.co/kgs/BgSNTZ

17CSX34 TABLEAU (Common to AI&DS&CSE Branches)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - III**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To Learn the basic concepts of Tableau products, Tableau Desktop interface and Types of connection	**1.1**	The students will be able to recall various Tableau products.	**a,j,l**	
2.0	To describe different date types like Discrete and Continuous dates, combined axis chart, Dualaxis chart, Maps and Text tables.	**2.1**	The students will be able to create discrete dates, continuous dates, multiple measures, measure on opposite axis, maps and show number in viz using text tables.	**a,e,j,l**	
3.0	To explore the concepts and creation of calculated fields, quick table calculation, reference line and dashboards	**3.1**	The students will be able to develop calculated field using existing fields, quick table calculation, reference line and reference band, dashboard and using dashboard actions.	**a,b,c,e,j,l**	
4.0	To design Joins, Cross database joins, Subsets ,levels of detail calculation and advanced table calculation	**4.1**	The Students will be able to implement Join the data from same database ,different database, dynamic grouping called Subsets ,Level of details Calculation and advanced table calculation	**a,b,c,e,j,l**	
5.0	To be familiar with Parameters, type of data connection like Extract, comparing measures, back ground maps, Device specific dashboards and Stories	**5.1**	The student will be able to design parameters from dynamic selection of a value, extract and comparing measure using bar in bar chart, bullet chart, back ground maps and Device specific dashboards like Desktop, Laptop, Mobile and story-telling.	**a,b,c,d,e,i,j,k,l**	

UNIT I – INTRODUCTION TO TABLEAU DESKTOP	**(9)**
Introduction: The Tableau Product Line - Interface of Tableau Desktop - Data types and their symbols - Dekstop Workflow- Connect, Analyse and Share - Panes of Tableau like Data , Analytics, marks ,Shelf - Data connection: Live and Extract - Split: smart and custom splits - Saving and Editing Data sources - Filtering - Dim, measures - sorting -Manual and Computed – Groups – Hierarchies.	
UNIT II – SLICING YOUR DATA BY DATE, COMBINED AND DUAL AXIS CHART, MAPS AND CROSSTAB	**(9)**
Slicing Your Data by Date: Discreate and continuous dates - custom dates - Using Multiple Measures in a View: Measure values and Measure Name - Combined Axis chart - Dual Axis chart - Showing the Relationship Between Numerical Values : Scatter plots - Mapping Data Geographically: Mapping- Navigation and selection in map - Creating Geographic Groups - Viewing Specific Values: Creating crosstab - Highlight Tables - Heat Map.	
UNIT III -CUSTOMIZING YOUR DATA,TABLE CALCULATION OVERVIEW, REFERENCE LINE AND DASHBOARDS	**(9)**
Customizing Your Data: Calculation and Aggregation - String and Date fn - Analyzing Data with Quick Table Calculations: Table Calculation Overview - Year over Year Changes - Running total of sales - Showing Breakdowns of the Whole: Pie chart - Tree maps - Highlighting Data with Reference Lines: Reference Lines and bands - Making Your Views Available: Dashboard - Dashboard Action(Highlight, Filter and URL).	

UNIT IV -JOINS,SUBSETS,LODs AND ADVANCED TABLE CALCULATION	(9)
Review: Measure Values and Measure Names - Measure Values and Measure Names - Dates-Discrete and continuous - Creating and Connecting to Data Sources: Data source and connection- Joins, Crosstab join, Blends and Union - Defining Subsets of Your Data: Sets - Nested Top N with Context - Nested Top N with Rank - Using Calculations in Tableau: Creating and Editing Calculated Fields – LOD - Advanced Table Calculations: Table Calculation Overview - Scope and Direction.	
UNIT V -PARAMETERS,DATA EXTRACT ,COMPARING MEASURES,BACKGROUND MAPS AND DEVICE SPECIFIC DASHBOARDS	**(9)**
Creating and Using Parameters: Create, Use and Show Parameters with Reference lines - Data Extracts: Using Data Extract - Comparing Measures: Bar in Bar chart- Bullet Chart - Tableau Geocoding: Navigation and Selection in Maps - Background Maps and Layers - Using Background Images for Spatial Analysis - Dashboards and Stories: Dash boarding - Device Specific - Story telling.	
TOTAL (L: 45) = 45 PERIODS	

WEB REFERENCES:

1. https://www.tableau.com/learn/training/20212
2. https://help.tableau.com/current/pro/desktop/en-us/buildexamples_bar.htm
3. https://help.tableau.com/current/pro/desktop/en-us/buildexamples_line.htm
4. https://help.tableau.com/current/pro/desktop/en-us/dashboards_create.htm

17ITX29 IT OPERATIONS (Common to AI&DS,CSE and IT Branches)				
	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, Hyper converged)- Risk, Response and Recovery: Risk Management and Information Security - The Risk Management Process - Business Continuity Management - Backing Up Data and Applications - Incident Handling - Recovery From a Disaster.	
UNIT V – AMS & Tools	**9**
Introduction – Support Models – Activities Type – Audits – Microsoft 365 – Domain Management – Licensing – Managing Teams – Meeting Policies – Messaging Policies	
TOTAL (L:45) : 45 PERIODS	

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 (Common to AI&DS,CSE and IT Branches)					
			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 identificationand 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

17CSX37 – PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP (Common to AI&DS,CSE Branches)				
L	T	P	C	
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	

17ITX32 JAVA - J2EE (Common to AI&DS, IT & CSE)					
		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

17AIX13 KNOWLEDGE ENGINEERING					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the basics of Knowledge Engineering.	**1.1**	The students will understand the basics of Knowledge Engineering	**a,b,c,d,e,f,i,j,k,l**	
2.0	To discuss methodologies and modeling for Agent Design and Development.	**2.1**	The students will apply methodologies and modelling for Agent Design and Development.	**a,b,c,d,e,i,j,k,l**	
3.0	To design and develop ontologies.	**3.1**	The students will design and develop ontologies	**a,b,c,d,e,i,j,k,l**	
4.0	To apply reasoning with ontologies and rules.	**4.1**	The students will apply reasoning with ontologies and rules.	**a,b,c,d,e,i,j,k,l**	
5.0	To understand learning and rule learning.	**5.1**	The students will understand learning and rule learning.	**a,b,c,d,e,i,j,k,l**	

UNIT I - REASONING UNDER UNCERTAINTY	**(9)**
Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering- Evidence-based Reasoning: Connecting the Dots - : Intelligence Analysis	
UNIT II – METHODOLOGY AND MODELING	**(9)**
Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.	
UNIT III - ONTOLOGIES – DESIGN AND DEVELOPMENT	**(9)**
Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.	
UNIT IV - REASONIING WITH ONTOLOGIES ,RULES AND LEARNING	**(9)**
Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge - Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization.	
UNIT V - RULE LEARNING AND DISCIPLE AGENTS	**(9)**
Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Analogy-based Generalization - Rule Generation and Analysis – Hypothesis Learning - Statement Abstraction - Reasoning Tree Abstraction - Reasoning Tree Browsing - Disciple Agents : Disciple-WA - Disciple-COA - Disciple-COG	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016.
   (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 – Chapter 7 , Unit 5 – Chapter 8, 9)

REFERENCES:

1. Ronald J. Brachman, Hector J. Levesque: “Knowledge Representation and Reasoning”, Morgan Kaufmann, 2004.
2. Ela Kumar, “Knowledge Engineering”, I K International Publisher House, 2018.
3. John F. Sowa: “Knowledge Representation: Logical, Philosophical, and Computational Foundations”, Brooks/Cole, Thomson Learning, 2000.
4. King , “Knowledge Management and Organizational Learning”, Springer, 2009.

17AIX14 RECOMMENDER SYSTEMS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the foundations of the recommender system.	**1.1**	The students will be able to Illustrate the concepts of recommendation systems and issues.	**a,b,c,d,e,f**	
2.0	To understand the concept of content-based recommendation	**2.1**	The students will be able to build the recommendation system based on content based recommendation.	**a,b,c,d,e,f**	
3.0	To learn about collaborative filtering	**3.1**	The students will be able to learn collaborative filtering and neighborhood models	**a,b,c,d,e,f**	
4.0	To Develop hybrid recommendation systems to improve the quality of predictions.	**4.1**	The students will be able to develop hybrid recommendation systems to improve the quality of predictions.	**a,b,c,d,e,f**	
5.0	To evaluating recommendation systems	**5.1**	The students will be able to evaluate recommendation systems and design.	**a,b,c,d,e,f**	

UNIT I - INTRODUCTION	**(9)**
Introduction - Recommender Systems Function - Data and Knowledge Sources - Recommendation Techniques - Application and Evaluation - Applications of recommendation systems - Issues with recommender system.	
UNIT II – CONTENT-BASED RECOMMENDATION	**(9)**
High level architecture of content-based systems - Advantages and drawbacks of content based filtering- Item Representation - Learning User Profiles and Filtering - Trends and Future Research - Neighborhood-based Recommendation - Components of Neighborhood Methods.	
UNIT III - COLLABORATIVE FILTERING	**(9)**
Preliminaries: Baseline predictors - The Netflix data - Implicit feedback - Matrix factorization models - Neighborhood models - Enriching neighborhood models - Between neighborhood and factorization - Constraint-based Recommenders	
UNIT IV - KNOWLEDGE BASED AND HYBRID RECOMMENDATION	**(9)**
Knowledge representation and reasoning - Interacting with constraint-based recommenders - Interacting with case-based recommenders - Opportunities for hybridization - Monolithic hybridization design - Parallelized hybridization design - Pipelined hybridization design	
UNIT V -EVALUATING RECOMMENDATION SYSTEMS	**(9)**
Evaluating Recommender Systems: Experimental Settings - Recommendation System Properties - IPTV Architecture - Recommender System Architecture- Recommender Algorithms- Recommender Services - System - General properties of evaluation research - Popular evaluation designs - Evaluation on historical datasets - Alternate evaluation designs	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Charu C. Aggarwal, “Recommender Systems: The Textbook”, First Ed., Springer, 2016. 2. Francesco Ricci , Lior Rokach , Bracha Shapira , “Recommender Sytems Handbook”, 1st ed, Springer (2011) **3.** Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich, “Recommender Systems: An Introduction”, Cambridge University Press (2011), 1st ed.
REFERENCES:
1. Manouselis N., Drachsler H., Verbert K., Duval E., “Recommender Systems For Learning”, Springer, 1st Edition, 2013. 2. Kim Falk., “Practical Recommender Systems”, Manning Shelter Island, 2019.

17AIX15 SOFT COMPUTING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.	**1.1**	The Student will be able to Understand the fundamentals of fuzzy logic operators and inference mechanisms	**a,b,c,d,e,i,j,k,l**	
2.0	To provide the mathematical background for carrying out the optimization associated with neural network learning	**2.1**	The Student will be able to Understand neural network architecture for AI applications such as classification and clustering	**a,b,c,d,e,i,j,k,l**	
3.0	To learn various Genetic Algorithms	**3.1**	The Student will Learn the functionality of Genetic Algorithms in Optimization problems	**a,b,c,d,e,i,j,k,l**	
4.0	To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.	**4.1**	The Student will Use hybrid techniques involving Neural networks and Fuzzy logic.	**a,b,c,d,e,i,j,k,l**	
5.0	To introduce case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing	**5.1**	The Student will Apply soft computing techniques in real world applications.	**a,b,c,d,e,i,j,k,l**	

UNIT I - INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC	**(9)**
Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems.	
UNIT II – NEURAL NETWORKS	**(9)**
Supervised Learning Neural Networks – Perceptrons – Back propagation -Multilayer Perceptrons –Learning from reinforcement – Adaptive heuristic Critic –Q-Learning - Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks	
UNIT III - GENETIC ALGORITHMS	**(9)**
Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function - Multi-Objective Genetic Algorithms.	
UNIT IV - NEURO FUZZY MODELING	**(9)**
ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability - Neuro fuzzy control – inverse learning – specialized Learning.	
UNIT V -APPLICATIONS	**(9)**
ANFIS Application – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition – Genetic Algorithm based Fuzzy Filters - Soft Computing for Color Recipe Prediction.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Sajang, J.-S. R., SUN, C.-T., & MIZUTANI, E.. "Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence". Upper Saddle River, NJ, Prentice Hall,1997.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
3. Himanshu Singh, Yunis Ahmad Lone, "Deep Neuro-Fuzzy Systems with Python".

REFERENCES:

1. Roj Kaushik and Sunita Tiwari, "Soft Computing-Fundamentals Techniques and Applications", 1st Edition, McGraw Hill, 2018.
2. Samir Roy, Udit Chakraborthy, "Introduction to Soft Computing, Neuro Fuzzy and Genetic Algorithms", Pearson Education, 2013.
3. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Third Edition, Wiley India Pvt Ltd, 2019.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996

17AIX16 OPTIMIZATION TECHNIQUES					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program Outcomes**
1.0	To understand fundamental topics in bio-inspired optimization techniques	**1.1**	The student will be able to familiarity with the basics of several biologically inspired optimization techniques.		**a,b,c,d,e,l,j,k,l**
2.0	To Learn the collective systems such as ACO, PSO, and BCO	**2.1**	The student will be able to familiarity with the basics of several biologically inspired computing paradigms.		**a,b,c,d,e,l,j,k,l**
3.0	To develop skills in biologically inspired algorithm design with an emphasis on solving real world problems	**3.1**	The student will be able to select an appropriate bio-inspired computing method and implement for any application and data set.		**a,b,c,d,e,l,j,k,l**
4.0	To understand the most appropriate types of algorithms for different data analysis problems and to introduce some of the most appropriate implementation strategies.	**4.1**	The student will be able to theoretical understanding of the differences between the major bio-inspired computing methods		**a,b,c,d,e,l,j,k,l**
5.0	To implement the Bio-inspired technique with other traditional algorithms.	**5.1**	The student will be able to learn other swarm intelligence algorithms and implement the bio-inspired technique with other traditional algorithms.		**a,b,c,d,e,l,j,k,l**

UNIT I – INTRODUCTION	**(9)**
Optimization Techniques: Introduction to Optimization Problems – Single and Multi- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function –differences between GA and Traditional optimization methods – Applications – Bio- inspired Computing (BIC): Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.	
UNIT II – SWARM INTELLIGENCE	**(9)**
Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behavior – Towards Artificial Ants – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Meta heuristic: Combinatorial Optimization – ACO Meta heuristic – Problem solving using ACO – Tabu Search – Local search methods – Scope of ACO algorithms.	
UNIT III – NATURAL TO ARTIFICIAL SYSTEMS	**(9)**
Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging –Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting .	
UNIT IV- SWARM ROBOTICS	**(9)**
Foraging for food – Clustering of objects – Collective Prey retrieval –Scope of Swarm Robotics – Social Adaptation of Knowledge: Particle Swarm – Particle Swarm Optimization (PSO) – Artificial Bee Colony (ABC) Optimization biologically inspired algorithms in engineering.	

UNIT V -CASE STUDIES	(9)
Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACO and PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems – Travelling Salesman problem.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. A. E. Elben and J. E. Smith, “Introduction to Evolutionary Computing”, 2nd Edition, Springer, 2015.
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007.

REFERENCES:

1. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, “Swarm Intelligence: FromNatural to Artificial Systems”, Oxford University press, 2000.
2. Christian Blum, Daniel Merkle (Eds.), “Swarm Intelligence: Introduction and Applications”, Springer Verlag, 2008.
3. Leandro N De Castro, Fernando J Von Zuben, “Recent Developments in Biologically Inspired Computing”, Idea Group Inc., 2005.
4. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
5. C. Ebelhart et al., “Swarm Intelligence”, Morgan Kaufmann, 2001.

17AIX17 BUSINESS INTELLIGENCE					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To introduce the basics of Business Intelligence, Analytics and Decision Support.	**1.1**	The students will be able to explain the overview of analytics and decision support for business applications.	**g,h,l**
2.0	To understand about Business Reporting, Visual Analytics and Business Performance Management.	**2.1**	The students will be able to organize the business reporting, visual analytics and business performance management for business applications.	**g,j,k,l**
3.0	To understand and learn data mining concepts.	**3.1**	The students will be able to utilize the data mining concepts for business intelligence.	**a,b,c,d,j,k**
4.0	To understand and learn Text and Web Analytics.	**4.1**	The students will be able to examine the text and web analytics with respect to business intelligence.	**a,b,c,d,j**
5.0	To learn about future Impacts in Business Analytics	**5.1**	The students will be able to analyze the emerging trends and future impacts in business analytics.	**a,b,c,d,l**

UNIT I – BUSINESS INTELLIGENCE, ANALYTICS AND DECISION SUPPORT	**(9)**
Changing Business Environments and Computerized Decision Support - A Framework for Business Intelligence - Intelligence Creation, Use, and BI Governance - Transaction Processing Versus Analytic Processing - Successful BI Implementation - Analytics Overview - Brief Introduction to Big Data Analytics.	
UNIT II - BUSINESS REPORTING AND VISUAL ANALYTICS	**(9)**
Business Reporting Definitions and Concepts - Data and Information Visualization – Different Types of Charts and Graphs - The Emergence of Data Visualization and Visual Analytics - Performance Dashboards - Business Performance Management – Performance Measurement - Balanced Scorecards – Six Sigma as a Performance Measurement System.	
UNIT III - DATA MINING	**(9)**
Data Mining Concepts and Applications - Data Mining Applications - Data Mining Process - Data Mining Methods - Data Mining Software Tools - Data Mining Privacy Issues, Myths and Blunders.	
UNIT IV - TEXT AND WEB ANALYTICS	**(9)**
Text Analytics and Text Mining Overview - Natural Language Processing - Text Mining Applications - Text Mining Process – Sentiment Analysis - Web Mining Overview - Search Engines - Web Usage Mining - Social Analytics.	
UNIT V - FUTURE IMPACTS IN BUSINESS ANALYTICS	**(9)**
Location Based Analytics for Organizations - Analytics Applications for Consumers - Recommendation Engines - The Web 2.0 Revolution and Online Social Networking - Cloud Computing and BI - Impacts of Analytics in Organizations -Issues of Legality, Privacy and Ethics - An Overview of the Analytics Ecosystem.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
1. Ramesh Sharda, Dursun Delen and Efraim Turban "Business Intelligence – A Managerial Perspective on Analytics", 3rd Edition, Pearson Education, India, 2018.
REFERENCES:
1. Efraim Turban, Ramesh Sharda and Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson Education, India, 2017. 2. David Loshin, "Business Intelligence – The Savvy Manager's Guide", 2nd Edition, Morgan Kaufmann Publishers, USA, 2013

17AIX18 ETHICS OF AI					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To understand the need for ensuring ethics in AI	**1.1**	The students will be able to understand the ethical issues in the development of AI agents	**a,b,c,d,e,i,j,k,l**	
2.0	To understand ethical issues with the development of AI agents	**2.1**	The students will be able to learn the ethical considerations of AI with perspectives on ethical values	**a,b,c,d,e,i,j,k,l**	
3.0	To apply the ethical considerations in different AI applications	**3.1**	The students will be able to apply the ethical policies in AI based applications and robot development	**a,b,c,d,e,i,j,k,l**	
4.0	To evaluate the relation of ethics with nature	**4.1**	The students will be able to implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.	**a,b,c,d,e,i,j,k,l**	
5.0	To overcome the risk for Human rights and other fundamental values.	**5.1**	The students will be able to this study will help to overcome the evil genesis in the concepts of AI.	**a,b,c,d,e,i,j,k,l**	

UNIT I – INTRODUCTION TO ETHICS OF AI	**(9)**
Role of Artificial Intelligence in Human Life, Understanding Ethics, Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities	
UNIT II – FRAMEWORK AND MODELS	**(9)**
AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.	
UNIT III – CONCEPTS AND ISSUES	**(9)**
Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder.	
UNIT IV- PERSPECTIVES AND APPROACHES	**(9)**
Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents.	
UNIT V - CASES AND APPLICATION	**(9)**
Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Markus D. Dubber, Frank Pasquale, Sunit Das, “The Oxford Handbook of Ethics of AI”, Oxford University Press Edited book, 2020
2. Paula Boddington, “Towards a Code of Ethics for Artificial Intelligence”, Springer, 2017

REFERENCES:

1. S. Matthew Liao, “Ethics of Artificial Intelligence”, Oxford University Press Edited 99 Book, 2020
2. N. Bostrom and E. Yudkowsky. “The ethics of artificial intelligence”. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
3. Wallach, W., & Allen, C, “Moral machines: ceaching robots right from wrong”, Oxford University Press, 2008.

17AIX19 COGNITIVE SCIENCE					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To know the theoretical background of cognition	**1.1**	The students will be able to understand the underlying theory behind cognition.	**a,b,c,d,e,i,j,k,l**	
2.0	To understand the link between cognition and computational intelligence.	**2.1**	The students will be able to connect to the cognition elements computationally	**a,b,c,d,e,i,j,k,l**	
3.0	To explore probabilistic programming language.	**3.1**	The students will be able to implement mathematical functions through webppl.	**a,b,c,d,e,i,j,k,l**	
4.0	To study the computational inference models of cognition.	**4.1**	The students will be able to develop applications using cognitive inference model.	**a,b,c,d,e,i,j,k,l**	
5.0	To study the computational learning models of cognition.	**5.1**	The students will be able to develop applications using cognitive learning model.	**a,b,c,d,e,i,j,k,l**	

UNIT I PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE	**(9)**
Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.	
UNIT II – COMPUTATIONAL INTELLIGENCE	**(9)**
Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision.	
UNIT III – PROBABILISTIC PROGRAMMING LANGUAGE	**(9)**
WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration	
UNIT IV- INFERENCE MODELS OF COGNITION	**(9)**
Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference.	
UNIT V - LEARNING MODELS OF COGNITION	**(9)**
Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, “Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016
2. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive Computing and Big Data Analytics”, Wiley Publications, 2015
3. Robert A. Wilson, Frank C. Keil, “The MIT Encyclopedia of the Cognitive Sciences”,The MIT Press, 1999.
4. Jose Luis Bermúdez, “Cognitive Science -An Introduction to the Science of the Mind”, Cambridge University Press 2020

REFERENCES:

1. Noah D. Goodman, Andreas Stuhlmuller, “The Design and Implementation of Probabilistic Programming Languages”, Electronic version of book, https://dippl.org/.
2. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, “Probabilistic Models of Cognition”, Second Edition, 2016,
3. Web References: https://probmods.org/.

17AIX20 ROBOTICS PROCESS AUTOMATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To explain the basic concepts of working of robot	**1.1**	The student will be able to explain the basic concepts of working of robot	**a,b,c,k,l**	
2.0	To analyze the function of sensor in robot and design the robotic arm with various tools	**2.1**	The student will be able to analyze the function of sensor in robot and design the robotic arm with various tools	**a,b,c,k,l**	
3.0	To program the robot for a typical application and path planning with end effectors	**3.1**	The student will be able to program the robot for a typical application and path planning with end effectors	**a,b,c,k,l**	
4.0	To conduct and design the experiments for various robot operations	**4.1**	The student will be able to conduct and design the experiments for various robot operations	**a,b,c,k,l**	
5.0	To understand the various robot programming languages	**5.1**	The student will be able to understand the various robot programming languages	**a,b,c,k,l**	

UNIT I -INTRODUCTION	**(9)**
Introduction, brief history, types, classification and usage, science and technology of robots, Artificial Intelligence in Robotics, some useful websites, textbooks and research journals	
UNIT II -ELEMENTS OF ROBOTS-JOINTS, LINKS, ACTUATORS, AND SENSORS	**(9)**
Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kind of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders-tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors-and vision	
UNIT III – END EFFECTORS	**(9)**
Classification of end effectors-tools as end effectors-drive system for grippers-mechanical adhesive- vacuum magnetic-grippers-hooks and scoops-gripper force analysis-and gripper design- active and passive grippers	
UNIT IV - PLANNING AND NAVIGATION	**(9)**
Introduction, path planning-overview-road map path planning-cell decomposition path planning- potential field path planning-obstacle avoidance-case studies .Vision system **-** Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations	

UNIT V- ROBOT PROGRAMMING	(9)
Introduction to robot languages-VAL-RAPID-language-basic commands-motion instructions- pick and place operation using industrial robot manual mode-automatic mode-subroutine command based programming-move master command language-introduction-syntax-simple problems	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Richared D.Klafter.ThomasAchmielewski and MickaelNegin," Robotic Engineering an Integrated approach"prentice hall India- newdelhi-2001
2. SaeedB.Nikku, Introduction to Robotics, analysis, control and applications Wiley-India 2nd edition-2011

REFERENCES:

1. "Industrial robotic technology-programming and application" by M.P.Groover et al, McGrawhill 2008
2. "Robotics technology and flexible automation" by S.R. Deb, TMH2009
3. https://www.robots.com/applications

17AIX21 AUGUMENTED REALITY AND VIRTUAL REALITY				
	L	T	P	C
	3	0	0	3
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE – 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To Identify the components of the virtual reality system	**1.1**	The students will be able to identify the components of the virtual reality system	**a,b,e,h,j,k,l**
2.0	To Describe various input and output devices used for virtual reality	**2.1**	The students will be able to describe various input and output devices used for virtual reality	**a,b,i,j,k,l**
3.0	To Apply the different modelling concepts to visual virtualization	**3.1**	The students will be able to apply the different modelling concepts to visual virtualization	**a,b,c,d,l**
4.0	To Analyze the performance of given simple applications related to virtual reality	**4.1**	The students will be able to analyze the performance of given simple applications related to virtual reality	**a,b,c,d,e,k,l**
5.0	To Implement 3D technology with virtual programming concepts	**5.1**	The students will be able to implement 3d technology with virtual programming concepts	**a,b,,i,j,k,l**

UNIT I - INTRODUCTION	**(9)**
The three I's of virtual reality, commercial VR technology and the five classic components of a VR system, Augmented Reality and Tele presence.	
UNIT II -INPUT AND OUTPUT DEVICES	**(9)**
Input Devices : (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays& haptic feedback.	
UNIT III –MODELING	**(9)**
Geometric modelling, kinematics modelling, physical modelling, behaviour modelling, model management and Modelling real-life from sensors.	
UNIT IV - HUMAN FACTORS	**(9)**
Methodology and terminology, user performance studies, VR health and safety issues. Applications: Medical applications, military applications, robotics applications, Virtual product design (CAD display, process simulation, virtual prototyping)	
UNIT V -VR PROGRAMMING	**(9)**
VR Programming-I: Introducing Unity 3D, Project panel, Scene hierarchy, Simple game object, Scene editor. VR Programming-II: Middle VR, device management, graphics card limitation, 3D user interactions, deployment, VR software: VRPN, VR Juggler.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:
1. "Virtual Reality Technology", Gregory C. Burdea& Philippe Coiffet, John Wiley & Sons, Inc., Second Edition,2006
REFERENCES:
1. "Killer Game Programming in Java", Andrew Davison, O'reilly-SPD, 2005. 2. "Understanding Virtual Reality, interface, Application and Design", William R.Sherman, Alan Craig, Elsevier (Morgan Kaufmann), First edition, 2002. 3. "3D Modeling and surfacing", Bill Fleming, Elsevier (Morgan Kauffman), 1999. 4. "3D Game Engine Design", David H.Eberly, Elsevier, Second Edition, 2006.

17AIX22 CYBER SECURITY					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To study the basics of Cyber security.	**1.1**	The students will be able to explain the basic concepts of computer security	**a,b,c,d,e,i,j,k,l**	
2.0	To know about the security aspects operating systems and networks.	**2.1**	The students will be able to devise methods for security in operating system & networks	**a,b,c,d,e,i,j,k,l**	
3.0	To explore Cryptography , IDS and IPS	**3.1**	The students will be able to differentiate the various security counter measures.	**a,b,c,d,e,i,j,k,l**	
4.0	To study the privacy principles and policies.	**4.1**	The students will be able to devise privacy principles and policies	**a,b,c,d,e,i,j,k,l**	
5.0	To know about the Security management and incidents.	**5.1**	The students will be able to manage the cyber space.	**a,b,c,d,e,i,j,k,l**	

UNIT I – INTRODUCTION TO CYBER SECURITY	**(9)**
Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls – Authentication Access Control and Cryptography - Web-User Side - Browser Attacks - Web Attacks- Targeting Users - Obtaining User or Website Data - Email Attacks.	
UNIT II – SECURITY IN OPERATING SYSTEM & NETWORKS	**(9)**
Security in Operating Systems - Security in the Design of Operating Systems -Root kit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.	
UNIT III – DEFENCES: SECURITY COUNTER MEASURES	**(9)**
Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.	
UNIT IV- PRIVACY IN CYBERSPACE	**(9)**
Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining - Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.	
UNIT V -MANAGEMENT AND INCIDENTS	**(9)**
Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:
1. Jan L.Harrington,"Network Security – A Practical Approach", Morgan Kaufmann Publishers –An Imprint of Elsevier, 2005, 2. William Stallings, "Cryptography and Network Security – Principles and Practice", Pearson Education Asia, Fourth Edition, 2005
REFERENCES:
1. Edward Amoroso, "Cyber Security", Silicon Press, 2006 2. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, "Security in Computing", 5th Edition , Pearson Education , 2015 3. George K.Kostopoulous, "Cyber Space and Cyber Security", CRC Press, 2013. 4. MarttiLehto, PekkaNeittaanmäki, "Cyber Security: Analytics, Technology and Automation edited", Springer International Publishing Switzerland 2015 5. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

17AIX23 DRONE TECHNOLOGIES				
	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – I

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand the basics of drone concepts	1.1	The students will be able to execute the suitable operating procedures for functioning a drone	a,b,c,d,f,l
2.0	To learn and understand the fundaments of design, fabrication and programming of drone	2.1	The students will be able to know about a various type of drone technology, drone fabrication and programming.	a,b,c,d,f,l
3.0	To impart the knowledge of an flying and operation of drone	3.1	The students will be able to impart the knowledge of an flying and operation of drone	a,b,c,d,,l
4.0	To know about the various applications of drone	4.1	The students will be able to know about the various applications of drone	a,b,c,d,e,f,l
5.0	To understand the safety risks and guidelines of fly safely	5.1	The students will be able to understand the safety risks and guidelines of fly safely	a,b,c,f,l

UNIT I INTRODUCTION	(9)
Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses. Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability	
UNIT II DRONE DESIGN, FABRICATION AND PROGRAMMING	**(9)**
Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program - Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.	
UNIT III DRONE FLYING AND OPERATION	**(9)**
Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications.	
UNIT IV DRONE COMMERCIAL APPLICATIONS	**(9)**
Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing	
UNIT V FUTURE DRONES AND SAFETY	**(9)**
The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms	
	TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:
1. Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, 2021 John Wiley & Sons, Inc. 2. Terry Kilby and Belinda Kilby, “Make:Getting Started with Drones “,Maker Media, Inc, 2016
REFERENCES:
1. John Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016 2. Zavrsnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”, Springer, 2018.

17AIX24 CYBER FORENSICS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To Infer the role of a Computer forensics profession for investigation.	**1.1**	The students will be able to infer the role of a computer forensics profession for investigation.	**a,b,e,h,j,k,l**	
2.0	To Summarize the requirements and recovery for data acquisition.	**2.1**	The students will be able to summarize the requirements and recovery for data acquisition.	**a,b,c,d,k,l**	
3.0	To Identify the tools of Process crime and Incident scenes for digital evidence.	**3.1**	The students will be able to identify the tools of process crime and incident scenes for digital evidence.	**a,b,c,i,j,k,l**	
4.0	To Choose suitable data Recover techniques for analysis and validate cyber forensics.	**4.1**	The students will be able to choose suitable data recover techniques for analysis and validate cyber forensics.	**a,b,c,d,e,i,j,k,l**	
5.0	To Analyze various digital techniques of forensics data.	**5.1**	The students will be able to analyze various digital techniques of forensics data.	**a,b,i,j,k,l**	

UNIT I - COMPUTER FORENSICS AND INVESTIGATION	**(9)**
Understanding computer forensics, Preparing for Computer Investigations, Maintaining Professional Conduct, Preparing a Digital Forensics Investigation, Procedures for Private-Sector High-Tech Investigations, Conducting an Investigation, Corporate High Tech Investigation	
UNIT II -DATA ACQUISITION AND RECOVERY	**(9)**
Storage formats using acquisition tools, Data Recovery: RAID Data acquisition, Using Remote Network Acquisition Tools, Using Other Forensics Acquisition Tools.Processing Crime and Incident Scene - Identifying and collecting evidence, Preparation for search, Seizing and Storing Digital evidence.	
UNIT III –COMPUTER FORENSICS TOOLS (ENCASE)	**(9)**
Evaluating Digital Forensics Tool Needs, Digital Forensics Software Tools, Digital Forensics Hardware Tools, Validating and Testing Forensics Software Understanding file structure and file system, NTFS disks, Disk Encryption and Registry Manipulation. Computer Forensics software and hardware tools .	
UNIT IV - COMPUTER FORENSICS ANALYSIS AND VALIDATION	**(9)**
Data collection and analysis, validation of forensics data, Addressing – data hiding technique Email Investigation and Mobile device Forensics - Investigation e-mail crimes and Violations, Using specialized E-mail forensics tools. Understanding mobile device forensics and Acquisition procedures.	
UNIT V- DIGITAL FORENSICS IN REAL TIME APPLICATIONS	**(9)**
E-mail and Social Media Investigations- Investigating E-mail Crimes and Violations, Understanding E-mail Servers, Using Specialized E-mail Forensics Tools. Mobile Device Forensics and the Internet of Anything- Understanding Mobile Device Forensics, Understanding Acquisition Procedures for Mobile Devices. Cloud Forensics-An Overview of Cloud Computing, Technical Challenges in Cloud Forensics.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Bill Nelson, Amelia Philips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, sixthEdition, Cengage Learning, 2018.

REFERENCE BOOKS :

1. David Lilburn Watson, Andrew Jones, “Digital Forensics Processing and Procedures”, Syngress, 2013
2. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools, British Library Cataloguing-in-Publication Data”, 2011
3. Greg Gogolin,”Digital Forensics Explained”,CRC Press, 2013.

17AIX25 QUANTUM COMPUTING				
L	T	P	C
3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE – 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To Understand the building blocks of a quantum computer.	1.1	The students will be able to explain the basic concepts of quantum computing.	a,b,c,h,j,k,l
2.0	To Understand the computation of quantum by circuit, algorithm and its application	2.1	The students will be able to understand the computation of quantum by circuit, algorithm and its application	a,b,c,i,j,k,l
3.0	To Gain knowledge about the quantum search algorithm	3.1	The students will be able to gain knowledge about the quantum search algorithm	a,b,k,l
4.0	To know the quantum computers by its types	4.1	The students will be able to know the quantum computers by its types	a,b,c,j,k,l
5.0	To learn the information about the quantum limitations and applications	5.1	The students will be able to learn the information about the quantum limitations and applications	a,b,c,j,k,l

UNIT I - FUNDAMENTAL CONCEPTS	(9)
Fundamental Concepts: Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	
UNIT II -QUANTUM COMPUTATION	**(9)**
Quantum Circuits - Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications	
UNIT III –QUANTUM SEARCH ALGORITHMS	**(9)**
Quantum search algorithms - Quantum counting- Speeding up the solution of NP complete problems - Quantum Search for an unstructured database.	
UNIT IV - QUANTUM COMPUTERS	**(9)**
Quantum Computers : Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.	
UNIT V- QUANTUM INFORMATION	**(9)**
Quantum noise and quantum operation-classical noise and Markov process, quantum operation, examples, applications, limitations	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:
1. Micheal A. Nielsen. &Issac L. Chuang – "Quantum Computation and Quantum Information",Cambridge University Press,2011.
REFERNCE BOOK:
1. "Quantum computing An applied approach" – Jack D. Hidery, Springer –second edition

17AIX26 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGY					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the mechanism of Block chain and Crypto currency.	**1.1**	The students will be able to understand the mechanism of block chain and crypto currency.	**a,b,c,d,e,i,l**	
2.0	To understand the functionality of current implementation of block chain technology.	**2.1**	The students will be able to understand the functionality of current implementation of block chain technology.	**a,b,c,d,e,i,l**	
3.0	To understand the required cryptographic background.	**3.1**	The students will be able to understand the required cryptographic background.	**a,b,c,d,e,i,l**	
4.0	To explore the applications of Block chain to crypto currencies and understanding limitations of current Block chain.	**4.1**	The students will be able to explore the applications of block chain to crypto currencies and understanding limitations of current block chain.	**a,b,c,d,e,i,l**	
5.0	To exposure towards recent research.	**5.1**	The students will be able to exposure towards recent research.	**a,b,c,d,e,i,l**	

UNIT I - INTRODUCTION	**(9)**
Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Crypto currency. Block chain	
UNIT II -BLOCKCHAIN ACHIEVES, STORE AND USE	**(9)**
Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a block chain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.	
UNIT III –MECHANICS OF BITCOIN	**(9)**
Bit coin transactions, Bit coin Scripts, Applications of Bit coin scripts, Bit coin blocks, The Bit- coin network, Limitations and improvements.	
UNIT IV - BITCOIN MINING	**(9)**
The task of Bit coin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies. Bit coin and Anonymity - Anonymity Basics, How to De-anonymize Bit coin, Mixing, Decentralized Mixing, Zero coin and Zero cash.	
UNIT V- COMMUNITY, POLITICS, AND REGULATION	**(9)**
Consensus in Bit coin, Bit coin Core Software, Stakeholders, Roots of Bit coin, Governments Notice on Bit coin, Anti Money Laundering Regulation, New York"s Bit License Proposal. Bit coin as a Platform: Bit coin as an Append only Log, Bit coins as Smart Property, Secure Multi Party Lotteries in Bit coin, Bit coin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds. **Recent trends**-meta mask.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:
1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. (2016). “Bitcoin and cryptocurrency technologies: a comprehensive introduction”. Princeton University Press.
REFERENCE BOOKS :
1. Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. OReillyMedia, Inc.”. **2.** Franco, P. (2014). “Understanding Bitcoin: Cryptography, engineering and economics”. John Wiley and Sons.

17AIX27 GAME DEVELOPMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To learn game architecture in the game industry	**1.1**	The students will be able to learn game architecture in the game industry	**a,b,j,k,l**	
2.0	To Create and produce digital components, games and documentation using a variety of Game Engines.	**2.1**	The students will be able to create and produce digital components, games and documentation using a variety of game engines.	**a,b,c,j,k,l**	
3.0	To Design the graphics based games and learn to manage the graphics devices.	**3.1**	The students will be able to design the graphics based games and learn to manage the graphics devices.	**a,b,c,,l**	
4.0	To Construct the game using artificial intelligence and physics based modeling.	**4.1**	The students will be able to construct the game using artificial intelligence and physics based modeling.	**a,b,c,l**	
5.0	To Create various types of games projects with different types of modes and perspectives.	**5.1**	The students will be able to create various types of games projects with different types of modes and perspectives.	**a,b,c,d,l**	

UNIT I – INTRODUCTION	**(9)**
Overview of game programming, game industry, Game Engine Architecture - Engine Support, Resource Management, Real Time Game Architecture	
UNIT II -GRAPHICS	**(9)**
Graphics Device Management, Tile-Based Graphics and Scrolling, GUI programming for games,	
UNIT III – ARTIFICIAL INTELLIGENCE AND PHYSICS	**(9)**
Artificial Intelligence in games, Physics based modeling, Path finding algorithms, Collision detection	
UNIT IV - GAME DESIGN	**(9)**
Game design, Differing game types, modes, and perspectives, scripting, audio engineering, Sound and Music, level design, render threading	
UNIT V- PROJECT MANAGEMENT	**(9)**
Game project management, Game design documentation, Rapid prototyping and game testing , Recent Trends	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. "Game Engine Architecture", 2nd Edition, Jason Gregory, A K Peters, 2014 ISBN 9781466560017

REFERENCES:

1. "Best of Game Programming Gems", Mark DeLoura, Course Technology, Cengage Learning, 2014
2. "Rules of Play: Game Design Fundamentals", Katie Salen and Eric Zimmerman, MIT Press, 2003, ISBN 0-262-24045-9
3. "Real-Time Collision Detection, Christer Ericson", Morgan Kaufmann, 2005, ISBN 9781558607323
4. "XNA Game Studio 4.0 Programming". Tom Miller and Dean Johnson, Addison-Wesley Professional, 2010 ISBN-10:0672333457
5. "Introduction to Game Development", Second Edition, Steve Rabin, Charles River Media; 2009 ISBN-10: 1584506792
6. "Game Coding Complete", Mike McShaffry and David Graham, Fourth Edition, 2012 Cengage Learning PTR, ISBN-10: 1133776574
7. "Beginning Game Programming", Jonathan S. Harbour, Cengage Learning PTR; 4th edition, 2014, ISBN-10: 1305258959

17AIX28 DIGITAL MARKETING				
L	T	P	C	
3	0	0	3	
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE – 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To identify some of the latest digital marketing trends and skills sets needed for today's marketer.	**1.1**	The students will be able to identify some of the latest digital marketing trends and skills sets needed for today's marketer.	**a,b,c,j,k,l**
2.0	To discover the hottest techniques to optimize digital marketing campaigns	**2.1**	The students will be able to discover the hottest techniques to optimize digital marketing campaigns	**a,b,c,i,j,k,l**
3.0	To evaluate the importance of your digital marketing assets, which ones actually matter the most to your business	**3.1**	The students will be able to evaluate the importance of your digital marketing assets, which ones actually matter the most to your business	**a,b,c,j,k,l**
4.0	To assess digital marketing as a term career opportunity	**4.1**	The students will be able to assess digital marketing as a term career opportunity	**a,b,c,d,e,h,i,j,k,l**
5.0	To understand experiments using a/b testing	**5.1**	The students will be able to understand experiments using a/b testing	**a,b,c,j,k,l**

UNIT I - INTRODUCTION	**(9)**
Introduction of Digital Marketing - Planning Digital Marketing Campaigns - Website designing with Word Press - Essentials of a website.	
UNIT II -SEARCH ENGINE OPTIMIZATION	**(9)**
Introduction to Search Engines - Keyword Research and Competition - On page Optimization - Off page Optimization - Local SEO - Search Engine Algorithm Updates - SEO Reporting	
UNIT III –GOOGLE ADWORDS	**(9)**
PPC Advertising (Online Advertisement) - Display Advertising - Google Shopping Ads -Introduction to Bing Ads -Mobile Marketing - Video Marketing - Google online Advertisement program – Certification	
UNIT IV - SOCIAL MEDIA MARKETING	**(9)**
Introduction to SMM - Facebook Marketing - Facebook Advertising - Twitter Marketing & Ads - YouTube Marketing - LinkedIn Marketing - InstaGram Marketing - Email Marketing – Pinterest Marketing - Online Reputation Management -Inbound Marketing - Google Analytics - Audience Reports - Traffic Reports - Behavior Reports	
UNIT V- EXPERIMENTAL TESTING	**(9)**
Conversion Tracking - Personality Development - Google AdSense - Getting Started as Freelancer - Affiliate Marketing	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. ShivaniKarwal, “Digital Marketing Handbook: A Guide to Search Engine Optimization Paperback” - Import, 25 Nov 2015.

REFERENCES :

1. Philip kolter and Gary Armstrong, “Principles of marketing”, Pearson education, 2010.
2. Michael Millerth, “B2B Digital Marketing: Using the Web to Market Directly to Businesses”,firstedition, Que Biz-Tech series2012.
3. Dave Chaffey, Fiona Ellis Chadwick, “Digital Marketing: Strategy, Implementation &Practice,Paperback” - Import, 2012.

17ITX37 PROBLEM SOLVING USING JAVA				
L	T	P	C	
3	0	0	3	

PRE REQUISITE : NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcome
1.0	To understand the basics of Java Programming Language	**1.1**	The Students will be able to solve simple problems using Java.	**a,b,c,d,e, h,j,k,l**
2.0	To understand fundamentals of programming such as conditional and iterative execution	**2.1**	The students will be able to write programs using branching and looping statements	**a,b,c,d,e, h,i,j,k,l**
3.0	To understand the concepts of Java arrays and Strings.	**3.1**	The students will be able to Be able to develop confidently with Strings and implement arrays.	**a,b,c,d,e, h,i,j,k,l**
4.0	To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods.	**4.1**	The students will be able to understand basic oops concepts and develop applications using inheritance and interfaces.	**a,b,c,d,e, h,i,j,k,l**
5.0	To understand threads and collection concepts	**5.1**	The students will be able to build applications using threads and collection framework.	**a,b,c,d,e, h,i,j,k,l**

UNIT I - INTRODUCTION TO JAVA	(9)
History of java-Features-Glimpse of java-Data types and Variables-Local variable-Instance variable-static variable-Keywords: this, super, final- Type conversion & casting- Importance of Scanner class-Getting started with Eclipse IDE and VSCode.	
UNIT II-OPERATORS AND DECISION MAKING STATEMENTS	(9)
Operators- Arithmetic Operator, Bitwise Operator, Conditional Operator, Unary Operator-Relational and Logical operators-Conditional statements: If else, If else if, Nested if -Looping Statements: For Loop, while Loop, do while loop-switch-break-continue- auto boxing and unboxing**.**	
UNIT III-ARRAYS AND STRINGS	(9)
Arrays: One Dimensional Array-Two Dimensional Array-Inbuilt functions in arrays. Strings-String array-Inbuilt functions in Strings-String Buffer class-String Builder class-String Tokenizer class	
UNIT IV-OBJECT-ORIENTED PROGRAMMING PARADIGM	(9)
Class-objects-Encapsulation-Inheritance and its types-Polymorphism: Static binding and dynamic binding-Methods –Constructors and its types-Abstract class-Interface.	
UNIT V- MULTITHREADING AND COLLECTIONS	(9)
Throwable classes-Exception types-Exception keywords-Collection classes: List, Set-Thread-Ways of thread creation-methods-thread priorities-Synchronization-multithreading-Lambda Expression.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Herbert Schildt, “Java:The Complete Reference”,McGraw Hill Education, Twelfth edition,2021.

REFERENCE:

1. Cay.S.Horstmann,GaryCornell, “Core Java-JAVA Fundamentals”, Prentice Hall,Eleventh edition, 2020.

17AIM01-INTRODUCTION TO ARTIFICIAL INTELLIGENCE					
		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	Understand the basic concepts of intelligent agents	1.1	To paraphrase Artificial Intelligence, intelligent agents, and apply blind search to solve problems.	**a,b,c,e,g,i,k,l**	
2.0	Develop general-purpose problem solving agents.	2.1	To demonstrate the effectiveness of heuristics in informed search methods.	**a,b,c,d,e,f,i,k,l**	
3.0	Employ AI techniques to solve some of today's real world problems.	3.1	To apply game playing in problem solving.	**a,b,c,d,e,i,k**	
4.0	To analyze the agent activities based on knowledge and logical aspects.	4.1	To make use of propositional logic and first order logic in knowledge-based reasoning.	**a,b,c,d,e,f,g,h,i, j,k,l**	
5.0	To introduce the most basic concepts, methods, algorithms for planning to achieve the goals.	5.1	To apply knowledge representation and planning to real world problems.	**a,b,c,e,f,g**	

UNIT I – INTRODUCTION	**(9)**
Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents– Problem Solving agents – search algorithms – uninformed search strategies.	
UNIT II – PROBLEM SOLVING	**(9)**
Heuristic search strategies – heuristic functions–Local search and optimization problems – local search in continuous space – search with non- deterministic actions – search in partially observable environments – online search agents and unknown environments.	
UNIT III – GAME PLAYING AND CSP	**(9)**
Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games–Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.	
UNIT IV –LOGICAL AGENTS	**(9)**
Knowledge-based agents – propositional logic – propositional model checking – agents based on propositional logic– First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining.	
UNIT V – PROBABILISTIC REASONING	**(9)**
Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories –Classical planning – algorithms for classical planning – time, schedule, and resources –hierarchical planning – Planning and acting in non-deterministic domains.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.
REFERENCE BOOKS:
1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education,2007 2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008 3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006 4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013. 64 5. http://nptel.ac.in/

17AIM02-FUNDAMENTALS OF MACHINE LEARNING					
			L	T	P	C
			3	0	0	3
PREREQUISITE :		**QUESTION PATTERN : TYPE - III**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the basic concepts of machine learning	1.1	The students will be able to explain the basic concepts of machine learning.	**a,b,c,e,g,i,k,l**	
2.0	To understand and build supervised learning models.	2.1	The students will be able to construct supervised learning models.	**a,b,c,d,e,f,i,k,l**	
3.0	To understand and build unsupervised learning models.	3.1	The students will be able to construct unsupervised learning algorithms.	**a,b,c,d,e,i,k**	
4.0	To evaluate the algorithms based on corresponding metrics identified	4.1	The students will be able to evaluate and compare different models	**a,b,c,d,e,f,g,h,i, j,k,l**	
5.0	To design and analyze machine learning experiments.	5.1	The student will be able to analyze machine learning experiments.	**a,b,c,e,f,g**	

UNIT I - INTRODUCTION TO MACHINE LEARNING	**(9)**
Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning	
UNIT II - SUPERVISED LEARNING	**(9)**
Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model	
UNIT III - 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 IV - NEURAL NETWORKS	**(9)**
Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyper parameter tuning	
UNIT V - DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS	**(9)**
Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS
1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020. 2. 2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective, “Second Edition”, CRC Press, 2014.
REFERENCES
1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006. 2. Tom Mitchell, “Machine Learning”, McGraw Hill, 3rd Edition, 1997. 3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, “Foundations of Machine Learning”, Second Edition, MIT Press, 2012, 2018. 4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016 5. Sebastain Raschka, Vahid Mirjalili , “Python Machine Learning”, Packt publishing, 3rd Edition, 2019. C

17AIM03-KNOWLEDGE REPRESENTATION AND REASONING					
		L	T	P	C
		3	0	0	3
PREREQUISITE :		**QUESTION PATTERN : TYPE - III**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the basics of Knowledge Engineering.	1.1	The students will understand the basics of Knowledge Engineering	**a,b,c,e,g,i,k,l**	
2.0	To discuss methodologies and modeling for Agent Design and Development.	2.1	The students will apply methodologies and modelling for Agent Design and Development.	**a,b,c,d,e,f,i,k,l**	
3.0	To design and develop ontologies.	3.1	The students will design and develop ontologies	**a,b,c,d,e,i,k**	
4.0	To apply reasoning with ontologies and rules.	4.1	The students will apply reasoning with ontologies and rules.	**a,b,c,d,e,f,g,h,i, j,k,l**	
5.0	To understand learning and rule learning.	5.1	The students will understand learning and rule learning.	**a,b,c,e,f,g**	

UNIT I - REASONING UNDER UNCERTAINTY	**(9)**
Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent	
UNIT II – METHODOLOGY AND MODELING	**(9)**
Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment	
UNIT III - ONTOLOGIES – DESIGN AND DEVELOPMENT	**(9)**
Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development –	
UNIT IV - REASONIING WITH ONTOLOGIES ,RULES AND LEARNING	**(9)**
Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge	
UNIT V - RULE LEARNING AND DISCIPLE AGENTS	**(9)**
Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Analogy-based Generalization - Rule Generation and Analysis – Hypothesis Learning - Statement Abstraction - Reasoning Tree Abstraction - Reasoning Tree Browsing -	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016.

(Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 – Chapter 7 , Unit 5 – Chapter 8, 9)

REFERENCES:

1. Ronald J. Brachman, Hector J. Levesque: "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
2. Ela Kumar, "Knowledge Engineering", I K International Publisher House, 2018.
3. John F. Sowa: "Knowledge Representation: Logical, Philosophical, and Computational Foundations", Brooks/Cole, Thomson Learning, 2000.
4. King , "Knowledge Management and Organizational Learning", Springer, 2009.

17AIM04- FUNDAMENTALS OF NEURAL NETWORKS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To use artificial neural network concepts to solve real world problems	**1.1**	The student will be able to use artificial neural network concepts	**a,b,c,e,l**
2.0	To solve simple real world problems using deep neural networks	**2.1**	The student will be able to solve and train deep neural networks	**a,b,c,e,l**
3.0	To use the concepts of RBF and boltzman machines to solve real world problems	**3.1**	The student will be able to explain the concepts of RBF and boltzman machines as non-linear classifier	**a,b,c,e,l**
4.0	To explicate the concepts of recurrent neural networks	**4.1**	The student will be able to analysis the concepts of recurrent neural network and convolution neural networks.	**a,b,c,e,l**
5.0	To learn the advanced techniques of deep learning	**5.1**	The student will be able to learn the advanced techniques of deep learning	**a,b,c,e,l**

UNIT I - NEURAL NETWORKS	**(9)**
Introduction – Basic Architecture of Neural Networks – Training Neural Network with Back propagation - Practical Issues in Neural Network Training - Power of Function Composition – Common Neural Architectures – Neural Architectures	
UNIT II - TRAINING DEEP NEURAL NETWORKS	**(9)**
Introduction – Back propagation- Setup and Initialization Issues – Vanishing and Exploding Gradient Problems – Gradient Descent Strategies – Batch Normalization - Practical Tricks for Acceleration and Compression – Bias- Variance Trade-Off –	
UNIT III - RADIAL BASIS FUNCTION NETWORKS AND BOLTZMANN MACHINES	**(9)**
Radial Basis Function : Introduction - Training an RBF Network – Hopfield Network – The Boltzman Machine – Restricted Boltzman Machine – Applications of Restricted Boltzman Machines	
UNIT IV –RECURRENT NEURAL NETWORK	**(9)**
Introduction – Architecture of Recurrent Neural Networks – Challenges of training Recurrent Networks – Echo-State Networks – Long Short-Term Memory (LSTM) – Gated Recurrent Units (GRUs) – Applications of Recurrent Neural Networks	

UNIT V - ADVANCED TOPICS IN DEEP LEARNING	(9)
Introduction ,Attention Mechanisms- Recurrent Models of Visual Attention, Neural Networks with External Memory- A Fantasy Video Game, Neural Turing Machines, Differentiable Neural Computer, Generative Adversarial Networks (GANs)- Training a Generative Adversarial Network	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Aggarwal, Charu C, “Neural Networks and Deep learning”, Springer, 2018
2. Francois Chollet, “Deep Learning using Python”, Manning Publications, 2017

REFERENCES:

1. Stone, James. (2019). “Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning”, Sebtel Press, United States, 2019
2. Ian Good fellow, Yoshua Bengio, Aaron Courville, “Deep Learning", MIT Press, 2016
3. Vance, William , “Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science” (Hardcover - 2020), Joining the dotstv Limited
4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), “Deep Learning Applications”, Volume 3,Springer Publications 2022
5. Charu C. Aggarwal, ”Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 2018.

17AIM05- DEEP LEARNING							
				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 and need and principles of deep neural networks	1.1	Explain the basics in deep neural networks	**a,b,c,e,g,i,k,l**			
2.0	To understand CNN and RNN architectures of deep neural networks	2.1	Apply Convolution Neural Network for image processing	**a,b,c,d,e,f,i,k,l**			
3.0	To comprehend advanced deep learning models	3.1	Apply Recurrent Neural Network and its variants for text analysis	**a,b,c,d,e,i,k**			
4.0	To learn the evaluation metrics for deep learning models	4.1	Apply model evaluation for various applications	**a,b,c,d,e,f,g,h,i, j,k,l**			
5.0	To learn about auto encoders and generative models for suitable applications	5.1	Apply auto encoders and generative models for suitable applications	**a,b,c,e,f,g**			

UNIT I DEEP NETWORKS BASICS	**9**
Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions – Gradient based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -	
UNIT II CONVOLUTIONAL NEURAL NETWORKS	**9**
Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions;	
UNIT III RECURRENT NEURAL NETWORKS	9
Unfolding Graphs -- RNN Design Patterns: Acceptor -- Encoder --Transducer; Gradient Computation -- Sequence Modeling Conditioned on Contexts -- Bidirectional RNN -- Sequence to Sequence RNN	
UNIT IV MODEL EVALUATION	**9**
Performance metrics -- Baseline Models – Hyper parameters: Manual Hyper parameter -- Automatic Hyper parameter -- Grid search -- Random search -- Debugging strategies.	
UNIT V AUTOENCODERS AND GENERATIVE MODELS	**9**
Auto encoders: Under complete auto encoders -- Regularized auto encoders -- Stochastic encoders and decoders -- Learning with auto encoders; Deep Generative Models: Variational auto encoders – Generative adversarial networks.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning", MIT Press, 2016. 2. Andrew Glassner, “Deep Learning: A Visual Approach”, No Starch Press, 2021.
REFERENCE BOOKS:
1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018. 2. Yoav Goldberg, ``Neural Network Methods for Natural Language Processing", Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017. 3. Francois Chollet, ``Deep Learning with Python", Manning Publications Co, 2018.

17AIM06-BUSINESS ANALYTICS					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - I**			

COURSE OBJECTIVES AND OUTCOMES:

Course objectives		Course outcomes		Related program outcomes
1.0	To understand the Analytics Life Cycle.	**1.1**	The students will be able to explain the real world business problems and model with analytical solutions.	**a,b,c,d,e,i,j,k,l**
2.0	To comprehend the process of acquiring Business Intelligence	**2.1**	The students will be able to identify the business processes for extracting Business Intelligence	**a,b,c,d,e,i,j,k,l**
3.0	To understand various types of analytics for Business Forecasting	**3.1**	The students will be able to apply predictive analytics for business fore-casting	**a,b,c,d,e,i,j,k,l**
4.0	To model the supply chain management for Analytics.	**4.1**	The students will be able to apply analytics for supply chain and logistics management	**a,b,c,d,e,i,j,k,l**
5.0	To apply analytics for different functions of a business	**5.1**	The students will be able to use analytics for marketing and sales.	**a,b,c,d,e,i,j,k,l**

UNIT I - INTRODUCTION TO BUSINESS ANALYTICS	**(9)**
Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation	
UNIT II - BUSINESS INTELLIGENCE	**(9)**
Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions.	
UNIT III - BUSINESS FORECASTING	**(9)**
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling	
UNIT IV - HR & SUPPLY CHAIN ANALYTICS	**(9)**
Applying HR Analytics to make a prediction of the demand for hourly employees for a year-Human Resources – Planning and Recruitment – Training and Development - Supply chain network – Logistics – Analytics applications in HR & Supply Chain .	
UNIT V – MARKETING & SALES ANALYTICS	**(9)**
Marketing Strategy, Marketing Mix, Customer Behavior –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behavior in marketing and sales.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. R. Evans James, “Business Analytics”, 2nd Edition, Pearson, 2017
2. R N Prasad, Seema Acharya, “Fundamentals of Business Analytics”, 2nd Edition, Wiley, 2016 Education,2018

REFERENCES:

1. Philip Kotler and Kevin Keller, “Marketing Management”, 15th edition, PHI, 2016
2. VSP RAO, “Human Resource Management”, 3rd Edition, Excel Books, 2010.
3. Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson

17AIM07-INTRODUCTION TO ROBOTICS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To explain the basic concepts of working of robot	**1.1**	The student will be able to explain the basic concepts of working of robot	**a,b,c,k,l**	
2.0	To analyze the function of sensor in robot and design the robotic arm with various tools	**2.1**	The student will be able to analyze the function of sensor in robot and design the robotic arm with various tools	**a,b,c,k,l**	
3.0	To program the robot for a typical application and path planning with end effectors	**3.1**	The student will be able to program the robot for a typical application and path planning with end effectors	**a,b,c,k,l**	
4.0	To conduct and design the experiments for various robot operations	**4.1**	The student will be able to conduct and design the experiments for various robot operations	**a,b,c,k,l**	
5.0	To understand the various robot programming languages	**5.1**	The student will be able to understand the various robot programming languages	**a,b,c,k,l**	

UNIT I -INTRODUCTION	**(9)**
Introduction, brief history, types, classification and usage, science and technology of robots, Artificial Intelligence in Robotics, some useful websites, textbooks and research journals	
UNIT II -ELEMENTS OF ROBOTS-JOINTS, LINKS, ACTUATORS, AND SENSORS	**(9)**
Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kind of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor	
UNIT III – END EFFECTORS	**(9)**
Classification of end effectors-tools as end effectors-drive system for grippers-mechanical adhesive- vacuum magnetic-grippers-hooks and scoops-gripper force analysis-and gripper design- active and passive grippers	
UNIT IV - PLANNING AND NAVIGATION	**(9)**
Introduction, path planning-overview-road map path planning-cell decomposition path planning- potential field path planning-obstacle avoidance-case studies .Vision system **-** Robotic vision systems-image representation-object recognition-and categorization-depth measurement	
UNIT V- ROBOT PROGRAMMING	**(9)**

Introduction to robot languages-VAL-RAPID-language-basic commands-motion instructions- pick and place operation using industrial robot manual mode-automatic mode-subroutine command based programming-move master command language-introduction-syntax-simple problems
TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:
1. Richared D.Klafter.ThomasAchmielewski and MickaelNegin," Robotic Engineering an Integrated approach"prentice hall India- newdelhi-2001 **2.** SaeedB.Nikku, Introduction to Robotics, analysis, control and applications Wiley-India 2nd edition-2011
REFERENCES:
1. "Industrial robotic technology-programming and application" by M.P.Groover et al, McGrawhill 2008 2. "Robotics technology and flexible automation" by S.R. Deb, TMH2009 3. https://www.robots.com/applications

17AIM08- ETHICS FOR ARTIFICIAL INTELLIGENCE					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE – I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To understand the need for ensuring ethics in AI	**1.1**	The students will be able to understand the ethical issues in the development of AI agents	**a,b,c,d,e,i,j,k,l**	
2.0	To understand ethical issues with the development of AI agents	**2.1**	The students will be able to learn the ethical considerations of AI with perspectives on ethical values	**a,b,c,d,e,i,j,k,l**	
3.0	To apply the ethical considerations in different AI applications	**3.1**	The students will be able to apply the ethical policies in AI based applications and robot development	**a,b,c,d,e,i,j,k,l**	
4.0	To evaluate the relation of ethics with nature	**4.1**	The students will be able to implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.	**a,b,c,d,e,i,j,k,l**	
5.0	To overcome the risk for Human rights and other fundamental values.	**5.1**	The students will be able to this study will help to overcome the evil genesis in the concepts of AI.	**a,b,c,d,e,i,j,k,l**	

UNIT I – INTRODUCTION TO ETHICS OF AI	**(9)**
Role of Artificial Intelligence in Human Life, Understanding Ethics, Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities	
UNIT II – FRAMEWORK AND MODELS	**(9)**
AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.	
UNIT III – CONCEPTS AND ISSUES	**(9)**
Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder.	
UNIT IV- PERSPECTIVES AND APPROACHES	**(9)**
Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values.	
UNIT V - CASES AND APPLICATION	**(9)**
Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.	
TOTAL (L:45) = 45 PERIODS	

TEXT BOOKS:

1. Markus D. Dubber, Frank Pasquale, Sunit Das, “The Oxford Handbook of Ethics of AI”, Oxford University Press Edited book, 2020
2. Paula Boddington, “Towards a Code of Ethics for Artificial Intelligence”, Springer, 2017

REFERENCES:

1. S. Matthew Liao, “Ethics of Artificial Intelligence”, Oxford University Press Edited 99 Book, 2020
2. N. Bostrom and E. Yudkowsky. “The ethics of artificial intelligence”. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
3. Wallach, W., & Allen, C, “Moral machines: caching robots right from wrong”, Oxford University Press, 2008.