PANIMALAR ENGINEERING COLLEGE

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

B.TECH - INFORMATION TECHNOLOGY

REGULATION 2021

CURRICULUM & SYLLABUS

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Bangalore Trunk Road, Varadharajapuram,
Poonamallee, Chennai – 600 123.

DEPARTMENT OF INFORMATION TECHNOLOGY

B.TECH - INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABUS

REGULATION - 2021

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. To provide Excellent Knowledge on Fundamental Computing Technology and Embedded System to inculcate interest and awareness in IT the stream.
2. To mould the student to synchronize the acquired theoretical knowledge with practical applications in real time situations.
3. To provide an insight for analyzing current trends, to explore the future issues in different perspectives of the computing environment.
4. To Stimulate the student to appear for the competitive examinations, to pursue higher studies and to continue the learning process with effective communication in technical aspects, to function efficiently as a team, individual and apply the acquired knowledge with in global, communal and to the stipulated environment.
5. To explore the acquired knowledge for developing innovative ideas, to become an Entrepreneur.

PROGRAM OUTCOMES (PO)

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

PO2 (Problem Analysis): Identify, formulate, research literature, and analyze complex engineering problem reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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

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

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

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

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

PO9 (Individual and team work): Function effectively as an individual, and as a memberor leader in diverse teams, and in multidisciplinary settings

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

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

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

PROGRAMME SPECIFIC OUTCOMES (PSO)

- **PSO1**: System Formulation: Apply Computing techniques to resolve issues with reasonable investigation for advancement.
- **PSO2:** System Design: Analyze systems for modeling and to provide domain specific solutions.
- **PSO3:** System Exploration: Explore new and emerging technologies leading to innovations in the field of Information Technology.

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.TECH- INFORMATION TECHNOLOGY

CHOICE BASED CREDIT SYSTEM CURRICULA AND SYLLABI - R 2021

SEMESTER - I

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21HS1101	Communicative English and Language Skills Lab - I Integrated	HS	5	3	0	2	4
2.	21MA1101	Engineering Mathematics – I	BS	4	3	1	0	4
3.	21PH1101	Engineering Physics	BS	3	3	0	0	3
4.	21CY1101	Engineering Chemistry	BS	3	3	0	0	3
5.	21ES1101	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	21ES1102	Engineering Graphics	ES	5	3	0	2	4
PRACTICALS								
7.	21ES1111	Problem Solving and PythonProgramming Laboratory	ES	4	0	0	4	2
8.	21BS1111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**31**	**18**	**1**	**12**	**25**

SEMESTER - II

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21HS1201	Communicative English and Language Skills Lab - II Integrated	HS	5	3	0	2	4
2.	21MA1201	Engineering Mathematics - II	BS	4	3	1	0	4
3.	21ES1201	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
4.	21IT1201	Programming in C	PC	3	3	0	0	3
5.	21IT1202	Information Technology Essentials (Lab Integrated)	ES	5	3	0	2	4
6.		Mandatory Course - I	MC	2	2	0	0	0
PRACTICALS								
7.	21ES1211	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	21IT1211	C Programming Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**17**	**1**	**12**	**22**

SEMESTER-III

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21MA1301	Discrete Mathematics	BS	4	3	1	0	4
2.	21IT1301	Data Structures	PC	3	3	0	0	3
3.	21IT1302	Operating Systems (Lab Integrated)	PC	5	3	0	2	4
4	21IT1303	Computer Organization and Architecture	PC	3	3	0	0	3
5.	21IT1304	Object Oriented Programming	PC	3	3	0	0	3
6.		Mandatory Course – II	MC	2	2	0	0	0
PRACTICALS								
7.	21IT1311	Data Structures Laboratory	PC	4	0	0	4	2
8.	21IT1312	Object Oriented Programming laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**17**	**1**	**10**	**21**

SEMESTER-IV

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21MA1402	Probability and Statistical Methods	BS	4	3	1	0	4
2.	21IT1401	Object Oriented Software Engineering (Lab Integrated)	PC	5	3	0	2	4
3.	21CS1401	Database Management Systems	PC	3	3	0	0	3
4.	21IT1402	Microprocessor Systems	PC	3	3	0	0	3
5.	21CS1402	Design and Analysis of Algorithms	PC	3	3	0	0	3
6.	21CS1403	Computer Networks	PC	3	3	0	0	3
PRACTICALS								
7.	21CS1411	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	21CS1412	Networks Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**18**	**1**	**10**	**24**

SEMESTER - V

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21IT1501	Compiler Engineering	PC	3	3	0	0	3
2.	21IT1502	Web Technologies	PC	3	3	0	0	3
3.	21IT1503	Artificial Intelligence	PC	3	3	0	0	3
4.	21IT1504	Embedded Systems and Internet of Things	PC	3	3	0	0	3
5.		Professional Elective-I	PE	3	3	0	0	3
6.		Open Elective -I	OE	3	3	0	0	3
PRACTICALS								
7.	21IT1511	Web Technologies Laboratory	PC	4	0	0	4	2
8.	21IT1512	Embedded Systems and Internet of Things Laboratory	PC	4	0	0	4	2
9.	21IT1513	Socially Relevant Mini Project	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER - VI

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21IT1601	Machine Learning	PC	3	3	0	0	3
2.	21IT1602	Cloud Computing and Big Data Analytics	PC	3	3	0	0	3
3.		Professional Elective-II	PE	3	3	0	0	3
4.		Professional Elective -III	PE	3	3	0	0	3
5.		Professional Elective -IV	PE	3	3	0	0	3
PRACTICALS								
6.	21IT1611	Machine Learning Laboratory	PC	4	0	0	4	2
7.	21IT1612	Cloud Computing and Big Data Analytics Laboratory	PC	4	0	0	4	2
			TOTAL	**23**	**15**	**0**	**8**	**19**

SEMESTER - VII

Sl.No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21IT1701	Mobile Computing with Mobile Application Development (Lab Integrated)	PC	5	3	0	2	4
2.	21CS1701	Cryptography and Network Security	PC	3	3	0	0	3
3.	21MG1701	Principles of Management	HS	3	3	0	0	3
4.		Professional Elective - V	PE	3	3	0	0	3
5.		Open Elective - II	OE	3	3	0	0	3
PRACTICALS								
6.	21CS1712	Cryptography and Network SecurityLaboratory	PC	4	0	0	4	2
7.	21EEC001	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
			TOTAL	**27**	**15**	**0**	**12**	**21**

SEMESTER - VIII

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective - VI	PE	3	3	0	0	3
2.		Professional Elective - VII	PE	3	3	0	0	3
PRACTICALS								
3.	21IT1811	Project Work	EEC	16	0	0	16	8
			TOTAL	**22**	**6**	**0**	**16**	**14**

TOTAL NO. OF CREDITS: 169

CREDIT DISTRIBUTION

Sl. No.	Subject Area	Credits Per Semester								Credits Total	Percentage %
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Social Studies(HS)	4	4					3		11	6.51
2.	Basic Sciences(BS)	12	4	4	4					24	14.20
3.	Engineering Sciences(ES)	9	9							18	10.65
4.	Professional Core (PC)		5	17	20	16	10	9		77	45.56
5.	Professional Electives (PE)					3	6	6	6	21	12.43
6.	Open Electives(OE)					3		3		6	3.55
7.	Project Work (PR/EEC)					1	3		8	12	7.10
8.	Non-Credit/(Mandatory)										
	Total	25	22	21	24	23	19	21	14	169	100.00

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Data Science	Vertical II Full Stack Development	Vertical III Cloud Computing and Data Center Technologies	Vertical IV Cyber Security and Data Privacy	Vertical V Creative Media Technologies	Vertical VI Emerging Technologies	Vertical VII Artificial Intelligence Techniques	Vertical VIII Networking
21AD1901 - Exploratory Data Analysis	21IT1901 - Open Source Technologies	21CS1901 - Cloud Tools and Techniques	21IT1908 - Ethical Hacking	21CS1908 - Augmented Reality/Virtual Reality	21CS1908 - Augmented Reality/Virtual Reality	21AD1923 - Knowledge Engineering	21CS1918 - Communication Theory
21AD1902 - Recommender Systems	21IT1902 - App Development	21CS1902 - Virtualization	21IT1909 - Digital and Mobile Forensics	21CS1909 - Multimedia and Animation	21CS1915 - Robotic Process Automation	21AD1903 - Soft Computing	21CS1919 - Network Design And Programming
21AD1918 - Neural Networks and Deep Learning	21CS1903 -Cloud Services Management	21CS1903 -Cloud Services Management	21IT1910 -Social Network Security	21CS1910 - Video Creation and Editing	21AD1918 - Neural Networks and Deep Learning	21AD1918 -Neural Networks and Deep Learning	21IT1916 - Wireless Technologies
21AD1919 - Text and Speech Analysis	21IT1903 - UI and UX Design	21CS1904 - Storage Technologies	21IT1911 - Modern Cryptography	21IT1903 - UI and UX Design	21IT1915 - Cyber Security	21AD1919 - Text and Speech Analysis	21IT1917 -Network Management
21AD1920 - Business Analytics	21IT1904 - Software Testing and Automation	21CS1905 - Site Reliability Engineering	21IT1912 - Engineering Secure Software Systems	21CS1911 -Digital Marketing	21CS1916 - Quantum Computing	21AD1924 - Optimization Techniques in Machine Learning	21CS1920 - Wireless Adhoc And Sensor Networks
21AD1906 - Image and Video Analytics	21IT1905 - Web Application Security	21CS1906 - Stream Processing	21IT1913 - Cryptocurrency and Blockchain Technologies	21CS1912 - Visual Effects	21IT1913 - Cryptocurrency and Blockchain Technologies	21AD1916 - Game Theory	21IT1918 - Protocols And Architectures For Wireless Sensor Networks
21AD1921 - Computer Vision Techniques	21IT1906 - DevOps	21IT1906 - DevOps	21IT1914 - Cyber Physical Systems Security	21CS1913 - Game Development	21CS1913 -Game Development	21AD1917 - Cognitive Science	21CS1921 - Next Generation Networks
21AD1922 - Data Visualization	21IT1907 - Principles of Programming Languages	21CS1907 - Security and Privacy in Cloud	21CS1907 - Security and Privacy in Cloud	21CS1914 - Multimedia Data Compression and Storage	21CS1917 - 3D Printing and Design	21AD1907 - Ethics And AI	21IT1919 - Software Defined Networks

Registration of Professional Elective Courses from Verticals

Professional Elective Courses will be registered from Semester V onwards.

These courses are listed in groups called verticals that represent a particular area of Specialization

/ diversified group.

Students are permitted to choose all the Professional Elective Courses from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled one Semester and another in other semester.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: DATA SCIENCE

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21AD1901	Exploratory Data Analysis	PE	3	3	0	0	3
2.	21AD1902	Recommender Systems	PE	3	3	0	0	3
3.	21AD1918	Neural Networks and Deep Learning	PE	3	3	0	0	3
4.	21AD1919	Text and Speech Analysis	PE	3	3	0	0	3
5.	21AD1920	Business Analytics	PE	3	3	0	0	3
6.	21AD1906	Image and Video Analytics	PE	3	3	0	0	3
7.	21AD1921	Computer Vision Techniques	PE	3	3	0	0	3
8.	21AD1922	Data Visualization	PE	3	3	0	0	3

VERTICAL 2: FULL STACK DEVELOPMENT

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21IT1901	Open Source Technologies	PE	3	3	0	0	3
2.	21IT1902	App Development	PE	3	3	0	0	3
3.	21CS1903	Cloud Services Management	PE	3	3	0	0	3
4.	21IT1903	UI and UX Design	PE	3	3	0	0	3
5.	21IT1904	Software Testing and Automation	PE	3	3	0	0	3
6.	21IT1905	Web Application Security	PE	3	3	0	0	3
7.	21IT1906	DevOps	PE	3	3	0	0	3
8.	21IT1907	Principles of Programming Languages	PE	3	3	0	0	3

VERTICAL 3 : CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1901	Cloud Tools and Techniques	PE	3	3	0	0	3
2.	21CS1902	Virtualization	PE	3	3	0	0	3
3.	21CS1903	Cloud Services Management	PE	3	3	0	0	3
4.	21CS1904	Storage Technologies	PE	3	3	0	0	3
5.	21CS1905	Site Reliability Engineering	PE	3	3	0	0	3
6.	21CS1906	Stream Processing	PE	3	3	0	0	3
7.	21IT1906	DevOps	PE	3	3	0	0	3
8.	21CS1907	Security and Privacy in Cloud	PE	3	3	0	0	3

VERTICAL 4 : CYBER SECURITY AND DATA PRIVACY

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21IT1908	Ethical Hacking	PE	3	3	0	0	3
2.	21IT1909	Digital and Mobile Forensics	PE	3	3	0	0	3
3.	21IT1910	Social Network Security	PE	3	3	0	0	3
4.	21IT1911	Modern Cryptography	PE	3	3	0	0	3
5.	21IT1912	Engineering Secure Software Systems	PE	3	3	0	0	3
6.	21IT1913	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
7.	21IT1914	Cyber Physical Systems Security	PE	3	3	0	0	3
8.	21CS1907	Security and Privacy in Cloud	PE	3	3	0	0	3

VERTICAL 5: CREATIVE MEDIA TECHNOLOGIES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1908	Augmented Reality/Virtual Reality	PE	3	3	0	0	3
2.	21CS1909	Multimedia and Animation	PE	3	3	0	0	3
3.	21CS1910	Video Creation and Editing	PE	3	3	0	0	3
4.	21IT1903	UI and UX Design	PE	3	3	0	0	3
5.	21CS1911	Digital marketing	PE	3	3	0	0	3
6.	21CS1912	Visual Effects	PE	3	3	0	0	3
7.	21CS1913	Game Development	PE	3	3	0	0	3
8.	21CS1914	Multimedia Data Compression and Storage	PE	3	3	0	0	3

VERTICAL 6: EMERGING TECHNOLOGIES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1908	Augmented Reality/Virtual Reality	PE	3	3	0	0	3
2.	21CS1915	Robotic Process Automation	PE	3	3	0	0	3
3.	21AD1918	Neural Networks and Deep Learning	PE	3	3	0	0	3
4.	21IT1915	Cyber security	PE	3	3	0	0	3
5.	21CS1916	Quantum Computing	PE	3	3	0	0	3
6.	21IT1913	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
7.	21CS1913	Game Development	PE	3	3	0	0	3
8.	21CS1917	3D Printing and Design	PE	3	3	0	0	3

VERTICAL 7: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21AD1923	Knowledge Engineering	PE	3	3	0	0	3
2.	21AD1903	Soft Computing	PE	3	3	0	0	3
3.	21AD1918	Neural Networks and Deep Learning	PE	3	3	0	0	3
4.	21AD1919	Text and Speech Analysis	PE	3	3	0	0	3
5.	21AD1924	Optimization Techniques in Machine Learning	PE	3	3	0	0	3
6.	21AD1916	Game Theory	PE	3	3	0	0	3
7.	21AD1917	Cognitive Science	PE	3	3	0	0	3
8.	21AD1907	Ethics And AI	PE	3	3	0	0	3

VERTICAL 8: NETWORKING

Sl. No	COURSE CODE	COURSETITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1918	Communication Theory	PE	3	3	0	0	3
2.	21CS1919	Network Design and Programming	PE	3	3	0	0	3
3.	21IT1916	Wireless Technologies	PE	3	3	0	0	3
4.	21IT1917	Network Management	PE	3	3	0	0	3
5.	21CS1920	Wireless Adhoc and Sensor Networks	PE	3	3	0	0	3
6.	21IT1918	Protocols and Architectures for Wireless Sensor Networks	PE	3	3	0	0	3
7.	21CS1921	Next Generation Networks	PE	3	3	0	0	3
8.	21IT1919	Software Defined Networks	PE	3	3	0	0	3

VERTICALS FOR MINOR DEGREE
(In addition to all the verticals of other programmes)

Vertical I Fintech andBlock Chain	Vertical II Entrepreneurship	Vertical III Public Administration	Vertical IV Business Data Analytics	Vertical V Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Datamining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation andSupply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable development
-	-	-	-	Energy Efficiency for Sustainable Development

HUMANITIES AND SOCIAL SCIENCES (HS)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21HS1101	Communicative English and Language Skills Lab I Integrated	HS	5	3	0	2	4
2.	21HS1201	Communicative English and Language Skills Lab II Integrated	HS	5	3	0	2	4
3.	21MG1701	Principles of Management	HS	3	3	0	0	3

BASIC SCIENCES (BS)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21MA1101	Engineering Mathematics -I	BS	4	3	1	0	4
2.	21PH1101	Engineering Physics	BS	3	3	0	0	3
3.	21CY1101	Engineering Chemistry	BS	3	3	0	0	3
4.	21BS1111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	21MA1201	Engineering Mathematics-II	BS	4	3	1	0	4
6.	21MA1301	Discrete Mathematics	BS	4	3	1	0	4
7.	21MA1402	Probability and Statistical Methods	BS	4	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21ES1101	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	21ES1102	Engineering Graphics	ES	5	3	0	2	4
3.	21ES1111	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
4.	21ES1201	Basic Electrical, Electronics andMeasurement Engineering	ES	3	3	0	0	3
5.	21IT1202	Information Technology Essentials (Lab Integrated)	ES	5	3	0	2	4
6.	21ES1211	Engineering Practices Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21IT1201	Programming in C	PC	3	3	0	0	3
2.	21IT1211	C Programming Laboratory	PC	4	0	0	4	2
3.	21IT1301	Data Structures	PC	3	3	0	0	3
4.	21IT1302	Operating Systems (Lab Integrated)	PC	5	3	0	2	4
5.	21IT1303	Computer Organization and Architecture	PC	3	3	0	0	3
6.	21IT1304	Object Oriented Programming	PC	3	3	0	0	3
7.	21IT1311	Data Structures Laboratory	PC	4	0	0	4	2
8.	21IT1312	Object Oriented Programming laboratory	PC	4	0	0	4	2
9.	21IT1401	Object Oriented Software Engineering (Lab Integrated)	PC	5	3	0	2	4
10.	21CS1401	Database Management Systems	PC	3	3	0	0	3
11.	21IT1402	Microprocessor Systems	PC	3	3	0	0	3
12.	21CS1402	Design and Analysis of Algorithms	PC	3	3	0	0	3
13.	21CS1403	Computer Networks	PC	3	3	0	0	3
14.	21CS1411	Database Management Systems Laboratory	PC	4	0	0	4	2
15.	21CS1412	Networks Laboratory	PC	4	0	0	4	2
16.	21IT1501	Compiler Engineering	PC	3	3	0	0	3
17.	21IT1502	Web Technologies	PC	3	3	0	0	3
18.	21IT1503	Artificial Intelligence	PC	3	3	0	0	3
19.	21IT1504	Embedded Systems and Internet of Things	PC	3	3	0	0	3
20.	21IT1511	Web Technologies Laboratory	PC	4	0	0	4	2
21.	21IT1512	Embedded Systems and Internet of Things Laboratory	PC	4	0	0	4	2
22.	21IT1601	Machine Learning	PC	3	3	0	0	3
23.	21IT1602	Cloud Computing and Big Data Analytics	PC	3	3	0	0	3
24.	21IT1611	Machine Learning Laboratory	PC	4	0	0	4	2
25.	21IT1612	Cloud Computing and Big Data Analytics Laboratory	PC	4	0	0	4	2
26.	21IT1701	Mobile Computing with Mobile Application Development (Lab Integrated)	PC	5	3	0	2	4
27.	21CS1701	Cryptography and Network Security	PC	3	3	0	0	3
28.	21CS1712	Cryptography and Network Security Laboratory	PC	4	0	0	4	2

OPEN ELECTIVES (OE)

OPEN ELECTIVE – I

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CE1010	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	21CE1001	Energy Conservation and Management	OE	3	3	0	0	3
3.	21GE1004	Hospital Waste Management	OE	3	3	0	0	3
4.	21CY1001	Industrial Nanotechnology	OE	3	3	0	0	3
5.	21EE1003	Logic and Distributed Control systems	OE	3	3	0	0	3
6.	21EC1011	Telehealth Technology	OE	3	3	0	0	3

OPEN ELECTIVE II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21EE1001	Basic Circuit Theory	OE	3	3	0	0	3
2.	21EC1004	Electronic Devices	OE	3	3	0	0	3
3.	21CY1002	Energy Technology	OE	3	3	0	0	3
4.	21CE1009	Environmental and Social Impact Assessment	OE	3	3	0	0	3
5.	21GE1003	Hospital Management	OE	3	3	0	0	3
6.	21EC1002	Medical Electronics	OE	3	3	0	0	3
7.	21EC1006	Signals and Systems	OE	3	3	0	0	3
8.	21ME1008	Supply Chain Management	OE	3	3	0	0	3
9.	21ME1006	Systems Engineering	OE	3	3	0	0	3
10.	21CY1003	Waste Water Treatment	OE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	21IT1513	Socially Relevant Mini Project	EEC	2	0	0	2	1
2	21EEC001	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
3	21IT1811	Project Work	EEC	16	0	0	16	8

MANDATORY COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21MC1001	Environmental Science	MC	2	2	0	0	0
2.	21MC1002	Constitution of India	MC	2	2	0	0	0
3.	21MC1003	Human Values	MC	2	2	0	0	0
4.	21MC1005	Essence of Indian Knowledge Tradition	MC	2	2	0	0	0
5.	21MC1006	Soft Skills and Personality Development	MC	2	2	0	0	0
6.	21MC1007	Value Education, Human Rights & Legislature Procedure	MC	2	2	0	0	0

21HS1101	COMMUNICATIVE ENGLISH AND LANGUAGE SKILLS LAB - I (INTEGRATED)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To induce the basic reading and writing skills among the first year engineering and technology students
- To assist the learners to develop their listening skills, which will enable them listening to lectures and comprehend them by asking questions and seeking clarifications
- To succor the learners to develop their speaking skills and speak fluently in real contexts.
- To motivate the learners to develop vocabulary of a general kind by developing their reading skills for meeting the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments

UNIT- I INTRODUCING ONE SELF 9

Listening: Listening and filling details, Listening to Speeches by Specialists and Completing Activities such as Answering Questions, Identifying the Main Ideas, Style, etc. Speaking: Introducing Oneself -Introducing Friend/ Family. Reading: Descriptive Passages(From Newspapers/ Magazines).Writing: Writing a Paragraph (Native Place, School Life), Developing Hints. Grammar: Noun Pronoun & Adjective. Vocabulary Development: One Word Substitution

UNIT - II DIALOGUE WRITING 9

Listening: Listening to Conversations (Asking for and Giving Directions). Speaking: Making Conversation Using (Asking for Directions, Making an Enquiry), Role Plays, and Dialogues. Reading: Reading a Print Interview and Answering Comprehension Questions. Writing: Writing a Checklist, Dialogue Writing Grammar: Tenses and Voices. Vocabulary Development: Prefix & Suffix, Word formation.

UNIT - III DRAFTING OFFICIAL COMMUNICATIONS 9

Listening: Listening for specific information. Speaking: Giving Short Talks on a given Topic. Reading: Reading Motivational Essays on Famous Engineers and Technologists (Answering Open – Ended and Closed Questions). Writing: Writing Formal Letters / Emails. Grammar :Adverb, Prepositions & Conjunctions. Vocabulary Development: Collocations – Fixed Expressions.

UNIT - IV WRITTEN COMMUNICATION 9

Listening: Listening to Short Talks (5 Minutes Duration and Fill a Table, Gap-Filling Exercise) Note Taking / Note Making .Speaking: Small Group Discussion, Giving Recommendations .Reading: Reading Problem –Solution Articles / Essays Drawn From Various Sources. Writing: Making Recommendations Note Making – Complaint Letters. Grammar: Subject - Verb Agreement, Framing Questions. Vocabulary Development: Connectives, Reference Words, Technical Vocabulary.

UNIT - V WRITING DEFINITIONS AND PRODUCT DESCRIPTION 9

Listening: Listening to a Product Description (Labeling and Gap Filling) Exercises. Speaking: Describing a Product and Comparing and contrasting it with Other Products. Reading: Reading Graphical Material for Comparison (Advertisements). Writing: Writing Definitions (Short and Long)– Compare and Contrast Paragraphs, Essay writing. Grammar:– Phrasal Verbs – Cause and Effect Sentences – Compound Nouns Vocabulary Development: Use of Discourse Markers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will be able to comprehend conversations and short talks delivered in English
2. Participate effectively in informal conversations; introduce themselves and their friends and express opinions English
3. Read articles of a general kind in magazines and news papers
4. Write short essays of a general kind and personal letters and emails in English
5. Recognize the use of grammar in speech and writing

TEXT BOOKS:

1. N P Sudharshana & C Savitha. *English for Technical Communication* Delhi: CUP, 2019.Board of Editors. *English for Engineers and Technologists* Volume1 Orient Black Swan Limited,2020.

REFERENCES:

1. Board of Editors Using English - A course book for Under graduate engineers and Technologists Orient Black Swan Limited, 2017.

2. Bailey, Stephen .Academic Writing: *A Practical Guide for Students*. New York: Rutledge, 2011.3. Comfort, Jeremy, etal .*Speaking Effectively: Developing Speaking Skills for Business English*. Cambridge University Press, Cambridge: Reprint 2011

3. Means ,L. Thomas and Elaine Langlois .*English & Communication For Colleges*. Cengage Learning, USA: 2007

4. Redston ,Chris & Gillies Cunningham *Face 2 Face*(Pre-intermediate Student's Book & Work book) Cambridge University Press, New Delhi: 2005.

WEB REFERENCES:

1. https://learn english teens. british council.org /exams / grammar-and - vocabulary- exams / word - formation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINE COURSES / RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LANGUAGE SKILLS LAB MINIMUM OF EXERCISES TO BE CONDUCTED **15**

List of exercises

1 Reading: Different text type

2 Reading: Predicting content using pictures and title.

3 Reading: Use of graphic organizer store view

4 Reading: Aid comprehension.

5 Reading: Understanding reference words

6 Reading: Use of connectors in a passage-

7 Reading: Speed reading Techniques.

8	Reading and Comprehending the passages in the competitive exams like GATE, TOFEL, GRE ,IELTS, and other exams conducted by Central and State governments.
9	Reading: Sentence Completion Exercises used in competitive exams.
10	Writing-Error Detection:
11	Writing-Spotting and reasoning the errors found from the passages in competitive exams.
12	Writing-Email writing
13	Writing: Job Application: Resume
14	Writing - Elements of a good essay-
15	Writing: Types of essays-Descriptive-Narrative-issue based.
16	Writing: Statement of Purpose
17	Writing: Letter of recommendation
18	Writing: Vision statement
19	Writing-Verbal Analogy,
20	Writing-Phrases, and Idioms associated with competitive exams

TOTAL: 30 PERIODS

SOFTWARE REQUIRED:

Globarena

REFERENCES:

1. Suresh Kumar. Eandet al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
2. Davis, Jason and Rhondaiss .Effective Academic Writing (Level3) Oxford University Press:Oxford,2006
3. With row ,Jeans and etal. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge UniversityPress:Cambridge,2004
4. Goatly, Andrew. Critical Reading and Writing .Routledge: United States of America ,2000

21MA1101	ENGINEERING MATHEMATICS - I	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- Matrix transforms are very useful within the world of computer graphics. A matrix algebra can be readily applied to the structural properties of graphs from an algebraic point of view.
- The aim of this course to get depth knowledge about calculus.
- Familiarize the functions of two variables and finding its extreme points.
- To make the students understand various techniques of integration.
- Apply multiple integral ideas in solving areas, volumes and other practical problems

UNIT- I MATRICES 9+3

Eigen values and Eigen vectors of a real matrix —Rank of the matrix – Characteristic equation –Properties of Eigen values and Eigen vectors – Cayley Hamilton theorem – Diagonalization of matrices– Reduction of a quadratic form to canonical form by orthogonal transformation and similarity transformation–Nature of quadratic forms.

UNIT - II DIFFERENTIALCALCULUS 9+3

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules(Sum, Product & Quotient rule, Chain rule, logarithmic and implicit differentiation) - Maxima and Minima of functions of one variable-Rolle's theorem-Mean value theorem.

UNIT - III FUNCTIONS OF SEVERALVARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions - Taylor's series for functions of two variables - Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT - IV INTEGRAL CALCULUS 9+3

Definite and Indefinite integrals – Substitution rule – Techniques of Integration – Integration by parts –Bernoulli's formula- Trigonometric integrals - Trigonometric substitutions – Integration of rational functions by partial fraction–Integration of irrational functions – Improper integrals.

UNIT - V **MULTIPLE INTEGRALS** **9+3**

Double integrals in modelling and polar coordinates - Change of order of integration in modelling coordinates-Area enclosed by plane curves – Change of variables in double integrals- Triple integrals-Volume of Solids.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

1. Able to find eigen values and eigen vectors, diagonalization of a matrix, symmetric matrices, positive definite matrices and similar matrices.
2. Apply limit definition and rules of differentiation to differentiate functions.
3. Understand familiarity in the knowledge of Maxima and Minima, Jacobian, Taylor series and apply the problems involving Science and Engineering
4. Understand the knowledge of Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction.
5. Understand the knowledge of Area enclosed by plane curves, Change of variable double integrals, Triple integrals, Volume of Solids. in double integrals, Triple integrals, Volume of Solids.

TEXT BOOKS:

1. GrewalB.S.,"HigherEngineeringMathematics‖,KhannaPublishers,NewDelhi, 43rdEdition,2014.
2. James Stewart, "Calculus: Early Transcendentals‖, Cengage Learning, 7thEdition, New Delhi, 2015.
3. Bali N.,Goyal M.and Walkins C.,"Advanced Engineering Mathematics‖, Firewall Media (Anim print of Lakshmi Publications Pvt. Ltd.),New Delhi, 7thEdition,2009

REFERENCES:

1. Anton,H, Bivens, IandDavis, S,Calculus,Wiley, 10thEdition,2016.
2. JainR.K. and IyengarS.R.K., "AdvancedEngineeringMathematics" , Narosa Publications,NewDelhi,3rdEdition, 2007.
3. Narayanan, S.and Manicavachagom Pillai, T.K.,C℃alculus'' Volume I and II,S. Viswanathan Publishers Pvt. Ltd.,Chennai,2007

4. Srimantha PalandBhunia, S.C, Engineering Mathematics, Oxford University Press, 2015

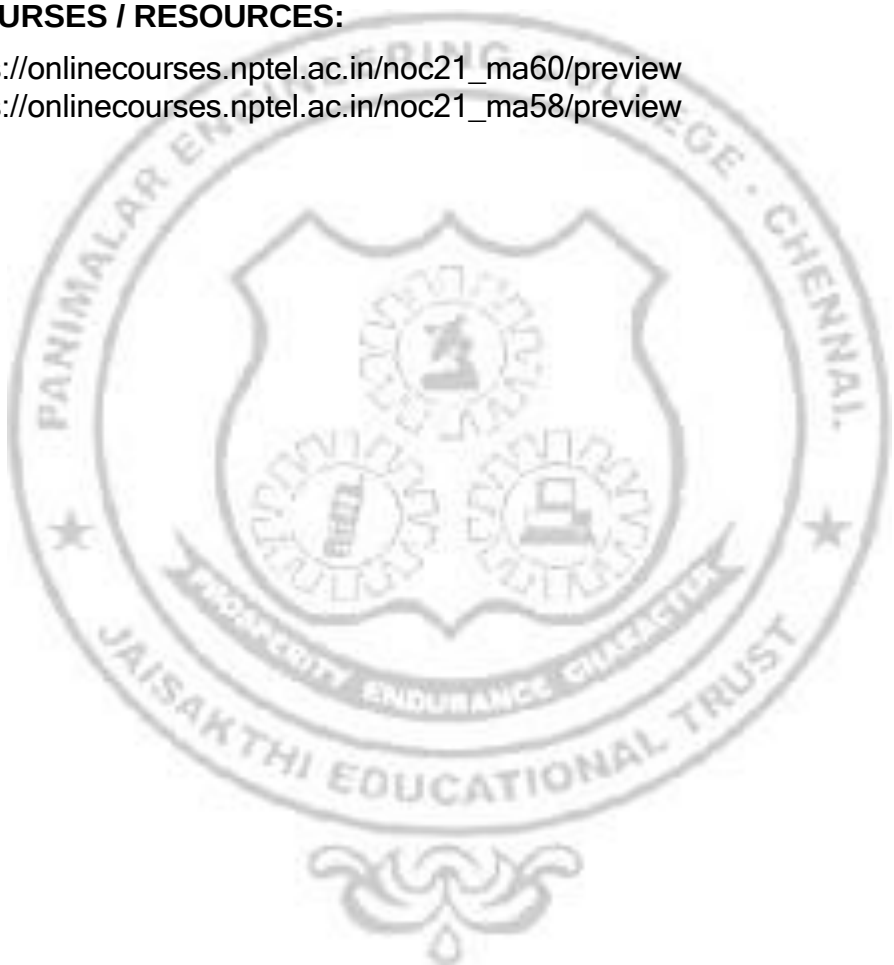
5. Weir, M.D and Joel Hass, Thomas Calculus ,12th Edition, Pearson India, 2016.

6. B.V. Ramana, ―Higher Engineering Mathematics ‖,McGraw Hill Education, India.

7. ErwinKreyzig,AdvancedEngineeringMathematics,JohnWileysons,10th edition, 2015

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma60/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma58/preview



21PH1101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT– I MECHANICS 9

System of particles: centre of mass in one and two dimensions – rotational motion of continues system– torque – moment of inertia – conservation of angular momentum – Newton's laws for rotation –equations of rotational motion – work energy theorem for rotational motion. Stress, strain, Hooke's law and elastic moduli – twisting couple per unit twist for solid and hollow cylinders – torsional pendulum theory – bending moment of beam – cantilever and non-uniform bending theory – uniform bending theory –Ishape girder.

UNIT–II ELECTROMAGNETIC THEORY 9

Divergence – curl – integral calculus – Gauss divergence theorem – Stoke's theorem - equation of continuity - displacement current - Maxwell's equations - Gauss's laws – Faraday's law –Ampere Maxwell law – mechanism of electromagnetic wave propagation - Hertz observation - production and detection of electromagnetic wave – electromagnetic waves in free space and matter – energy carried by electromagnetic wave–momentum and radiation pressure– properties of electromagnetic waves.

UNIT - III THERMAL PHYSICS 9

Mode of heat transfer: conduction, convection and radiation - thermal expansion of solids - bimetallic strips - thermal conductivity - heat conduction through compound media (series & parallel) - Forbe's and Lee's disc method; theory and experiment - thermal insulation – applications – heat exchangers –refrigerators, solar water heater.

UNIT - IV OSCILLATORY MOTION, LASERS AND FIBER OPTICS 9

Spring mass system - differential equation-simple harmonic motion-damped oscillation-forced oscillation –analogy with LCR circuits and mechanical oscillation - plane wave equation – equations of wave motion in a rope and velocity of wave. Population of energy levels, Einstein's A and B coefficients derivation - optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction –components and principle of fiber optics - numerical aperture and acceptance angle derivation - types of optical fibers (material, refractive index, mode) – losses associated with optical fibers – fiber as pressure and displacement sensors.

UNIT - V **QUANTUM MECHANICS** **9**

Black body radiation – Planck's hypothesis and derivation – wave particle duality of light: concepts of photon – Compton effect: theory and experiment – de Broglie hypotheses - concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations-particle in a one-dimensional box-tunnelling (qualitative)-scanning tunnelling microscope

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics of mechanics and especially elastic properties of materials.
2. Gain knowledge on the basic concepts of electromagnetic waves and its properties
3. Gain adequate knowledge on the concepts of thermal properties of materials and their applications in heat exchangers.
4. Acquire knowledge on the concepts of oscillations, lasers and fiber optics and their technological applications
5. Get knowledge on advanced physics concepts of quantum theory and its applications in modelling microscopes.

TEXT BOOKS:

1. Gaur, R.K.& Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
2. Santhosam, K. Russel Raj,K.& Maheswaran, A. " Engineering Physics, K RAM Publications ,2021
3. Pandey,B.K.& Chaturvedi,S. " Engineering Physics".Cengage Learning India,2012

REFERENCES:

1. Halliday,D.,Resnick, R.&Walker,J. "Principles of Physics".Wiley,2015.
2. Tipler, P.A. &Mosca, G. Physics for Scientists and Engineers with Modern Physics'.W.H.Freeman,2007.
3. ArthurBeiser, "Concepts of Modern Physics , McGrawHill, Sixthedition,1994.
4. Douglas.C.,Giancoli, "Physics:Principles with applications",Pearson,2014

WEB REFERENCES:

1. https://kluniversity.in/physics/pdfs/crypdf.pdf

2. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf
3. https://nptel.ac.in/content/storage2/courses/117101002/downloads/Lec1.pdf
4. https://nptel.ac.in/content/storage2/courses/117101002/downloads/Lec19.pdf
5. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/MIT8_04S16_LecNotes3.pdf
6. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/MIT8_04S16_LecNotes5.pdf

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/115/102/115102023/
2. https://nptel.ac.in/courses/115/106/115106066/

21CY1101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about the importance of Chemistry in Engineering domain
- To understand the Chemistry back ground of industrial process.
- To apply Chemistry knowledge for Engineering disciplines.

UNIT– I WATER TECHNOLOGY 9

Hardness -Types of hardness-Estimation by EDTA method-Boiler troubles-scale, sludge, priming, foaming, caustic embrittlement, Boiler corrosion-Internal Conditioning-Carbonate, phosphate, Calgon conditioning - External Conditioning - Zeolite and Demineralization process -Desalination, Reverse Osmosis Method-Domestic water treatment.

UNIT– II HIGH POLYMER SAND NANOCHEMISTRY 9

Polymers – Introduction – Classification of Polymers (Origin/Source, Structure, Monomers, Inter - molecular Forces, Synthesis) -Commercial Polymers (Poly Viny lChloride(PVC), Poly tetra fluoro ethylene (PTFE), Nylon-6 6, Nylon-6, Polyethylene Terephthalate (PET) – ConductingPolymers-Polyaniline,Polythiophene,Trans-Polyacetylene – Basic definition -FRP- General Engineering applications of FRP (Civil Engineering Structures). Nano materials – Introduction, size dependent properties(Surface area, Electrical, Optical, Catalytic and Thermal properties).Synthesis of nano materials: Top-down and bottom-up approaches, Chemical Synthesis – Co precipitation, Sol-Gel process and Chemical vapor deposition, Nanoscale materials: Fullerenes, Carbon nano tubes and8odellin-Characterization, propertie sandapplic ations. Green synthesis of Nano particles.

UNIT - III INSTRUMENTAL METHOD SAND ANALYSIS 9

Introduction to Spectroscopy – Types of spectroscopy – Absorption spectra – Emission spectra - Wave length and Wave number - Electromagnetic radiation - Flame Photometry, Atomic Absorption Spectroscopy, UV-Visible spectrum. Introduction – basic principles – Instrumentation& Applications – Infrared Spectroscopy. Chromatographic methods -Types (column, Thin layer, paper, Gas, High Performance Liquid Chromatographic methods) - principle- Separation and quantification of Organic compounds by GC and HPLC.Conducto metric Titrations: Instrumentation – Advantages – Applications Potentiometric Titrations: Instrumentation – Advantages - Applications.Measurement of pH :pHmetry – Instrumentation – Applications.

UNIT - IV ELECTRO CHEMISTRY AND CORROSION 9

Introduction- Electro de potentials -Electro chemical series-Electro chemical cell-redox reaction – measurement and applications – Nernst Equation Derivation-Electro chemical extraction of metals -Electrolytic refining of metals -Nano electro chemical Sensors. Corrosion – causes, factors, types, Chemical and Electro chemical Corrosion (Galvanic, Differentialaeration)-Corrosion Control, Electrochemical protection – Sacrificial Anodic method – Impressed Current Cathodic Protection – Corrosion Inhibitors – Biocorrosion. Protective Coatings-Paints, Constituents, Functions-Surface preparation for metallic coatings, Electroplating and Electroless Plating.

UNIT - V ENERGY SOURCE SAND STORAGE DEVICES 9

Introduction – Nuclear energy – Nuclear fission – Controlled Nuclear fission – Nuclear Fusion – Differences – Nuclear chain reactions – Nuclear Reactor – Classification of Nuclear Reactor - Light Water Nuclear Reactor, Breeder Reactor - Solar Energy, Conversion, Solar Cells - Wind Energy. Batteries and Fuel Cells - Types of batteries — Zinc – carbon dry cell -Lead Storage battery – Nickel - Cadmium Battery – Lithium battery-Battery Engineering-Battery hazards – Biological Batteries. Fuel Cells - Hydrogen -Oxygen Fuel Cell - Hondas cell -Super capacitors (elementary idea)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. Analyze the water quality parameters in purification and significance in industries, daily life
2. Explain the types, fabrication and engineering applications of polymers. Develop economically ne methods of synthesizing nano materials and their applications.

3. Demonstrate the knowledge of analytical techniques using spectroscopy.
4. Relate the electrode potential for its feasibility in electro chemical reaction. Illustrate the causes, cocorrosion and to achieve its protection.
5. Compare the economic and efficient usage of non -conventional and conventional energy source and various storage devices.

TEXT BOOKS:

1. P.C.Jainand Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) LTD., New Delhi.
2. S.S.Daraand S.S. Umare, "A Text book of Engineering Chemistry " S. Chandand Company Ltd ,New Delhi
3. V.R.Gowariker, N.V.Viswanath anand Jaya dev Sreedhar, Polymer Science, New Age International P(Ltd.,),Chennai, 2006
4. P. Kannan and A. Ravi krishnan, ¯ Engineering Chemistry , Sri Krishna Hitech Publishing Company Pvt .Ltd. Chennai, 2009.16
5. S.Vairam, P.Kalyaniand Suba Ramesh, ¯ Engineering Chemistry , Wiley India, 2011

REFERENCES:

1. Fried rich Emich, Engineering Chemistry , Scientific International Pvt.Ltd., New Delhi
2. Prasantha Rath,Engineering Chemistry, Cengage Learning India Pvt., Ltd., Delhi.
3. P.W. Atkins and de Paula Julio, Physical Chemistry, Oxford University Press, 8th Ed.,(Indian Student Edition)(2009).
4. K.K.Rohatgi - Mukherjee , ¯ Fundamental of Photo chemistry, New Age International (P) Ltd.,NewDelhi,1986.
5. G.A.Ozinand A.C .Arsenault, ¯ Nanochemistry :A Chemical Approach to Nano materials , RSC Publishing, 2005 Nanomaterials, B.Viswanathan, Alpha Science, ISBN:9781842654941

WEB REFERENCES:

1. http://www.mhhe.com/engcs/compsci/forouzan/dcn/student/olc

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/103/108/103108100
2. https://nptel.ac.in/courses/121/106/121106014
3. https://nptel.ac.in/courses/104/105/104105039

21ES1101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

1. To know the basic programming constructs –data types, decision structures, and control structures in python
2. To know how to use libraries for string manipulation
3. To Use python data structures – Lists, Tuples and Dictionary
4. To know the basic concepts of Object - Oriented Programming
5. To learn about input /output with files in Python

UNIT– I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flowchart, programming language); Python: Data types, variables, expressions, precedence of operators, algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi

SUGGESTED ACTIVITIES:

- Developing Pseudo codes and flowcharts for real life activities such as railway ticket Booking using IRCTC, admission process to under graduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic Operations
- Installing Python.
- Simple programs on print statements, arithmetic operations.

SUGGESTED EVALUATION METHODS:

- Quizzes on algorithm and basic python.
- Assignments on illustrative problems.
- On simple python programs

UNIT– II CONTROL FLOW, STRINGS & FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; functions, function definition and use; Fruitful functions: return values, parameters and arguments, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module. Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

SUGGESTED ACTIVITIES:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructsand Functions
- Developing simple applications like calculator, calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and
- Recursion vs. Iteration.

SUGGESTED EVALUATION METHODS:

- Quizzes on strings.
- Assignments on illustrative problems.
- Quizzes on control flow and functions

UNIT– III LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Lists as arrays. Illustrative programs: selection sort, insertion sort, merge sort, histogram.

SUGGESTED ACTIVITIES:

- Implementing python program using lists, tuples, sets for the following scenario:
- Simple sorting techniques
- Student Examination Report
- Billing Scheme during shopping.
- Implementing any application using List and Tuple data structures

SUGGESTED EVALUATION METHODS:

- Quizzes on list slices.
- Assignments on illustrative problems.
- Quizzes on tuples and dictionaries.

UNIT - IV OBJECT ORIENTED PROGRAMMING WITH PYTHON 9

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data 11odelling; persistent storage of objects – inheritance, polymorphism, operator overloading; abstract classes; exception handling, try block. Illustrative programs: demonstrate the concept of class and objects.

SUGGESTED ACTIVITIES:

- Features of OOP.
- Persistent storage of objects
- Operators and its usage.
- Simple programs using OOP concepts.

SUGGESTED EVALUATION METHODS:

- Quizzes on basic OOP concepts.
- Assignments on illustrative problems.
- Quizzes on inheritance and exception handling

UNIT - V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

SUGGESTED ACTIVITIES:

- Developing modules using Python to handle files and apply various operations on files
- Usage of exceptions, multiple except blocks – for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

SUGGESTED EVALUATION METHODS:

- Quizzes on basic file operations.
- Assignments on illustrative problems.
- Quizzes on packages and modules.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. Develop algorithmic solutions to simple computational problems.
2. Write and execute simple Python programs.
3. Familiarize with python string handling techniques and user defined functions.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Understand the concept of object oriented programming techniques.
6. Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Reema Thareja, ``Problem Solving and Programming with Python'', 2nd edition, OXFORD University Press, New Delhi, 2019.(UNIT 1,2,3,4(Exception Handling) and 5).
2. Bill Lubanovic, ¯Introducing Python-Modern Computing in Simple Package, 2nd edition, O'REILLY, 2019.(UNIT 4(Object Oriented Programming)).

REFERENCES:

1 Steven F. Lott, Modern Python Cookbook'', 2nd Edition, O'REILLY, 2020. Ryan Marvin, Mark Ng'ang'a, Amos Omondi, Python Fundamentals, Packt Publishing.,

2. Ryan Marvin, Mark Ngang'a, Amos Omondi, Python Fundamentals, Packt Publishing., 2018.
3. Paul J. Deitel, Python for Programmers, Pearson India Education Services Pvt. Ltd,2020. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education; Forth edition, 2018.

WEB REFERENCES:

1. https://greenteapress.com/thinkpython2/thinkpython2.pdfhttps://freecomputerbooks.com/An-Introduction-to-Python-Guido-van-ossum.html#downloadLinks

2. http://marvin.cs.uidaho.edu/Teaching/CS515/pythonTutorial.pdf

ONLINE COURSES / RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.javatpoint.com/python-tutorial
5. https://nptel.ac.in/courses/

21ES1102	ENGINEERING GRAPHICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
- Drawing orthographic projections of lines and planes.
- Drawing orthographic projections of solids.
- Drawing development of the surfaces of objects.
- Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination): 2

Importance of graphics in engineering applications – Use of drafting instruments.BIS conventions and specifications. Size, layout and folding of drawing sheets – Lettering and dimensioning. Introduction to drafting packages like CAD and demonstration of their use in engineering fields.

UNIT – I . **PLANE CURVES AND FREEHAND SKETCHING** 14

Basic Geometrical constructions, Curves used in engineering practices-Conics: Construction of Ellipse, Parabola and Hyperbola by eccentricity method – Construction of cycloid, Involutes of square, pentagon and circle – Drawing of tangents and normal to the above curves. Free Hand sketching-Orthographic projection – Orthographic views of simple three-Dimensional objects

UNIT – II **PROJECTION OF POINTS, LINES AND PLANE SURFACES 15**

Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths eg and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method

UNIT – III **PROJECTION OF SOLIDS 15**

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to one principle planes by rotating object method and auxiliary plane method

UNIT – IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **15**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple solids and frustum and truncated solids – Prisms, pyramids cylinders and cones.

UNIT – V ISOMETRIC AND PERSPECTIVE PROJECTIONS **14**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and frustum and truncated solids – Prisms, pyramids, cylinders, cones-combination of two solid objects in simple vertical positions. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

1. Natarajan, K. V., A text book of Engineering Graphics, 28th Ed., Dhanalakshmi Publishers, Chennai, 2015.

2. Venugopal, K. and Prabhu Raja, V., Engineering Graphics, New Age, 2008.

REFERENCES:

1. Bhatt, N.D.,Panchal V M and Pramod R. Ingle, Engineering Drawing‖, Charotar Publishing House, 53rd Edition, 2014.

2. Parthasarathy, N. S. and Vela Murali, Engineering Drawing‖, Oxford University Press, 2015

3. Agrawal, B. and Agrawal C.M., Engineering Drawing, Tata McGraw, N.Delhi, 2008.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/104/105104148/
2. https://www.youtube.com/channel/UCkCk0nvNyWhEOLge9JtDLDg

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/112/103/112103019/

21ES1111	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditions and loops.
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples, dictionaries.
- To use OOPS concepts in Python.
- To read and write data from/to files in Python

LIST OF EXPERIMENTS

1. Basic Python Programs.
2. Write programs to demonstrate different number data types in python.
3. Develop python programs to demonstrate various conditional statements.
4. Implement user defined functions using python.
5. Develop python scripts to demonstrate functions.
6. Develop python programs to perform various string operations like slicing, indexing & formatting.
7. Develop python programs to perform operations on List & Tuple.
8. Demonstrate the concept of Dictionary with python programs.
9. Develop python codes to demonstrate concept of class and objects.
10. Demonstrate OOPS concepts like inheritance and polymorphism with python programs.
11. Demonstrate python codes to print try, except and finally block statements.
12. Implement python programs to perform file operations.
13. Implement python programs using modules and packages.
14. Simulate bouncing ball using Pygame.

Mini Project : Suggested Topics(but not limited to)

1. Dice roll simulator.
2. Guess the number game.
3. Sending emails using python.
4. Random password generator.

5. Alarm clock.

COURSE OUTCOMES:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditions and loops.
3. To use functions for structuring Python programs.
4. To represent compound data using Python lists, tuples, dictionaries.
5. To use OOPS concepts in Python.
6. To read and write data from/to files in Python

WEB REFERENCES:

1. https://www.programiz.com/python-programming/examples
2. https://www.geeksforgeeks.org/python-programming-examples/
3. https://beginnersbook.com/2018/02/python-programs/
4. https://www.javatpoint.com/python-programs
5. https://www.w3schools.com/python/python_examples.asp
6. https://www.sanfoundry.com/python-problems-solutions/

21BS1111	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids

LIST OF EXPERIMENTS (Minimum of experiments to be conducted: 5)

1. Determination of rigidity modulus – Torsion pendulum.
2. Determination of Young's modulus by non-uniform bending method.
3. Determination of wavelength, and particle size using Laser.
4. Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
7. Determination of wavelength of mercury spectrum – spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of thickness of a thin wire – Air wedge. method

TOTAL: 30 PERIODS

COURSE OUTCOMES:

1. Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.

TEXT BOOKS:

1. Ruby Das, C.S. Robinson, Rajesh Kumar, Prashant Kumar Sahu, A Textbook of Engineering Physics Practical, University Science Press, Delhi, II Edition (2016),
2. Harnam Singh, Dr.P.S. Hemne, B.Sc., Practical Physics, S.Chand & Company Ltd, New Delhi, Edition 2011.

WEB REFERENCES:

1. https://www.vlab.co.in/broad-area-physical-sciences
2. https://vlab.amrita.edu/?sub=1

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters such as, alkalinity, hardness, DO and chloride.

- To induce the students to familiarize with electroanalytical techniques such as, pH metry,potentiometry and conductometry in the determination of aqueous solutions.

LIST OF EXPERIMENTS (Minimum of experiments to be conducted: 5)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in Water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler‟s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Determination of total, temporary & permanent hardness of water by EDTA method.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-26, Phenanthroline / thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
12. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
13. Pseudo first order kinetics-ester hydrolysis.
14. Corrosion experiment-weight loss method.

COURSE OUTCOMES:

1. To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO
2. To quantitatively analyse the aqueous solution by electro analytical techniques

TEXT BOOKS:

1. Laboratory Manual- Department of Chemistry
2. Vogel’s Textbook of Quantitative Chemical Analysis (8th edition, 2014)

21HS1201	COMMUNICATIVE ENGLISH AND LANGUAGE SKILLS LAB II INTEGRATED	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To develop linguistic and strategic competence in workplace context and to enhance language proficiency and thereby the employability of budding engineers and technologists.
- To improve the relevant language skills necessary for professional communication.
- To help learners to develop their listening skills, which will, enable them to listen to lectures and comprehend them by asking questions; seeking clarification and developing their speaking skills and to speak fluently in real contexts.
- To Introduce them to life skills, their importance in leading Personal & professional life, key concepts ofbusiness communication and Communicative skills.

UNIT-I INTERPERSONAL COMMUNICATION 9

Listening: Listening to Telephone Conversations. **Speaking**: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks. **Reading:** Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting). **Writing:** Writing a Short Biography of an Achiever Based on Given Hints, **Grammar:** Adjective, Sentence pattern. **Vocabulary** Development: Idioms and Phrases.

UNIT-II TECHNICAL COMMUNICATION 9

Listening: Listening to Talks/Lectures Both General and Technical and Summarizing the Main Points. **Speaking:** Participating in Debates, TED Talks **Reading:** Reading Technical Essays/ Articles and Answering Comprehension Questions **Writing:** Summary Writing, Minutes of the meeting **Grammar:** Participle Forms, Relative Clauses **Vocabulary Development:** Compound Words, Abbreviations and Acronyms

UNIT-III PROCESS DESCRIPTION 9

Listening: Listening to a Process Description and Drawing a Flowchart **Speaking:** Participating in Group Discussions, Giving Instructions, Presentation **Reading:** Reading Instruction Manuals **Writing:** Process Descriptions – Writing Instructions **Grammar:** Use of Imperatives, Active and Passive Voice, Sequence Words **Vocabulary Development:** Misspelt words, Homophones and Homonyms.

UNIT-IV REPORT WRITING 9

Listening: Listening to a Presentation and Completing Gap-Filling Exercises **Speaking:** Making Formal Presentations **Reading:** Reading and Interpreting Charts/Tables and Diagrams **Writing:** Interpreting Charts/Tables and Diagrams, Writing a Report **Grammar:** Direct into Indirect Speech, Use of Phrases **Vocabulary Development:** Reporting Words, Technical Jargon.

UNIT-V APPLYING FOR JOBS 9

Listening: Listening to a Job Interview and Completing Gap-Filling Exercises **Speaking:** Mock Interview,Telephone Interviews, GD **Reading:** Reading a Job Interview, SOP, Company Profile and Completing Comprehension Exercises **Writing:** Job Applications and

Resumes **Grammar:** Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Read and comprehend technical texts effortlessly.
2. Write thoughts and insights of their own.
3. Recognize the need for life skills, apply them to different situations, the basic communicationpractices in different types of communication.
4. Gain confidence to communicate effectively in various situations to acquire employability skills.
5. Become an active listener of professional contexts.

TEXTBOOKS:

1. Richards, C. Jack. *Interchange*, New Delhi: CUP, 2017
2. Board of Editors. *English for Engineers and Technologists* Volume 2 Orient Black Swan Limited, 2020,

REFERENCES:

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles andPractice.OxfordUniversity Press: New Delhi, 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning,USA: 2007.
5. Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

WEBREFERENCES:

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary-exams/word-formation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINECOURSES/RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LIST OF EXERCISES MINIMUM OF EXERCISES TO BE CONDUCTED: 15

1. Listen to lectures - articulate a complete idea as opposed to producing fragmented

utterances – Tedtalks, Science Fiction – My fair lady

2. Listening to a process information – General Competitive Examinations, GRE
3. Listening for specific information: accuracy and fluency – BEC
4. Listening - following, responding to explanations, giving directions and instructions in academic andbusiness contexts – IELTS, TOEFL.
5. Listening to transcripts and answer to the questions.
6. Listening: Read aloud in class and gap - filling.
7. Listening: Recognizing and interpreting non - verbal cues.
8. Listen first, speak second - Having the mindset of a listener.
9. Speaking – sharing personal information - Self introduction
10. Speaking – Small talk or Pep Talk
11. Speaking – Group discussion, Visume –visual presentation of resume
12. Speaking – Presentation – Formal and Informal
13. Speaking – Mock interview
14. Speaking – FAQ"S on Job interview
15. Speaking : Simulations - (show and tell)
16. Speaking: News brief - Ripped from today's headlines.
17. Speaking: Who's telling the truth?
18. Speaking: JAM
19. Speaking: Debate
20. Speaking: Story Narration

SOFTWARE REQUIRED:

Globarena

TEXT BOOKS

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press,Oxford:2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals.Pearson: New Delhi, 2010.
2. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.
3. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
4. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
5. E. Suresh Kumar et al. Communication for Professional Success, Orient Blackswan: Hyderabad,2015.
6. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press:Oxford, 2014.

21MA1201	ENGINEERING MATHEMATICS II	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Vectors are very helpful for the engineering students as it will give the insight into how totrace along the different types of curves.
- To develop an understanding of the standard technique of a complex variable theory inparticular of analytics functions and its mapping property.
- Complex integration is an intuitive extension of real integration. Complex variable techniques have been used in a wide variety of areas of engineering. This has been particularly true in areas such as electromagnetic field theory, fluid dynamics, aerodynamics and elasticity.
- To solve the linear differential equations with constant coefficients.
- Laplace Transform is very useful for the electronics students , this gives the basics of howto solve the problems in electronic circuits

UNIT-I VECTOR CALCULUS 12

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane - Gauss divergence theorem and Stokes" theorem (excluding proofs) – Simple applications involving cubes, rectangular parallelopiped, sphere and cylinder.

UNIT-II ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions - Cauchy-Riemann equations - Necessary and sufficient conditions- Harmonic and orthogonal properties of analytic function – Harmonic conjugate Construction of analytic functions by Milne Thomson method- Conformal mapping: w =z+c, cz, 1/z, z^2 and bilinear transformation.

UNIT-III COMPLEX INTEGRATIONS 12

Line integrals- Cauch's integral theorem-Cauch's integral formula - Singularities – Residues- Cauch's residue theorem – Taylor's and Laurent's series expansions —– Application of residue theorem for evaluation of real definite integrals – Use of circular contour and semi- circular contour (excluding poleson the real axis).

UNIT-IV ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients -Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

UNIT-V LAPLACE TRANSFORMS 12

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms -Transforms of unit function, unit step function and unit impulse functions – Transform of periodic functions- Initial and final value theorems. Inverse Laplace transform -Convolution theorem- Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Can identify the Gradient, divergence and curl of a vector point function and related Identities. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorem and their verification.
2. Understanding analytic functions, harmonic functions, conformal mapping.
3. Determine the types of singularities, residues, contour integration.
4. Apply various techniques in solving differential equations.
5. Able to solve differential equations using laplace transforms.

TEXTBOOKS:

1. Grewel. B.S, ¯Higher Engineering Mathematics‖, 43rd Edition, Khanna Publications, Delhi,2014.
2. B.V. Ramana, ¯ Higher Engineering Mathematics‖, McGraw Hill Education, India.

REFERENCES:

1. Kreyszig Erwin, Advanced Engineering Mathematics‖, John wiley and Sons, 10th Edition,New Delhi.
2. Jain R.K. and Iyengar S.R.K., ¯Advanced Engineering Mathematics‖, Narosa Publications,New Delhi, 3rd Edition, 2007.
3. O"Neil, P.V. ¯Advanced Engineering Mathematics‖, Cengage Learning India Pvt. Ltd, NewDelhi, 2007.
4. Sastry, S.S, ¯Engineering Mathematics‖, Vol.I & II, PHI Learnig Pvt. Ltd, 4th Edition, NewDelhi, 2014.
5. Wyile, R.C. and Barrett, L.C., ¯Advanced Engineering Mathematics ¯Tata McGraw Hill Education Pvt Ltd, 6th Edition, New Delhi, 2012.

ONLINECOURSES/RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma69
2. https://onlinecourses.nptel.ac.in/noc21_ma57

21ES1201	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the concepts related with electrical circuits.
- To study the concept of electrical machines.
- To understand the utilization of electrical power.
- To understand the basics of electronic devices.
- To learn the applications of Op-Amp.
- To study the concepts of measurement and transducers.

UNIT-I BASIC ELECTRIC CIRCUITS 9

Current- Voltage- Power- Voltage Source – Current Source- Ohm's Law – KCL – KVL (Analysis with only independent source) - Resistors in series and parallel - Current Division – Voltage Division- Mesh analysis, nodal analysis, Phasors- RMS value of current and voltage – Active power- Apparent Power- Complex Power – Power Factor - Simple problems.

UNIT-II ELECTRICAL MACHINES 9

Construction and Working Principle of DC motor, Stepper Motor, BLDC motor, Transformer, Singlephase induction motor - Capacitor start and Capacitor run motor.

UNIT-III UTILIZATION OF ELECTRICAL POWER 9

Principle of wind and solar energy systems. Electrical wiring - Domestic and Industrial Illumination - Fluorescent and LED lamps. Protection- Need for Earthing, fuses and circuit breakers -Energy tariff.

UNIT-IV BASICS OF ELECTRONICS 9

PN Junction-VI Characteristics of Diode, Zener diode, Transistors configurations – amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Regulated power supply using 7805 and 7905.

UNIT-V MEASUREMENTS AND TRANSDUCERS 9

Fundamentals of moving coil and moving iron meters, Transducers- classification-thermo electric,RTD, Strain gauge, LVDT, LDR and piezoelectric. Smart sensors - Data acquisition systems.

TOTAL:45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Summarize the basic laws and concepts related to electrical circuits.
2. Explain the construction and working of electrical machines.
3. Discuss the utilization of electrical power.
4. Discuss the basic concepts of electronics .
5. Learn the applications of Op-Amp.
6. Explain the concepts of measurement and transducers

TEXTBOOKS:

1. Kothari DP and I.J Nagrath, ¯Basic Electrical and Electronics Engineering‖, McGraw HillEducation, 2014.
2. Thomas L. Floyd, „Electronic Devices‟, 10th Edition, Pearson Education, 2018.
3. John Bird, ¯Electrical Circuit theory and technology‖, Routledge, Fifth edition, 2013.

REFERENCES:

1. William Hayt, Jack Kemmerly, Steven Durbin and Jamie Phillips, :" Engineering Circuit Analysis", McGraw Hill, 2019.
2. Kothari DP and I.J Nagrath, ¯Basic Electrical Engineering‖, McGraw Hill, 2010.
3. A.K. Sawhney, Puneet Sawhney „A Course in Electrical & Electronic Measurements &
4. Instrumentation‟, Dhanpat Rai and Co, New Delhi, Edition 2011.

ONLINECOURSES/RESOURCES:

1. https://nptel.ac.in/courses/108/106/108106172/
2. https://nptel.ac.in/courses/108/102/108102146/
3. https://nptel.ac.in/courses/108/101/108101091/
4. https://nptel.ac.in/courses/108/105/108105153/

21IT1201	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the syntax for C programming
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers
- To develop applications using structures and union

UNIT-I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms - Structure of C program - C programming: Data Types –Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using integer type, arithmetic operators and basicinput/output
- Programs and Demonstration using other data types and operators
- Programs and Demonstration using else-if, switch, do-while, break, continue, enum

SUGGESTED EVALUATION METHODS:

- Programs on integer type, arithmetic operators, basic input output, else-if, switch, do-while, break, continue, enum
- Assignments
- Quiz

UNIT-II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program:Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare,concatenate, copy - Selection sort, linear and binary search

SUGGESTED ACTIVITIES:

- Programs and Demonstration using arrays and string operations
- Develop an application to perform matrix operations using multi-dimensional arrays.
- Create an application that performs operations like concatenation, finding a substring from agiven string, etc. using character arrays.
- Develop an application to perform Selection sort, linear and binary search

SUGGESTED EVALUATION METHODS:

- Programs on arrays and string operations with use of string library functions
- Assignments

UNIT-III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call, Built-in functions(string functions, math functions) - Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions - Pointers -Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference - Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using functions and concepts of recursion.
- Programs and Demonstration using pointers and arrays, address arithmetic
- Programs and Demonstration using Pointers and strings

SUGGESTED EVALUATION METHODS:

- Programs using functions and concepts of recursion
- Programs on pointers and arrays, address arithmetic..
- Programs using pointers and strings

UNIT-IV STRUCTURES AND UNION 9

Structure - Nested structures- Pointer and Structures- Array of structures – Example Program using structures and pointers - Self-referentials structures - Dynamic memory allocation – Singly linked list- typedef and Union.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using array of structure, Pointers to structures, Self-referential structures
- Programs to demonstrate Dynamic Memory Allocation

SUGGESTED EVALUATION METHODS:

- Programs using array of structure , Pointers to structures, Self-referential structures Assignments

UNIT-V FILE PROCESSING 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments

SUGGESTED ACTIVITIES:

- Programs and Demonstration using file operations in real-world applications

SUGGESTED EVALUATION METHODS:

- Demonstration of real-world application using Files and Command Line arguments

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Learn the syntax for C programming
2. Develop simple applications in C using basic constructs
3. Design and implement applications using arrays and strings

4. Develop and implement applications in C using functions and pointers.
5. Develop applications in C using structures and union.
6. Design applications using sequential and random access file processing.

TEXTBOOKS:

1. Reema Thareja, ―Programming in C‖, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, ―The C Programming language‖, Second Edition, Pearson Education, 2006

REFERENCES:

1. Paul Deitel and Harvey Deitel, ―C How to Program‖, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, ―Programming in C‖, CENGAGE Learning India pvt. Ltd.,2011
3. Pradip Dey, Manas Ghosh, ―Fundamentals of Computing and Programming in C‖, FirstEdition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, ―Computer Fundamentals and Programming in C‖, DorlingKindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schism‟s Outline of Theory and Problems of Programming with C",McGraw-Hill Education, 1996.
6. Paul Deitel and Harvey Deitel, ―C How to Program‖, Seventh edition, Pearson Publication

WEBREFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

ONLINECOURSES/RESOURCES:

1. https://www.programiz.com/c-programming
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://en.wikibooks.org/wiki/C_Programming
6. https://www.cprogramming.com/tutorial/c-tutorial.html?inl=hp

21IT1202	INFORMATION TECHNOLOGY ESSENTIALS (Lab Integrated)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To design and develop web pages using HTML and CSS.
- To understand the general concepts of PHP scripting language and MySQL functionalitiesfor the development of simple data-centric applications.
- To provide a basic knowledge of computer hardware and software.
- To familiarize with the basic taxonomy and terminology of computer networking and mobilecommunications.
- To understand various types of information systems and their complexities.

UNIT- I WEB AND SCRIPTING ESSENTIALS 9

Internet Basics – Browser Fundamentals – Authoring Tools – Introduction to HTML5 – HTML5 Tags HTML5 Forms - Cascading Style Sheets (CSS3) Fundamentals - Need for Scripting Languages -Introduction to JavaScript/ Angular JS

SUGGESTED ACTIVITIES:

- Browse the internet on special topics given by instructor.
- Learn HTML basic tags for web page design.
- Identify different types of form validations in the websites that are commonly used.
- Practical - Design of a small simple website, interlinking set of web pages created using theHTML tags and CSS.

SUGGESTED EVALUATION METHODS:

- Quizzes on all the topics of the unit.
- Discussion on form validation.
- Peer evaluation of the simple web-sites created.

UNIT- II SERVER-SIDE ESSENTIALS (PHP) 9

Introduction to PHP - PHP Variables - Constants - Operators - Flow Control and Looping – Arrays – Strings – Functions – File Handling – Exception Handling – PHP and HTML – Database Management - Introduction to MySQL - MySQL Commands - MySQL Database Creation -Connecting MySQL and PHP - Querying MySQL Database with PHP - Session and Cookies.

SUGGESTED ACTIVITIES:

Practical - Simple programs using PHP.
Design of a dynamic web pages using PHP.
Practical - Database creation using MySQL and PHP scripts.
Practical - Creation of session and cookies.

SUGGESTED EVALUATION METHODS:

Quizzes on different topics of the unit.
Demonstration of the implementations.
Group discussions design of web page.

UNIT- III HARDWARE ESSENTIALS 9

Motherboard – Networking Cards – Graphics Card – Processors – Hard Drive – USB Port –Monitor Ports – Servers – Types of Servers – Web Server – Database Server – Data Center and Cloud Servers Server Management.

SUGGESTED ACTIVITIES:

Understanding Personal Computer and various components.
Case studies on different types of servers.
Survey on data centre, cloud server and high-end server

SUGGESTED EVALUATION METHODS:

Quizzes on hardware components.
Presentations of case studies and survey

UNIT- IV NETWORK ESSENTIALS 9

Basics of Computer System – Data Transmission Fundamentals – Communication Medium – Fundamentals of Computer Networking – Types of Computer Networks – Network Topologies – Network Standards: OSI Model, TCP/IP Model – Network Protocols: TCP, UDP, IP - Network Components – Introduction to Mobile Communication – Generations of Cellular Networks – GSM

.

SUGGESTED ACTIVITIES:

Flipped classroom on generations of cellular networks.
Explore the web to know more about the networking concepts and recent technologies. Students may present their findings orally or by a written report or through discussion forums.
Explore the networking devices used in laboratories and homes, and their configurations.

SUGGESTED EVALUATION METHODS:

Quizzes on network transmission and communication.
Report evaluation by peers.
Discussion on network devices.

UNIT- V APPLICATION ESSENTIALS 9

Creation of Simple Interactive Applications - Simple Database Applications - Introduction to Information Systems – Personal Information System – Information Retrieval System – Social Networking Applications

SUGGESTED ACTIVITIES:

- Flipped classroom on social networking applications.
- Explore the web to know more about the concepts and technologies used for the design ofInformation Systems. Students may present their findings orally or by a written report.
- Design a simple web or mobile application.
- Explore and analyze some of the visual analytics software.

SUGGESTED EVALUATION METHODS:

- Quizzes on features of social networking applications.
- Presentations on various information systems.
- Demonstration of application.

- Discussions through forums.

LABORATORY EXERCISES: **30**

1. Design a static webpage primarily with text and CSS. Format and position the text usingCSS borders, background and color by understanding the box model.
2. Design the HTML forms (text boxes, text areas, radio buttons, check boxes and otherelements by understanding the input types and specified needs).
3. Validate the HTML form elements by creating small client-side validation scripts usingJavaScript / Angular JS.
4. Create small PHP scripts to manipulate data using various operators and PHP functions anddisplay the results.
5. Write two different PHP scripts to demonstrate passing variables with sessions and cookies.
6. Write PHP script to connect MySQL server from the website incorporating error-handlingusing exceptions.
7. Create a dynamic mobile-friendly web site using PHP, CSS and MySQL.

TOTAL:75 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Create dynamic website/web based applications using HTML, PHP, and MYSQL database.
2. Design websites that meet specified needs and interests using basic elements to controllayout and style.
3. Debug the programs by applying concepts and error handling techniques of HTML, JavaScript, PHP and MYSQL.
4. Understand the basic concepts of data communications and networking.
5. Describe the basic principles of mobile communication systems.
6. Identify the fundamental concepts and key issues in the design of commonly used applications.
7. Create dynamic website/web based applications using HTML, PHP, and MYSQL database.

TEXTBOOKS:

1. Robin Nixon, ¯Learning PHP, MySQL, & JavaScript; with jQuery, CSS & HTML5‖, FifthEdition, O'Reilly Media, Inc, 2018.
2. James Kurose and Keith Ross, ¯Computer Networking: A Top-Down Approach‖, SeventhEdition, 2017.

REFERENCES:

1. Steven Holzner, ¯PHP: The Complete Reference‖, Fifth Edition, Mc Graw Hill, 2017.
2. Niederst Robbins, Jennifer, ¯Learning Web Design: A Beginner's Guide to HTML, CSS,Javascript, and Web Graphics‖, Fifth Edition, O'Reilly Media, 2018.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, ¯Mastering HTML, CSS & JavaScript Web Publishing‖, BPB Publications, 2016.
4. Douglas E. Comer, ¯Computer Networks and Internets‖, Sixth Edition, Prentice Hall, 2015.

5. Jochen Schiller, ¯Mobile Communications‖, Pearson Education, 2012.

6. R. Kelly Rainer, Casey G. Cegielski, Brad Prince, ¯Introduction to Information Systems‖,Fifth Edition, Wiley Publication, 2014.

WEB REFERENCES:

1. https://www.w3schools.com/php/
2. https://www.tutorialspoint.com/php/index.htm
3. https://www.javatpoint.com/php-tutorial
4. https://www.w3schools.com/js/DEFAULT.asp
5. https://javascript.info/
6. https://www.tutorialspoint.com/javascript/index.htm

ONLINE COURSES / RESOURCES:

1. https://www.udemy.com/topic/php/
2. https://www.codecademy.com/learn/learn-php
3. https://www.coursera.org/learn/web-applications-php
4. https://www.w3schools.com/php/php_exam.asp
5. https://www.edureka.co/php-mysql-self-paced

21ES1211	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To provide exposure to the students with hands on experience on various basic engineeringpractices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A CIVIL & ELECTRICAL

I CIVIL ENGINEERING PRACTICES **15**

Plumbing Work:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbowsand
b) Other components which are commonly used in household.
c) Preparing plumbing line sketches.
d) Laying pipe connection to the suction side of a pump
e) Laying pipe connection to the delivery side of a pump.
f) Connecting pipes of different materials: Metal, plastic and flexible pipes used in householdappliances.

Wood Work:

a) Introduction to Tools and Equipments
b) Simple Planning and sawing practice
c) Making Half Lap, Dovetail, Mortise and Tenon joints

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

II ELECTRICAL ENGINEERING PRACTICES: **15**

a) Residential house wiring using switches, fuse, indicator, lamp and energy meter.
b) Fluorescent lamp wiring.
c) Stair case wiring
d) Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
e) Measurement of energy using single phase energy meter.
f) Measurement of resistance to earth of an electrical equipment.

GROUP – B MECHANICAL AND ELECTRONICS

III MECHANICAL ENGINEERING PRACTICES **15**

Basic Machining Work:

g) Introduction to Lathe machine, Tools and Equipments
h) Simple Turning and facing
i) Step turning
j) Simple Drilling and Tapping of flat plate

Welding Work:

a) Introduction to Arc welding, Tools and Equipments
b) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

Assembly Work:

a) Assembling a centrifugal pump.

b) Assembling an air conditioner.

Sheet Metal Work:
a) Demonstrating basic sheet metal operations

Foundry Work:
a) Demonstrating basic foundry operations.

IV ELECTRONICS ENGINEERING PRACTICES 15

a) Study of Electronic components and equipments – Resistor, colour coding
b) Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
c) Study of logic gates AND, OR, EX-OR and NOT.
d) Generation of Clock Signal.
e) Soldering practice – Components Devices and Circuits – Using general purposePCB.
f) Measurement of ripple factor of HWR and FWR.

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will able to:

1. Connecting various basic pipe fittings and other components which are commonly used inhousehold and to know about the various tools, Equipments and making different joints
2. To know the Lathe machine, Tools and Equipments with machining experiments and haveknowledge about Arc welding, Tools and Equipments with making different joints
3. To carry out basic home electrical works and appliances and measure the electrical quantities
4. To analyze the basic electronic circuits and to solder simple components on PCB and testsimple electronic circuits

TEXTBOOKS:

1. Jeyapoovan T., Saravanapandian M. & Pranitha S., ―Engineering Practices Lab Manual‖,Vikas Publishing House Pvt.Ltd, (2006)
2. Kannaiah P. & Narayana K.L., ―Manual on Workshop Practice‖, Scitech Publications, (1999).
3. Jeyachandran K., Natarajan S. & Balasubramanian S., ―A Primer on Engineering PracticesLaboratory‖, Anuradha Publications, (2007).
4. S. Gowri & T. Jeyapoovan, ―Enginering Practices Lab Manual 5/E‖, S. Chand Publishing, 2019

REFERENCES:

1. K.C. John, "Mechanical workshop practice", Second edition, PHI learning Pvt Ltd, New Delhi
2. Bawa H.S., ―Workshop Practice‖, Tata McGraw – Hill Publishing Company Limited, (2007)

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/107/112107090/
2. https://nptel.ac.in/courses/112/107/112107084/

21IT1211	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To write, test, and debug simple C programs.
- To implement C programs with conditional and looping statement
- To develop applications in C using strings, pointers, functions.
- To implement C programs with structures and union.
- To develop applications in C using file processing
- To develop an application in real time situation

LIST OF EXPERIMENTS

1. Programs using I/O statements and expressions.
2. Programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication,division and square of a number.
5. Check whether a given number is Armstrong number or not?
6. Programs using I/O statements and expressions.
7. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on thefollowing conditions
   a) if it is a perfect cube
   b) if it is a multiple of 4 and divisible by 6
   c) if it is a prime number
   d) Sort the numbers based on the weight in the increasing order as shown below <10,its weight>,<36,its weight><89,its weight>
8. Populate an array with height of persons and find how many persons are above the averageheight.
9. Populate a two dimensional array with height and weight of persons and compute the BodyMass Index of the individuals.
10. Given a string ¯a$bcd./fg‖ find its reverse without changing the position of special characters. (Example input:a@gh%;j and output:j@hg%;a)
11. Convert the given decimal number into binary, octal and hexadecimal numbers using userdefined functions.
12. From a given paragraph perform the following using built-in functions:
    a) Find the total number of words.
    b) Capitalize the first word of each sentence.
    c) Replace a given word with another word.
13. Solve towers of Hanoi using recursion.
14. Sort the list of numbers using pass by reference.
15. Generate salary slip of employees using structures and pointers.

16. a) Programs using Pointers
    b) Pointer demonstration the use of & and *
    c) Access Elements of an Array Using Pointer
    d) Perform the string operations like Length of the String , Concatenation of stringand compare the string using Pointer
    e) Count number of words, digits, vowels using pointers
    f) Add two matrices using Multidimensional Arrays with pointers
    g) Multiply two matrices using pointers
    h) Multiply two numbers using Function Pointers

17. Compute internal marks of students for five different subjects using structures and functions.
18. Program to demonstrate the difference between unions and structures
19. Insert, update, delete and append telephone details of an individual or a company into atelephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance usingsequential access file.
21. **MINI PROJECT**

    Create a ¯Railway reservation system‖ with the following modules

    a) Booking
    b) Availability checking
    c) Cancellation
    d) Prepare chart

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will able to:

1. Write, test, and debug simple C programs.
2. Implement C programs with conditionals and loops.
3. Develop C programs for simple applications making use arrays and strings.
4. Develop C programs involving functions, recursion, pointers, and structures and union.
5. Design applications using sequential and random access file processing.
6. Perform task as an individual and / or team member to manage the task in time

WEB REFERENCES:

1. https://www.programiz.com/c-programming/examples
2. https://beginnersbook.com/2015/02/simple-c-programs/
3. https://www.programmingsimplified.com/c-program-examples
4. https://www.tutorialgateway.org/c-programming-examples/
5. https://www.javatpoint.com/c-programs
6. https://www.tutorialspoint.com/learn_c_by_examples/simple_programs_in_c.htm

21MA1301	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To extend student's logical and mathematical maturity and ability to deal withabstraction.
- To introduce most of the basic terminologies used in computer sciencecourses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which arewidely used in computer science and engineering

UNIT-I LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy

UNIT-II COMBINATORICS 9+3

Mathematical induction – Strong induction and well ordering – The pigeonhole principle – Recurrence relations – Solving linear recurrence relations using generating functions – Inclusion and exclusion principle.

UNIT-III GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamiltonian paths.

UNIT-IV ALGEBRAIC STRUCTURES 9+3

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

UNIT-V LATTICES AND BOOLEAN ALGEBRA 9+3

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

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Explain the concept needed to test the logic of a program.
2. Make use of counting principles.
3. Identify the graphs and understand its properties.
4. Apply the concepts and properties of algebraic structures.
5. Determining Boolean functions and simplify expression using its properties.
6. Construct Homomorphism and isomorphism Structures.

TEXTBOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2019.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30thReprint, 2011.
3. Veerarajan. T, Discrete Mathematics: with graph theory and combinatorics, McGrawHill Education (India) Pvt.Ltd. 2008.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4thEdition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, TataMcGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006

21IT1301	DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting algorithms
- To Understand the concept of searching and hashing algorithms
- To apply Tree and Graph structures

UNIT-I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

SUGGESTED ACTIVITIES:

- Developing any application (student's choice) using all the linear data structures

SUGGESTED EVALUATION METHODS:

- Programs and Demonstration on applications of linear data structures.
- Checking output of programs implemented.
- Assignments

UNIT-II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues – Job Scheduling – Josephus problem

SUGGESTED ACTIVITIES:

Demonstrating stack for Towers of Hanoi application.

SUGGESTED EVALUATION METHODS:

- Programs on applications of Stacks and Queues
- Quiz on various topics of the unit
- Assignments

UNIT-III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT - Representation of Trees - Binary Tree-tree traversals - expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree – Trie- Heap – Applications of heap.

SUGGESTED ACTIVITIES:

- Solving expressions using expression trees by determining infix, prefix and postfixexpressions.
- Developing any application using trees.

SUGGESTED EVALUATION METHODS:

- Programs using tree traversal and binary tree
- Programs on binary search trees.
- Programs and Demonstration using AVL tree applications.
- Assignments

UNIT-IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal –Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – application of graphs - Shortest path algorithms.

SUGGESTED ACTIVITIES:

- External learning - Applications of graphs.
- Practical - To choose and apply a suitable graph algorithm for solving a real timeproblem/scenario such as Network Routing

SUGGESTED EVALUATION METHODS:

- Assignments on representation of graphs for a given problem
- Quizzes on basics of graphs.

Programs and Demonstration using application of graph and topological sort

UNIT-V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting –Quick Sort - Selection sort -Heap Sort – Merge Sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

SUGGESTED ACTIVITIES:

- External learning - External sorting implementation.
- Implementation of phone directory using hash tables.
- Demonstration of searching techniques under best and worst case inputs.

SUGGESTED EVALUATION METHODS:

- Assignment on external sorting.
- Assignment on hashing.
- Check output of programs implemented

TOTAL:45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear data structures to problem solutions.
3. Model problems as Tree problems and implement efficient Tree algorithms to solve them
4. Model problems as graph problems and implement efficient graph algorithms to solve them

5. Critically analyze the various sorting algorithms.
6. Analyze the various searching and hashing algorithms

TEXTBOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearsoneducation, 2011.
2. Reema Thareja, 'Data Structures Using C', Second Edition , Oxford University Press,2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introductionto Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983.
3. Stephen G. Kochan," Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures inC", Second Edition, University Press, 2008

21IT1302	OPERATING SYSTEMS (LAB INTEGRATED)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts and functions of operating systems.
- To understand concepts of Processes
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.
- To understand the basic concepts and functions of operating systems.

UNIT-I OPERATING SYSTEM OVERVIEW 9

Computer System Overview- Instruction Execution, Interrupts , Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Operating System Structure and Operations- System Calls, System Programs, Types of Kernels- OS Generation and System Boot- Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication

SUGGESTED ACTIVITIES:

- Learn Computer System Overview
- Understand Operating System overview

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

UNIT-II PROCESS MANAGEMENT 9

CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Process Synchronization – The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock

SUGGESTED ACTIVITIES:

- Programs to implement CPU scheduling
- Programs to detect and avoid deadlock

SUGGESTED EVALUATION METHODS:

- Assignment /quiz

UNIT-III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS examples

SUGGESTED ACTIVITIES:

- Programs and Demonstration of Memory Allocation Techniques
- Programs and Demonstration of Page replacement algorithm

SUGGESTED EVALUATION METHODS:

- Assignment /Quiz

UNIT-IV FILE SYSTEMS 9

File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Simulation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery ;Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management

SUGGESTED ACTIVITIES:

- Implement File Allocation methods
- Implement File Organization

SUGGESTED EVALUATION METHODS:

- Assignments / quiz

UNIT-V CASE STUDY 9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS – iOS and Android – Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

SUGGESTED ACTIVITIES:

- Learn Linux System
- Learn Mobile OS

SUGGESTED EVALUATION METHODS:

- Assignments for CASE STUDY

TOTAL:45 PERIODS

LABORATORY EXERCISES **30 PERIODS**

1. Basic Unix commands
2. System call using Unix
3. CPU Scheduling Algorithms
4. Simulation of Producer-Consumer Problem Using Semaphore
5. Simulation of Shared Memory Using IPC
6. Simulation of Deadlock Detection.
7. Simulation of Memory Allocation Techniques: First Fit, Best Fit And Worst Fit
8. Simulation of Paging Techniques
9. Simulation of Page Replacement Algorithms
10. Simulation of File Organization Techniques
11. Simulation of File Allocation Strategies

TOTAL : 75 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand The basics of Operating System
2. Understand Process, Process scheduling, Process Synchronization , Deadlock
3. Learn the various memory management schemes.
4. Understand File systems
5. Understand Linux OS
6. Understand Mobile OS like iOS and Android

TEXTBOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ¯Operating System Concepts,9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, Operating Systems: Internals and Design Principles, 9 th Edition byPearson
3. Neil Smyth, ¯iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payloadmedia, 2011.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, ¯Operating Systems – A Spiral Approach,Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, ¯Operating System, McGraw Hill Education, ThirdEdition ,2017.
3. Andrew S. Tanenbaum, ¯Modern Operating Systems,Fourth Edition, Pearson Education,2016.
4. Gary Nutt, ¯Operating Systems, Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel,Paul J Deital,Davis R Choffnes ¯Operating System, Third Edition,Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, ¯Understanding the Linux kernel‖, 3rd edition,O'Reilly,2005

21IT1303	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To identify the functional units in a digital computer system.
- To distinguish between the various ISA styles.
- To trace the execution sequence of an instruction through the processor.
- To evaluate different computer systems based on performance metrics.
- To understand the fundamentals of memory and I/O systems and their interface withthe processor

UNIT-I FUNDAMENTALS OF COMPUTER SYSTEMS 9

Functional Units of a Digital Computer – Operation and Operands of Computer Hardware – Software Interface – Translation from a High Level Language to Machine Language – Instruction Set Architecture – RISC and CISC Architectures – Addressing Modes – Performance Metrics – Power Law – Amdahl's Law.

Suggested Activities:

- In-class activity on performance evaluation.
- Use a Simulator for RISC and CISC. Analyze the ISA supported by the architectural
- simulator by running simple programs on the simulator.
- Mapping and correlating a C code with its machine code.
- Practical – Opening up a computer system and studying the components.

Suggested Evaluation Methods:

- Mock test on problems for computer performance.
- Group discussion on activity four with assembly instruction, identifying theinstruction type and encoding used in machine code.
- Quizzes on ISA.

UNIT-II ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Fast Adders – Multiplication: Booths Algorithm, Bit Pair Recoding – Division: Restoring and Non-Restoring – Floating Point Numbers: Single and Double Precision – Arithmetic Operations – ALU Design.

Suggested Activities:

- Simulation of the Unsigned binary operations(+,-,*,/), floating point operations.
- External learning – Arithmetic algorithms for faster multiplication and division.
- Tutorials on multiplication and division (Booths algorithm, restoring and non restoring).

Suggested Evaluation Methods:

- Mock test on multiplication and division.
- Quizzes on floating point single precision and double precision representation.

UNIT-III PROCESSOR 9

Design Convention of a Processor – Building a MIPS Datapath and designing a Control Unit –Execution of a Complete Instruction – Hardwired and Micro programmed Control – Introduction to Multicore – Graphics Processing Units- Case study: NVIDIA GPU

Suggested Activities:

- Classroom activities for analyzing data path in Intel and ARM core.
- Practical – Analyzing the data path on the standard simulator.
- Survey on multicore and draw a mind map on trends of multicore processors

Suggested Evaluation Methods:

- Assignment on data path design.
- Group discussion on pipeline depth and stages.
- Quiz on classroom content.

UNIT-IV MEMORY AND I/O 9

Types of Memories – Need for a hierarchical memory system –Cache memories- Memory Mapping – Improving Cache Performance – Virtual Memory – Memory Management Techniques – Accessing I/O devices – Programmed Input/output – Interrupts – Direct Memory Access.

Suggested Activities:

- Activities on memory hierarchy in Intel i7 and ARM Cortex.
- Practical – Implement a simple functional model for memory mapping in cache usingC/C++.
- Study hit/miss rates for various access patterns. Experiment with differentreplacement policies.

Suggested Evaluation Methods:

- Mock test for problems on memory mapping.
- Quizzes on memory management in ARM and Intel processor.

UNIT-V PARALLEL ARCHITECTURE 9

Exploitation of more ILP –Dynamic Scheduling: Tomasulo's Algorithm –Array Processor- Vector Processor – Basic Concepts of Pipelining – Pipelined Implementation of Datapath and Control Unit – Hazards – Structural, Data and Control Hazards-Overview of Next Generation Processors.

Suggested Activities:

- External learning – Speculative dynamic scheduling.
- Practical – Study of the pipelined implementation and analysis of various hazards on astandard simulator.

Suggested Evaluation Methods:

- Quizzes on dynamic scheduling.
- Group discussion on how to reduce CPI to less than one clock cycle.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Interpret assembly language instructions.
2. Design and analyze ALU circuits.
3. Implement a control unit as per the functional specification.
4. Design and analyze memory, I/O devices and cache structures for processor.
5. Evaluate the performance of computer systems.
6. Point out the hazards present in a pipeline and suggest remedies.

TEXTBOOKS:

1. David A. Patterson, John L. Hennessy, “Computer Organization and Design: TheHardware/Software Interface”, Fifth Edition, Morgan Kaufmann/Elsevier, 2013.

2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, “Computer Organization and Architecture – Designing forPerformance”, Tenth Edition, Pearson Education, 2016.
2. John L. Hennessey, David A. Patterson, “Computer Architecture – A QuantitativeApproach”, Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007.
3. V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, SecondEdition, Pearson Education, 2004.
4. Douglas E. Comer, “Essentials of Computer Architecture”, Sixth Edition, PearsonEducation, 2012.
5. John P. Hayes, “Computer Architecture and Organization”, Third Edition, TataMcGraw Hill, 1998.
6. BehroozParhami, “Computer Architecture”, Oxford University Press, 2007

7. Govindarajalu, “Computer Architecture and Organization, Design Principles andApplications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

21IT1304	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand Object Oriented Programming concepts and basic characteristics of Java.
- To know the principles of packages, inheritance and interfaces.
- To define exceptions and use I/O streams.
- To develop a java application with threads and generics classes.
- To design and build simple Graphical User Interfaces.

UNIT-I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Object Oriented Programming - Abstraction – Objects And Classes - Encapsulation- Inheritance Polymorphism- OOP In Java –Fundamental Programming Structures In Java – Defining Classes I Java – Constructors, Methods -Access Specifiers - Static Members - Arrays , Packages – Definin Packages – Finding Packages And CLASSPATH -Importing Packages - Packages Types Javadoc Comments .

SUGGESTED ACTIVITIES:

- Programs and Demonstration using simple Java programs Using Java Basic Constructsand Arrays
- Understanding JVM

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT-II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists– String Handling.

SUGGESTED ACTIVITIES:

- Programs and Demonstration of Java programs – use abstract classes, final methods andclasses and interfaces
- Programs and Demonstration of Java programs – using String class, Array List , Creatingclass and objects
- Programs using Inheritance and Interfaces

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT-III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics - Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files, Standard IDE like NETBEANS / ECLIPSE.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using exception handling and Streams using any standardIDE like NETBEANS / ECLIPSE
- Develop an application threading

SUGGESTED EVALUATION METHODS:

- Demonstration of real-world application using exception handling and Streams
- Assignments

UNIT-IV MULTITHREADING AND GENERIC PROGRAMMING 9

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations

SUGGESTED ACTIVITIES:

- Programs and Demonstration of java program using multithreading and Genericprogramming

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT-V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events – AWT event hierarchy - Introduction to Swing – layout management - Swing Components –Windows–Menus– Dialog Boxes- Study of Spring Framework , Hibernate Framework .

SUGGESTED ACTIVITIES:

- Programs and Demonstration using graphics programming and components
- Programs and Demonstration of Mouse, key events, creating interactive forms using AWT/Swing and adding functionality
- Understand AWT and SWING

SUGGESTED EVALUATION METHODS:

- Assignments

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop Java programs using OOP principles
2. Develop Java programs with the concepts inheritance and interfaces
3. Build Java applications using exceptions and I/O streams
4. Develop Java applications with threads and generics classes
5. Design and build simple Graphical User Interface.
6. Develop interactive Java programs using swings.

TEXTBOOKS:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, PrenticeHall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011
3. Timothy Budd, “Understanding Object-oriented programming with Java”, UpdatedEdition, Pearson Education, 2000
4. Felipe Gutierrez , Introducing Spring Framework: A Primer 1st ed. Edition, KindleEdition , 2014

21IT1311	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To Understanding the importance of data structures, abstract data type, and their basicusability in different application,
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
   - Singly Linked list
   - Circular Linked list
   - Doubly Linked list
4. Applications of List, Stack and Queue ADTs
   - Polynomial operations
   - Infix to post fix
   - Josephus problem
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Expression tree
9. Implementation of Trie
10. Implementation of Heaps using Priority Queues.
11. Graph representation and Traversal algorithms
    - Depth first search
    - Breadth first search
12. Applications of Graphs
    - Dijkstra algorithm
13. Implementation of searching and sorting algorithms
14. Hashing–any two collision techniques

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Write functions to implement linear and non-linear data structure operations
2. Suggest appropriate linear / non-linear data structure operations for solving a givenproblem
3. Appropriately use the linear / non-linear data structure operations for a given problem
4. Apply appropriate hash functions that result in a collision free scenario for datastorage and retrieval
5. Compare various kinds of searching and sorting techniques and hash tables andcollision resolution Techniques
6. Compare various kinds of hash tables and collision resolution Techniques

21IT1312	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

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

LIST OF EXPERIMENTS

1. Write a java program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula.
2. The Fibonacci sequence is defined by the following rule. The first two values in the sequence is 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non recursive functions.
3. Write a java program for sorting a given list of names in ascending order
4. Write a program that prompts the user for an integer and then prints out all prime numbers up to that integer.
5. Write a Java program to Multiply two given matrices
6. Write a Java program that checks whether a given string is a palindrome or not
7. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial).
8. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
9. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
10. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
11. Write a program to perform string operations using Array List. Write functions for the following
    a. Append - add at end

b. Insert – add at particular index
c. Search
d. List all string starts with given letter

12. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

13. Write a Java program to implement exception handling.

14. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
15. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
16. Write a java program that correct implements of producer consumer program using the concept of inter thread communication
17. Write a java program to find the maximum value from the given type of elements using a generic function.
18. Write a java program that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with "STOP "or "READY" or "GO" should appear above the buttons in selected color. Initially, there is no message shown.
19. Design a calculator using event-driven programming paradigm of Java using Scientific manipulations
20. Develop a mini project for any application using Java concepts

ADDITIONAL PROGRAMS

1. Design a class to represent a Student details include the Student ID, Name of the Student, Branch, year, location and college. Assign initial values using constructor. Calculate average of marks of 6 subjects and calculate attendance percentage.

2. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism

3. Write a program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
4. Write a java programs to find factorial of a number. User is allowed to enter a number into the text field whose factorial is to be determined. On pressing the button the value of the text field is firstly converted into integer and then

processed to find its factorial. The result will get displayed in another text field.(Hint: use swings).

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop and implement Java programs for simple applications that make use ofclasses, packages and interfaces.
2. Develop and implement Java programs with array list, Strings**.**
3. Design applications using inheritance and polymorphism
4. Develop and implement Java programs with exception handling and multithreading.
5. Design applications using file processing, generic programming.
6. Develop and implement Java programs using Event Handling

21MA1402	PROBABILITY AND STATISTICAL METHODS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples whichplays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments whichplays very important roles in the field of agriculture and statistical quality control.
- To introduce the basic concepts of solving algebraic and transcendental equations.

UNIT-I RANDOM VARIABLES 9 + 3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT-II TWO - DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem for Independent Identically Distributed random variable(without proof).

UNIT-III TESTING OF HYPOTHESIS 9 + 3

Statistical hypothesis - Large sample test based on Normal distribution for Proportion , single mean and difference of two means - Student's t test for single mean and difference of two means, F test for Variance. Chi-square tests for independence of attributes and goodness of fit.

UNIT-IV DESIGN OF EXPERIMENTS 9 + 3

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT-V NUMERICAL SOLUTION OF EQUATIONS 9 + 3

Solution of algebraic and transcendental equations - Fixed point theorem (without proof)- Newton Raphson method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method - Iterative methods of Gauss Jacobi and Gauss Seidel

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamental knowledge of the concepts of probability.
2. Have knowledge of standard distributions which can describe real life phenomenon.
3. Understand the basic concepts of one and two dimensional random variables and applyin engineering applications.
4. Apply the concept of testing of hypothesis for small and large samples in real lifeproblems.
5. Apply the basic concepts of classifications of design of experiments in the field ofagriculture and statistical quality control.
6. Understand the basic concepts and techniques of solving algebraic and transcendentalequations.

TEXTBOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007
3. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015
4. Veerarajan T, “Probability, Statistics and Random Processes with Queueing Theory”, Mc Graw Hill, 4th Edition, 2018.

REFERENCES:

1. Kandasamy, P., Thilagavathy ,K.,and Gunavathy,S., ‘Numerical Methods’, Chand and Co.,2013.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 8th Edition, 2014.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004

21IT1401	OBJECT ORIENTED SOFTWARE ENGINEERING (Lab Integrated)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To teach the students a solid foundation on different software development life cycleof Object- Oriented solutions for Real-World Problems
- To discuss and explore different analysis models, design and implement models ofobject-oriented software systems by means of a mid-sized project.
- To be aware of designing a software models considering the various perspectives ofend user.
- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches and designwith UML diagrams.
- To teach the students a solid foundation on different software development life cycleof Object- Oriented solutions for Real-World Problems

UNIT-I INTRODUCTION TO SOFTWARE DEVELOPMENT AND PROCESS 9

The Challenges of Software Development – An Engineering Perspective – Object-Orientation– Iterative Development Processes- Life cycle models – Unified Process – Iterative and Incremental – Workflow – Agile Processes

SUGGESTED ACTIVITIES:

- In-class activity - Application specific product and process view.
- External learning - Impact of unified process models on quality software development methods

SUGGESTED EVALUATION METHODS:

- Assignments on selection of suitable software process models for a given software specification.
- Assignments on identification of sample application for each process model and justify the same stating reasons.
- Assignments on selection of appropriate standards for each phase in software development.

UNIT-II MODELING – OBJECT ORIENTED SYSTEM ANALYSIS 9

Requirements Elicitation – Use Cases – Unified Modeling Language, Tools -Analysis Object Model (Domain Model) – Analysis Dynamic Models – Non-functional requirements – Analysis Patterns.

SUGGESTED ACTIVITIES:

- External learning - Using open source tools for requirement engineering to understand the requirements traceability and interdependency among the functionalities provided by the software project.
- External learning - Using open source tools for conceptual data modeling of a sample application, scenario based modeling of a problem statement and class based modeling for given software requirements.

SUGGESTED EVALUATION METHODS:

- Quiz on requirements elicitation mechanisms and selection of an appropriate strategy.
- Assignments on requirement categorization (considering contradicting, omission, commission of requirements) in a software project; Designing use case diagram and activity diagram to analyze the requirements obtained from the customer and segregate them as use cases and determine the possible set of activities from the end user; Determining the flow of data/events among the processes in the application under consideration.

UNIT-III OBJECT ORIENTED ANALYSIS DESIGN 9

System Design, Architecture – Design Principles - Design Patterns – Dynamic Object Modeling – Static Object Modeling – Interface Specification – Object Constraint Language

SUGGESTED ACTIVITIES:

- External learning - Use open source tools to perform different modeling approaches.
- Develop a software design for any socially relevant project.

SUGGESTED EVALUATION METHODS:

- Quizzes on different modeling approaches and design methodologies, use cases.
- Identification of the data and flow of the software design.
- Creation of use cases.

UNIT-IV DESIGN PATTERNS AND IMPLEMENTATION 9

Introduction – Design Patterns in Smalltalk MVC – Describing Design patterns – Catalog of Design Patterns- Organizing the Catalog –How Design Patterns Solve Design Problems – How to select a Design Pattern – How to use a Design Pattern – What makes a pattern? – Pattern Categories –Relationship between Patterns – Patterns and Software Architecture

SUGGESTED ACTIVITIES:

- External learning - Understanding the design pattern and designing a suitable diagram
- External learning - Designing a simple online application on selected use cases.

SUGGESTED EVALUATION METHODS:

- Quiz and discussion on Design pattern and their Catalogs.
- Assignments on Relationship between Patterns and Software Architecture

UNIT-V IMPLEMENTATION, DEPLOYMENT AND MAINTENANCE 9

Mapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management - Software Quality -ISO 9000 Certification - SEICMM - PCMM -Six Sigma – Maintenance - Recent Trends in Object oriented Software Development

SUGGESTED ACTIVITIES:

- External learning - Testing a simple online application on selected test cases.
- Discussion on software project management, risk management & mitigation, configuration management, software documentation standards

SUGGESTED EVALUATION METHODS:

- Quiz and discussion on testing strategies, types of testing and their methods.
- Assignements on identification of potential risks for a software project during development/ maintenance and tabulate.
- Assignments on using a software configuration management template for a software project

TOTAL:45PERIODS

LABORATORY EXERCISES **30 PERIODS**

Prepare the following documents for each experiment and develop the software using software engineering methodology.

1. Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
2. Software Requirement Analysis - Describe the individual Phases/modules of the project and Identify deliverables, Software requirements Specification SRS.
3. Data Modeling - Use work products – data dictionary, use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams, State Transition Diagram, Component and deployment diagrams
4. Software Development and Debugging – implement the design by coding
5. Software Testing - Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Identify and select suitable Process Model for the given problem and have a thorough understanding of various Software Life Cycle models.
2. Analyze the requirements of the given software project and produce requirement specifications.
3. Apply the knowledge of object-oriented modelling concepts and design methods with a clear emphasis on Unified Modelling Language for a moderately realistic object oriented system.
4. Apply various software architectures, including frameworks and design patterns, when developing software projects.
5. Evaluate the software project using various Testing techniques.
6. Recognize the deployment strategy and Configuration Management strategies ofthe software project

TEXTBOOKS:

1. Carol Britton and Jill Doake, A Student Guide to Object-Oriented Development (Oxford: Elsevier,2005).
2. Roger S. Pressman, “Software Engineering: A Practitioner‘s Approach” , McGraw Hill International Edition, Eighth Edition, 2019

REFERENCES:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable object-oriented software”, Addison-Wesley, 1995.
2. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd Edition, Pearson Education, 2004.
3. Ivar Jacobson, Grady Booch, James Rumbaugh,The Unified Software Development Process, Pearson Education, 1999.
4. Alistair Cockburn, Agile Software Development 2nd Edition, Pearson Education, 2007.

21CS1401	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts and the applications of database systems.
- To know the basics of SQL and construct queries using SQL.
- To learn the relational database design principles.
- To understand the basic issues oftransaction processing and concurrency control.
- To Familiar with database storage structures and access techniques
- To understand the basic concepts and the applications of database systems.

UNIT-I DATABASE FUNDAMENTALS 9

Introduction: Database System Applications, Purpose of Database Systems, View of Data, components and structure, Database Users and Administrator, History of Database Systems. Data models: ER model, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Enhanced E-R Model.

SUGGESTED ACTIVITIES:

- Developing ER diagrams for Banking application
- Translating requirements into models
- Comparing various data models and views

SUGGESTED EVALUATION METHODS:

- Quizzes on History of Database
- Assignments on architecture of Database
- Assignments on ER model

UNIT-II RELATIONAL DATABASE 9

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

SUGGESTED ACTIVITIES:

- Simple SQL queries
- Writing PL-SQL programs

SUGGESTED EVALUATION METHODS :

- Quizzes on SQL commands
- Assignments on SQL functions
- Quizzes on control flow and functions.

UNIT-III DATABASE DESIGN 9

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Properties of Decompositions. Normalization: First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form – Multivalued Dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form

SUGGESTED ACTIVITIES:

- Writing Armstrong's Axioms
- Developing Normal Forms for a requirement
- Applying Decomposition and Functional Dependency

SUGGESTED EVALUATION METHODS :

- Quizzes on Normalization theory.
- Assignments on Normal Forms
- Case study

UNIT-IV TRANSACTION MANAGEMENT 9

Transactions, Transaction Concept, ACID properties, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Concurrency Control: Lock-Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.

SUGGESTED ACTIVITIES:

- Writing Transaction rules for a database
- Comparing the efficiency of protocols
- Understanding the importance of Recovery

SUGGESTED EVALUATION METHODS :

- Quizzes on Transaction Management
- Assignments on Protocols
- Quizzes on Recovery

UNIT-V IMPLEMENTATION TECHNIQUES AND NON-RELATIONAL MODEL 9

Data on External Storage – RAID- File Organizations – Indexing and Hashing -Trees – B+ tree and B- Tree index files. Hashing: Static – Dynamic. Query Processing and Query Optimization - Introduction to NoSQL & MongoDB: Advantages, Architecture, Data Models MongoDB Data types and CRUD Operations

SUGGESTED ACTIVITIES:

- Applying RAID models
- Writing queries for index
- Comparing efficiency of Tree methods
- Writing No-Sql Queries

SUGGESTED EVALUATION METHODS:

- Quizzes on Tree concepts.
- Assignments on Indexing
- Quizzes on Query Optimization

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Remember the Structure of a Database
2. Understand an Entity Relational Model for a database.
3. Apply Relational and Non-Relational database concepts to design a database.
4. Analyze the importance of normalization and functional dependencies in databasedesign
5. Evaluate the working principles of indexing and hashing.
6. Create a database design using both Relational and Non- Relational models

TEXTBOOKS:

1. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill India Private Limited, 7th edition.
2. MongoDB Complete Guide by Manu Sharma, BPB Publications, ISBN: 9789389898866, July 2021

REFERENCES:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition

NPTEL COURSES:

1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview
2. http://nptel.ac.in/courses/106106093/ http://nptel.ac.in/courses/106106095/

NPTEL VIDEO COURSES:

1. https://www.youtube.com/watch?v=EUzsy3W4I0g
2. https://www.youtube.com/playlist?list=PL52484DF04A264E59

ONLINECOURSES/RESOURCES:

1. https://beginnersbook.com/2017/09/introduction-to-nosql/
2. https://www.w3schools.com/sql/
3. https://www.toptal.com/database/the-definitive-guide-to-nosql-databases
4. https://www.w3schools.in/mongodb/
5. https://www.coursera.org/lecture/introduction-to-nosql-databases/overview-of-nosql- liIaX

21IT1402	MICROPROCESSOR SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the architecture of the Intel 8086 microprocessor
- To familiarize with assembly language programming and learn to write programs in8086 assembly
- To discuss the various multiprocessor configurations
- To understand the functionality and working of different peripheral chips and theirinterfacing to the processor
- To understand the architecture and the salient features of the Advanced processors
- To understand the architecture of ARM and Android-ARM processor

UNIT-I THE 8086 MICROPROCESSOR 9

Intel 8086 Microprocessors – Architecture – Internal operation - Instruction set – Assembler directives and operators – Addressing modes. 8086- Assembly language programming- Stacks - Procedures – Macros – Interrupts and Interrupt service routines – Byte and String manipulation instructions

SUGGESTED EVALUATION METHODS:

- Assignment problems on basic arithmetic operations and string primitives Quizzes

UNIT-II 8086 SYSTEM BUS STRUCTURE 9

8086 Signals – Basic Configurations – Minimum mode- Maximum mode – Queue status and Lock Facility - System Bus Timing - System design using 8086: Multiprocessor configurations – Coprocessor – Closely coupled and Loosely coupled configurations

SUGGESTED EVALUATION METHODS:

- Assignment problems on different types of configurations
- Quizzes

UNIT-III I/O INTERFACING 9

Memory interfacing and I/O interfacing – Parallel communication Interface – Programming and Applications. Serial communication applications interface – Interrupt controller – DMA controller – programming and applications

SUGGESTED ACTIVITIES :

- Study of Different Applications using 8255

SUGGESTED EVALUATION METHODS:

- Assignment problems on memory interfacing and I/O interfacing in differentconfigurations, System design

using the 8086
- Quizzes
- Assignment problems on applications and interfacing

UNIT-IV ADVANCED MICROPROCESSOR 9

Block diagram of Advanced Microprocessor, Memory Hierarchy, Cache memory, Virtual memory, Paging & segmentation, Pipe lining – Pipe line hazards. Features and comparison of 80286, 80386, 80486, Pentium IV. Concept of core processor. Introduction to Power PC, Features of Power PC601 and AMD Athlon Processor. Features and applications of Super SPARC Processor.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT-V ARM FAMILY OF PROCESSORS 9

Overview of ARM architecture, The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control - Data movement and memory reference instructions. Android-ARM hardware- software interface

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Discuss the architecture of the 8086 processor in detail
2. Write assembly language programs in 8086 assembly
3. Show how multiple processors can be connected with an 8086 processor
4. Show how the various peripheral chips can be interfaced to the processor
5. Point out the salient features of the Advanced processors and discuss the various modes of operation of these processors.
6. Understand the architecture of ARM and Android-ARM processor

TEXTBOOKS:

1. Yu – Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086/8088 Family – Architecture, Programming and Design “, Second Edition, Prentice Hall of India, 2007.
2. Barry B. Brey, “The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing”, Eighth edition, Pearson Prentice Hall, 2009.
3. ARM System Developer's Guide: Designing and Optimizing System Software Morgan Kauffman Publisher

REFERENCES:

1. A. K.Ray , K M Bhurchandi, “Advanced Microprocessor & Peripherals”, Tata McGraw Hill,3nd Edition,2013
2. Peter Abel, “IBM PC Assembly Language and Programming”, Fifth edition, Prentice Hall, 2000
3. James L. Turley, “Advanced 80386 Programming Techniques”, Osborne McGraw Hill, 1988.
4. Intel® 64 and IA-32 Architectures Software Developer’s Manual, Volume 3B: System Programming Guide, Part 2.
5. Badri Ram , â€˜’Advanced Microprocessors and Interfacing”‘, McGraw Hill, 2014
6. Triebel, walter, Avatar singh,” The 8088 and 8086 microprocessors : programming, interfacing, software, hardware, and applications : including the 80286, 80386, 80486, and Pentium processors”, _Prentice Hall, Fourth edition, 2003.
7. The SPARC Architecture Manual.
8. INTEL manual/data sheet

21CS1402	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To get accustomed with various programming constructs such as divide-and-conquer, dynamic Programming, Backtracking and Branch and Bound.
- To understand the limitations of Algorithmic power.
- To learn techniques for solving specific problems more efficiently and for analyzing space and time requirements.

UNIT-I INTRODUCTION 9

Notion of an Algorithm - Fundamentals of Algorithmic Problem Solving -Important Problem Types –Algorithm Design Technique- Fundamentals of the Analysis of Algorithmic Efficiency - Asymptotic Notations and their properties-Analysis Framework - Mathematical analysis for Recursive and Non-recursive algorithms-Randomized algorithms-Las Vegas and Monte Carlo types.

SUGGESTED ACTIVITIES:

- Discussion on role of algorithms in computer science.
- Design of simple problems
- Basic method of calculating time and space complexity
- Design of Induction proof for recursive and non-recursive algorithms.

SUGGESTED EVALUATION METHODS:

- Quizzes on Asymptotic Notations
- Assignments on calculating time complexity using forward and BackwardApproach

UNIT-II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force - String Matching-KMP algorithm - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology - Binary Search - Merge sort - Quick sort – Randomized Quick Sort - Multiplication of Large Integers, Strassen's Matrix Multiplication

SUGGESTED ACTIVITIES:

- External Learning- Divide and Conquer based algorithms, Hackerrank divide andConquer algorithms
- Practical : Implementation of Binary Search and Merge Sort
- To calculate time complexity using Master's theorem
- Design of Induction proofs for algorithm verification for Divide and ConquerAlgorithms

SUGGESTED EVALUATION METHODS:

- Quizzes on brute force methods
- Assignments on Merge Sort and Multiplication of Large Integers

UNIT-III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming - Principle of optimality - Computing a Binomial Coefficient – Floyd's algorithm - Multi stage graph - Optimal Binary Search Trees - Knapsack Problem. Greedy Technique - Container loading problem - Prim's algorithm and Kruskal's Algorithm - 0/1 Knapsack problems - Huffman Trees.

SUGGESTED ACTIVITIES:

- External Learning- Dynamic Programming based algorithms like Longestcommon subsequence
- Practical : Implementation of Optimal Binary Search Tree
- External Learning- Greedy Techniques like Prim's and Kruskal's Algorithm
- Practical: Implementation of Huffman Trees.

SUGGESTED EVALUATION METHODS:

- Tutorials on Floyd's Algorithm
- Quizzes on greedy algorithms
- Assignments on Knapsack using Dynamic Programming method and Greedymethod

UNIT-IV ITERATIVE IMPROVEMENT AND BACKTRACKING 9

Iterative Improvement-The Maximum-Flow Problem-Stable marriage Problem-Backtracking - n- Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph Coloring Problem.

SUGGESTED ACTIVITIES:

- External Learning- Maximum-Flow Problem
- External Learning- Backtracking Algorithms like N Queens Problem andHamiltonian Circuit Problem
- Practical : Implementation of subset sum problem
- Practical : Implementation of Hamiltonian Circuit Problems

SUGGESTED EVALUATION METHODS:

- Tutorials on Hamiltonian Circuit Problem
- Quizzes on Backtracking algorithms

UNIT-V P, NP CLASSES AND BRANCH AND BOUND 9

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems-Branch and Bound- LIFO Search and FIFO search - Assignment problem - Knapsack Problem - Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems - Travelling Salesmanproblem - Knapsack problem

SUGGESTED ACTIVITIES:

- External Learning- NP Completeness
- External Learning- Branch and Bound Algorithms like Knapsack Problem
- Practical : Implementation of Travelling Salesman Problem using Branch andBound

- External Learning- Approximation Algorithms for NP-Hard Problems
- Practical : Implementation of Travelling Salesman Problem using ApproximationAlgorithms

SUGGESTED EVALUATION METHODS:

- Assignments on NP-Hard Problems
- Assignments on NP Completeness
- Quizzes on Knapsack Problems
- Assignments on Travelling Salesman Problem

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand different algorithmic design strategies
2. Articulate the process of problem solving and writing algorithms.
3. Design and implementing the problems using algorithmic design paradigms (divide-and- conquer, greedy method, dynamic-programming and Backtracking, Branch and Bound) and apply when an algorithmic design situation calls for it.
4. Analyze the correctness of algorithms using inductive proofs and invariants
5. Describe the classes P, NP,NP-Hard, NP Complete and appraise to prove that a certain problem is P,NP,BP-Hard, NP-Complete.
6. Designing their theoretical knowledge in practice

TEXTBOOKS:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ¯Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. S.Sridhar, DESIGN AND ANALYSIS OF ALGORITHMS, First Edition, Oxford Edition, 2014
3. Anany Levitin, ¯Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++,Second Edition, Universities Press, 2007.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ¯Data Structures and Algorithms‖, Pearson Education, Reprint 2006.
3. Harsh Bhasin, ¯Algorithms Design and Analysis‖, Oxford university press, 2015.
4. http://nptel.ac.in/

WEBREFERENCES:

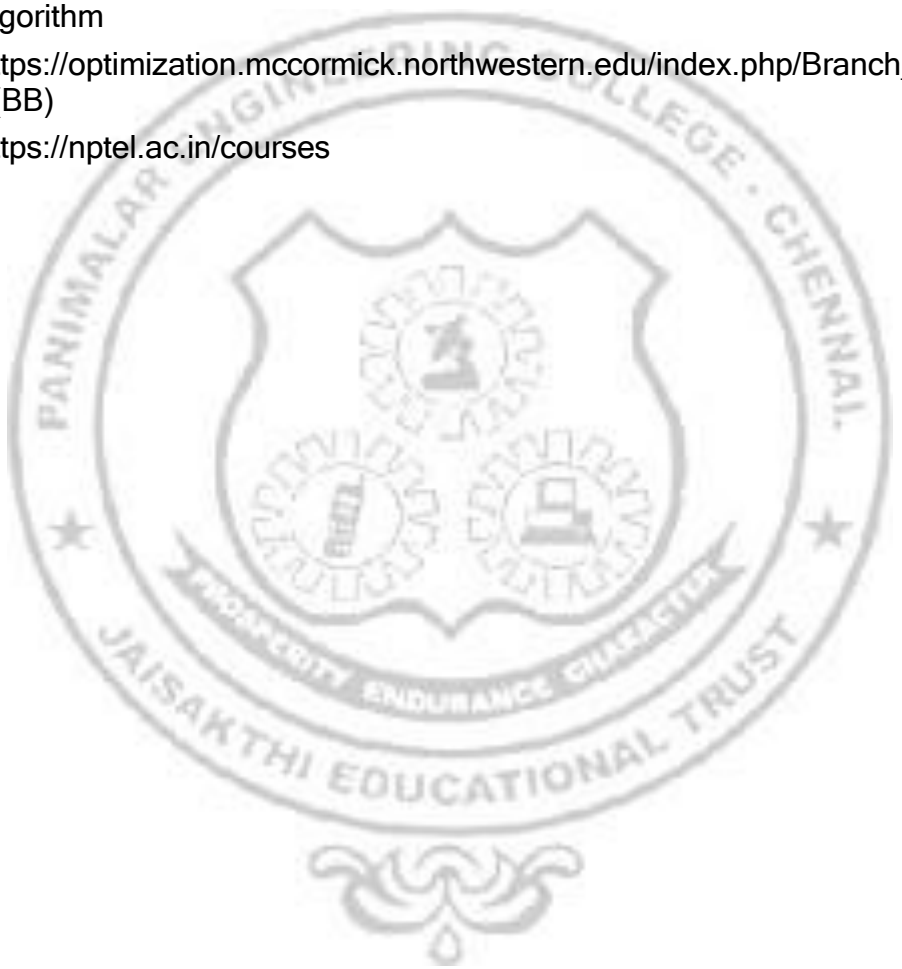
1. https://www.pdfdrive.com/design-analysis-of-algorithms-e33623281.html

2. https://www.pdfdrive.com/introduction-to-the-design-and-analysis-of-algorithms-2-vgloop- e17224696.html

3. https://www.pdfdrive.com/design-and-analysis-of-algorithms-tutorial-e60359577.html

ONLINE COURSES:

1. https://www.javatpoint.com/dynamic-programming
2. https://www.simplilearn.com/tutorials/data-structure-tutorial/backtracking-algorithm
3. https://optimization.mccormick.northwestern.edu/index.php/Branch_and_bound_(BB)
4. https://nptel.ac.in/courses



21CS1403	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

UNIT-I INTRODUCTION AND PHYSICAL LAYER 9

Networks — Network Types — Protocol Layering — TCP/IP Protocol suite — OSI Model– Physical Layer: Performance – Transmission media – Switching .

SUGGESTED ACTIVITIES:

- Designing Network Topology
- Problems on Performance metrics

SUGGESTED EVALUATION METHODS:

- Quizzes on Performance metrics

UNIT-II DATA-LINK LAYER & MEDIA ACCESS 9

Introduction – Link-Layer Addressing – Data-Link Layer Protocols – HDLC – PPP — Media Access Control – Wired LANs: Ethernet – Wireless LANs: IEEE 802.11, Bluetooth, Zig bee.

SUGGESTED ACTIVITIES:

- Problems on Error correction and detection

SUGGESTED EVALUATION METHODS:

- Assignment - HDLC
- Quizzes

UNIT-III NETWORK LAYER 9

Introduction — Network Layer Protocols: IPV4 , ICMP, IPV6 — Unicast Routing Algorithms – Multicasting Basics .

SUGGESTED ACTIVITIES:

- Problems on IP Addressing- In class
- In Class - Problems in Distance Vector Routing , Link State Routing using simulator

SUGGESTED EVALUATION METHODS:

- Assignments on IP Addressing and Routing Protocols

UNIT-IV TRANSPORT LAYER 9

Introduction — Transport Layer Protocols — User Datagram Protocol — Transmission Control Protocol – SCTP.

SUGGESTED ACTIVITIES:

- Socket Programming on UDP
- Implementation of DNS using UDP

SUGGESTED EVALUATION METHODS:

- Quiz on UDP and TCP applications

UNIT-V APPLICATION LAYER 9

WWW and HTTP – FTP – Email -Telnet -SSH – DNS – SNMP .

SUGGESTED ACTIVITIES:

- Seminar topic - WWW and HTTP

SUGGESTED EVALUATION METHODS:

- Implementation of HTTP using Socket Programming.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic layers and its functions in computer networks.
2. Evaluate the performance of a network.
3. Understand the basics of how data flows from one node to another.
4. Analyze and design routing algorithms.
5. Design protocols for various functions in the network.
6. Understand the working of various application layer protocols.

TEXTBOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, PearsonEducation, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open SourceApproach, McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

NPTEL COURSES:

1. https://nptel.ac.in › noc › noc22 › SEM1 › noc22-cs1

ONLINECOURSES/RESOURCES:

1. Computer Network Tutorial - javatpoint https://www.javatpoint.com › computer-network-tutorial https://www.geeksforgeeks.org/computer-network-tutorials/
2. TCP/IP Tutorial and Technical Overview, (IBM Redbook) - Download From http://www.redbooks.ibm.com/abstracts/gg243376.html
3. TCP/IP Guide, Charles M. Kozierok, Available Online - http://www.tcpipguide.com/
4. Request for Comments (RFC) - IETF - http://www.ietf.org/rfc.html

21CS1411	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- earn to create and use a database.
- Be familiarized with a query language.
- Have hands on experience on DDL Commands.
- Have a good understanding of DML Commands and DCL Commands.
- Familiarize advanced SQL queries.
- Be exposed to different applications

LIST OF EXPERIMENTS

Tools: Oracle SQL* Plus/No-SQL-MongoDB

1. Creation of a tables for Salesman and Customer Relation with following structure:

Salesman Relation:

salesman_id	name	city	commission

Customer Relation:

customer_id	cust_name	city	grade	salesman_id

2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.

3. Creation of Views, Synonyms, Sequence, Indexes, Save point.

4. Set various constraints like Not Null, Primary Key, Foreign Key and Check constraints.

5. Creating relationship between the databases and retrieve records using joins for the below relations:

Salesman Relation:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Customer Relation:

customer_id	cust_name	city	grade	salesman_id
3002	Nick Rimando	New York	100	5001
3007	Brad Davis	New York	200	5001
3005	Graham Zusi	London	300	5002
3004	Fabian	Paris	300	5006
3009	Geoff Cameron	Rome	100	5007
3003	Jozy	San Jose	300	5003

Execute the different types of Joins to find the output for the below:

a) From the following tables write a SQL query to find the salesperson and customer whoreside in the same city. Return Salesman, cust_name and city
b) From the following tables write a SQL query to find those orders where the order amount exists between 500 and 2000. Return ord_no, purch_amt, cust_name, city.
c) From the following tables write a SQL query to find the salesperson(s) and the customer(s)he represents. Return Customer Name, city, Salesman, commission
d) From the following tables write a SQL query to find salespeople who received commissions of more than 12 percent from the company. Return Customer Name, customercity, Salesman, commission
e) Write a SQL statement to join the tables salesman, customer and orders so that the same column of each table appears once and only the relational rows are returned

6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions
10. Database Connectivity with Front End Tools (Java/Python)
11. Mini project
    a. Inventory Control System.
    b. Material Requirement Processing.
    c. Hospital Management System.
    d. Railway Reservation System.
    e. Personal Information System.
    f. Timetable Management System.
    g. Hotel Management System

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the Syntax of SQL commands
2. Remember queries to retrieve records
3. Apply referential integrity constraints
4. Analyze the database design using constraints
5. Evaluate PL/SQL programs to implement triggers, functions, procedures and exceptions
6. Create front end tools to manipulate information from backend

21CS1412	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   a) Echo client and echo server
   b) Chat
   c) File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/ Link State Routing algorithm.
9. Performance evaluation of Routing protocols using Simulation tool.
10. Simulation of error correction code (like CRC).

TOTAL:60PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Implement various protocols using TCP and UDP.
2. Compare the performance of different transport layer protocols.
3. Use simulation tools to analyze the performance of various network protocols.
4. Analyze various routing algorithms.
5. Implement error correction codes.

21IT1501	COMPILER ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn about automata theory and regular expressions.
- To learn the concepts in the design of compilers.
- To learn about the runtime store organization.
- To know the data structures used to implement symbol tables.
- To be familiar with garbage collection.

UNIT-I INTRODUCTION TO AUTOMATA THEORY AND REGULAR EXPRESSIONS **9**

Finite Automata - Deterministic Finite Automata - Non-deterministic Finite Automata – NFA to DFA – Finite Automata with Epsilon Transitions – Epsilon-NFA to DFA – Kleene's Theorem - Minimization of Automata - Regular Expressions - Equivalence between Regular Expression and Automata - Properties of Regular Expressions.

Suggested activities:

- Assignments on Finite Automata and Regular Expressions and Automata, Basics of Finite Automata, NFA, DFA ,Finite state machines - Regular expressions.

Suggested Evaluation Methods:

- Assignments on regular expressions and minimization of automata.
- Quizzes on automata.

UNIT-II LEXICAL ANALYSIS **9**

Introduction - The Structure of Compiler - Evolution of Programming Languages - Application of Compiler Technology – Programming Languages Basics – Lexical Analysis – Role of Lexical Analyzer – Specification and Recognition of Tokens – Lexical Analyzer Generators.

Suggested Evaluation Methods:

- Assignments on lexical analysis.
- Quizzes on lexical generators.

UNIT-III SYNTAX ANALYSIS **9**

Introduction – Context Free Grammar – Top Down Parsing – Recursive Descend Parsing - Predictive Parsing - Non-Recursive Predictive Parsing - Error Recovery - Bottom Up Parsing - LR Parsers - Construction of SLR (1) Parsing Table, Canonical LR (1) Parsing Table and LALR (1) Parsing Table - Parser Generators.

Suggested Evaluation Methods:

- Assignments on context-free grammar and various parsers.
- Quizzes on parsers.

UNIT-IV INTERMEDIATE CODE GENERATION 9

Symbol Table – Construction – Syntax Directed Definitions – Evaluation Orders for Syntax Directed Definitions – Applications of Syntax Directed Translation – Intermediate Code Generation – Three Address Code – Types and Declarations – Expression Translation – Type Checking – Back Patching.

Suggested activities:

- Assignments on generating different types of curves.
- Practical - Drawing curves and curved objects

UNIT-V CODE GENERATION AND OPTIMIZATION 9

Issues – Design of Code Generator – Addresses in the Target Code – Basic Blocks in Flow Graph – Simple Code Generator – Peephole Optimization – Machine Independent Optimization – Principal Sources of Optimizations – Bootstrapping a Compiler – Compiling Compilers – Full Bootstrap.

Suggested Activities:

- Practical - Perform code generation.
- External learning - Code generation, Elementary optimizations. Basic blocks, Dataflow analysis.

Suggested Evaluation Methods:

- Assignment problems flow graph.
- Quizzes on code optimization.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the concept of lexical analysis and construction of deterministic and non-deterministic automata.
2. Understand the concept of parsing and construction of parser.
3. Develop an Intermediate Code generator.
4. Study programming language design, target machine design and run time environment of compilers.
5. Study about the compiler construction tools.
6. Obtain knowledge to construct a prototype compiler for a subset of a programming language.

TEXTBOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman, “Compilers:Principles, Techniques, and Tools”, Second Edition, Pearson Education, 2009.
2. John Hopcroft, Rajeev Motwani, Jeffrey Ullman, “Introduction To Automata TheoryLanguages, and Computation”, Third Edition, Pearson Education, 2007

REFERENCES:

1. Torbengidius Mogensen, “Basics of Compiler Design”, Springer, 2011
2. Charles N, Ron K Cytron, Richard J LeBlanc Jr., “Crafting a Complier”, Pearson Education, 2010.
3. K. D. Cooper, L. Torczon, “Engineering a Compiler”, Morgan-Kaufmann, Second Edition, 2011.
4. Micheal Sipser, “Introduction to the Theory of Computation”, Third Edition,2014.

WEB REFERENCES:

1. https://dl.acm.org/doi/pdf/10.5555/2737838
2. https://www.geeksforgeeks.org/compiler-design-tutorials/
3. https://www.javatpoint.com/compiler-tutorial

ONLINECOURSES/RESOURCES:

1. https://online.stanford.edu/courses/soe-ycscs1-compilers
2. https://onlinecourses.nptel.ac.in/noc20_cs13/preview
3. https://www.udacity.com/course/compilers-theory-and-practice--ud168

21IT1502	WEB TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To comprehend and analyze the basic concepts of web programming and Internet protocols..
- To understand the advanced features of Java language.
- To understand the essential client side technologies for web programming.
- To develop applications using database connectivity and server side programming in Java environment.
- To develop smart device based web application and deploy in different platforms

UNIT-I WEB ESSENTIALS 9

Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website – Creating a Website – Fundamentals of Client-side and server-side scripting.

Suggested activities:

- Basics of internet protocol
- Creation of web site.

Suggested Evaluation Methods:

- Assignment on different types of web browser
- Simple application development steps using all the above mentioned features.

UNIT-II JAVA GUI, FILE STREAM AND CONCURRENCY 9

GUI Development using SWING – I/O Streams and Object Serialization – Generic Collections – Concurrency – Thread States and Life Cycles – Thread Synchronization – Java Networking.

Suggested Activities :

- Applet and frame based application development using Swing.
- File stream and object serialization on text and binary data.
- Thread priorities and synchronization based application development. ·
- Simple networking programs like chat application.

Suggested Evaluation Methods:

- Grading system to evaluate simple java exercises.
- Various GUI control based applet and frame applications with event handling.
- Application development based on I/O stream and thread manipulation.

UNIT-III CLIENT SIDE ESSENTIALS 9

Java Script Objects and Functions – JQuery – Accessing DOM Elements using Java Script and JQuery Objects – Java Script Event Handling – XML DOM – AJAX Enabled Rich Internet Applications with XML and JSON – Dynamic Access and Manipulation of Web Pages using Java Script and JQuery – Web Speech API – Speech Synthesis Markup Language.

Suggested activities:

- Programming exercises on HTML forms with Java script and JQuery objects. ·
- XML and JSON based AJAX enabled rich Internet application.
- Program on Web speech API

Suggested Evaluation Methods:

- Case studies on simple web site with HTML, Java script and JQuery objects.
- AJAX enabled web site realization.
- Java script based speech API implementation

UNIT-IV SERVER SIDE ESSENTIALS 9

Overview of Servlet – Life Cycle of Servlet – Servlet Configuration – Running Servlet with Database Connectivity – Servlet Support for Cookies – Session Tracking – Basics of JSP – Java Server Faces – Multi tier Application Architecture – MVC Architecture of JSF Apps – JSF Components – Session Tracking – Developing Dynamic Data Driven Websites.

Suggested activities:

- Servlet programming with database connectivity and session tracking.
- JSF applications with database connectivity and session management.

Suggested Evaluation Methods:

- Demonstration of simple web application using Servlet and JSF.
- Session management demos using Servlet and JSF.

UNIT-V SERVERLESS AND MOBILE BASED WEB DEVELOPMENT 9

Node Programming Fundamentals – Asynchronous Programming Techniques – Sequencing Asynchronous Logic – Node JS – Global Objects – Event Listeners – J2ME Basics – MIDlet –Mobile Web Application Frameworks – Simple Android Based Development – Cloud Based Applications Deployment- AWS Lambda

Suggested Activities:

- Asynchronous web application development.
- Android based mobile application development.
- Practical - Application deployment in web servers.

Suggested Evaluation Methods:

- Evaluating asynchronous application development.

- Evaluation of online web hosting.
- Modular design factors like cohesion and coupling used to evaluate proper modules breakup.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Explain the basic concepts of web programming and internet protocols.
2. Develop GUI application by including I/O streams and threads.
3. Create web pages with proper client-side features.
4. Design dynamic web pages with server-side and other technologies.
5. Develop simple android based mobile application.
6. Deploy web applications in a cloud based environment.

TEXTBOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet & World Wide Web - How to Program”, 5th edition, Pearson Education, 2015
2. Core and Advanced Java”, Black book, Dr.R.Nageshwara Rao , Dream Tech Press, 2018.
3. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2011

REFERENCES:

1. Reto Meier, “Professional Android Application Development”, Wiley India Pvt Ltd,2018.
2. Mike Cantelon, Marc Harter, TJ Holowaychuk and Nathan Rajlich, “Node.js inAction”, Manning Publications, 2017.
3. Uttam K. Roy, “Web Technologies”, Oxford University Press, 2011

WEBREFERENCES:

1. https://books.google.co.in/books/about/Java_Programming.html?id=6CgrygEACAAJ &redir_esc=y
2. http://www.periodicooficial.oaxaca.gob.mx/files/2011/05/EXT02-2011-05-19.pdf
3. https://info340.github.io/client-side-development.html
4. https://www.zkoss.org/wiki/ZK_Component_Development_Essentials/Handling_Eve nts/Server-side_Listeners
5. https://www.section.io/engineering-education/how-to-build-apps-with-serverless-architecture/

ONLINECOURSES/RESOURCES:

1. https://www.javatpoint.com/java-basics
2. https://www.geeksforgeeks.org/server-side-client-side-programming/

3. https://www.guvi.in/full-stack-development-course
4. https://www.coursera.org/courses?query=web%20technologies
5. https://www.coursera.org/lecture/aws-fundamentals-building-serverless- applications/introduction-to-serverless-computing-with-aws-lambda-part-1-Zy2IR

21IT1503	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To study the background of Intelligent agents and search techniques.
- To know the logical implications in computational intelligence.
- To learn techniques for reasoning under uncertainty.
- To know the various planning and basics of natural language processing.
- To explore the adaption of artificial intelligence techniques in real-time scenarios.
- To study the background of Intelligent agents and search techniques.

UNIT-I INTELLIGENT AGENTS AND SEARCH TECHNIQUES 9

Agents and Environments – Good Behavior: The Concepts of Rationality – The Nature of Environments – The Structure of Agents – Problem Solving by Search – Uninformed Search- Informed State Space Search – Heuristic Search: Greedy – A*Search - Local search Algorithms and Optimization Problems -Game Search -Min Max Algorithm - Alpha-Beta Pruning - Constraint Satisfaction Problems.

Suggested activities:

- Solve puzzles with uninformed and informed searches
- Practical - Implementation of search through Python/other languages

Suggested Evaluation Methods:

- Assignments on puzzles with uninformed and informed searches
- Quizzes on agents, environments and search
- Evaluation of the programming exercises

UNIT-II REASONING WITH LOWER ORDER LOGICS 9

Logical Agent – Knowledge-Based Agents - Logic - Proposition Logic – Theorem Proving – First-Order Logic - Inference in First-Order Logic: Unification - Forward Chaining – Backward Chaining –Resolution.

Suggested activities:

- Reasoning methods through puzzles and real life scenarios
- Practical - Programming through Prolog/ Python for various topics such as reasoning through resolution.

Suggested Evaluation Methods:

- Assignment problems on different topics of the unit
- Quizzes on inference techniques in logic

UNIT-III PROBABILISTIC REASONING 9

Acting under Uncertainty - Basic Probability Notation - Bayesian Inference - naive bayes models Probabilistic reasoning - Bayesian networks - Exact inference in BN - Approximate Inference in BN.

Suggested activities:

- Examples of Probabilistic Reasoning through different methods.
- Design of Bayesian networks for real world scenarios

Suggested Evaluation Methods:

- Quiz on different methods of Probabilistic reasoning.
- Assignments on Bayesian Networks

UNIT-IV AI PLANNING AND NATURAL LANGUAGE PROCESSING 9

Components of a planning system-Goal Stack Planning - Non Linear Planning-Hierarchical Planning – Natural Language Processing Basics: Syntax – Semantics – Introduction to Statistical NLP.

Suggested activities:

- In class – Graph plan
- Develop a plan for block world, cargo world etc

Suggested Evaluation Methods:

- Assignments on graph plan
- Quizzes on planning and natural language processing basics

UNIT-V LEARNING AND APPLICATIONS 9

Logical Formulation of Learning – Knowledge in Learning – Explanation-based Learning – Learning using Relevance Information – Application with NLP: Developing a Simple Chatbot - Types of Chatbot - Case Study: Text to Speech using NLP.

Suggested Activities:

- Assignments on problem solving in learning techniques
- Explore the available Chat bot models such as Watson and adapt to a specific domain such as Education or Customer relations

Suggested Evaluation Methods:

- Quizzes on knowledge in learning
- Assignments on available Chatbot models.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the Intelligent agents and search techniques.
2. Use appropriate search algorithm for problem solving.
3. Represent a Problem using first order and predicate logic.
4. Apply the reasoning under uncertainty.
5. Understand the Planning and NLP techniques.

6. Apply AI techniques in developing real world applications.

TEXTBOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”,Fourth Edition, Pearson Education, 2021.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition,Tata McGraw-Hill Education, Reprint -2015

REFERENCES:

1. Dheepak Khemani, “A first course in Artificial Intelligence”, McGraw Hill Education Pvt Ltd., New Delhi, 2013
2. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O’Reilly, 2009, https://www.nltk.org/book/.
3. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmaan Publishers Inc; Second Edition, 2003.

WEBREFERENCES:

1. https://zoo.cs.yale.edu/classes/cs470/materials/aima2010.pdf
2. https://www.javatpoint.com/artificial-intelligence-ai

ONLINECOURSES/RESOURCES:

1. NPTEL, “Artificial Intelligence”, http://nptel.ac.in/courses/106105079/2.
2. Udacity, “Introduction to Artificial Intelligence”, https://in.udacity.com/course/intro-to-artificial-intelligence--cs271.

21IT1504	EMBEDDED SYSTEMS AND INTERNET OFTHINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the fundamentals of embedded system design and embedded processor
- To introduce embedded software and hardware components
- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols and tools
- To apply the concept of Internet of Things in the real world scenario.

UNIT- I EMBEDDED SYSTEMS BASICS AND 8-BIT EMBEDDED PROCESSOR 9

Introduction to Embedded System - Embedded Design Lifecycle- Systems Model- 8-Bit Microcontroller- General Purpose Microprocessor vs Microcontroller, Applications,8051 Architecture , Instruction Set and Programming

Suggested Activities:

- Study of an Instruction Set for a 8051 Microcontroller
- Discussion on role of Embedded systems in real time

Suggested Evaluation Methods:

- Assignments on Instruction set programming, 8051 Architecture
- Quizzes on Introduction to Embedded Systems

UNIT- II EMBEDDED HARDWARE AND SOFTWARE 9

Programming Parallel Port- Serial Port- Timers-Interrupts-Memory- I/O device Interface – Programming Embedded Systems in C- Introduction to Embedded OS- Multi tasking OS – RTOS

Suggested Activities:

- Practical - Developing simple applications using embedded C.

Suggested Evaluation Methods:

- Assignments on Embedded C and Embedded OS
- Quizzes on Timers, Interrupts and Memory
- Evaluation based on Lab Experiments Results

UNIT- III INTRODUCTION TO IOT 9

Internet of Things - Physical and Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates – Four Pillars of IoT-M2M-RFID-WSN-SCADA

Suggested Activities:

- Case study on Pillars of IoT
- External Learning on use of IoT Technologies in Projects

Suggested Evaluation Methods:

- Assignment on IoT Enabling Technologies
- Quiz on Basics of IoT design concepts

UNIT- IV IOT COMMUNICATION AND OPEN PLATFORMS 9

IoT Communication Models and APIs – IoT Communication Protocols : Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform-Raspberry Pi – Architecture – programming with sensor –ARDUINO -Pin configuration – Programming with sensor

Suggested Activities:

- Practical - Developing simple application using open platform (like Raspberry Pi).
- Practical- Developing simple application using Arduino

Suggested Evaluation Methods:

- Assignments on open platform tools
- Quizzes on IoT communication protocols.
- Evaluation based on Lab Experiments Results

UNIT- V APPLICATION DEVELOPMENT AND ADVANCED TECHNOLOGY 9

Home Automation-Smart Cities -Smart Agriculture- Smart Industry-Health and life style – Application with BlueMix- Apache Hadoop..

Suggested Activities:

- Practical - Designing simple applications.
- Case study on IoT based home automation solutions.

Suggested Evaluation Methods

- Assignment on different IoT based smart solutions.
- Demonstrating real-time applications using embedded and IOT processors.
- Quizzes on Design of embedded systems and IoT applications.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Define an embedded system and compare with general purpose system..
2. Design and deploy timers and interrupts..
3. Develop embedded C programs and design simple embedded applications
4. Apply the fundamental IoT concepts
5. Analyze various protocols for IoT and build programs using tools
6. Deploy an IoT real time application and connect to the cloud

TEXTBOOKS:

1. Muhammed Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second Edition, 2014.
2. Tammy Neogaard, “ Embedded Systems Architetcure : A Comprehensive

Guide for Engineers and Programmers", Newnes, Elsevier, 2013.

3. Arshdeep Bahga, Vijay Madisetti, ¯Internet of Things – A hands-on approach, Universities Press, 2015
4. Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri,- Internet of Things: Architectures, Protocols and Standards, ohn Wiley & Sons, 2018
5. Olivier Hersent, David Boswarthick, Omar Elloumi , ¯The Internet of Things – Keyapplications and Protocols‖, Wiley, 2012
6. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD),2014, ISBN: 9789350239759.

REFERENCES:

1. Michael J. Pont, "Embedded C", Pearson Education, 2007.
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
3. Honbo Zhou, ¯The Internet of Things in the Cloud: A Middleware Perspective‖, CRCPress, 2012.
4. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
5. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning, IOT Kindle Edition.
6. Andrew N Sloss, D. Symes, C. Wright, "Arm System Developers Guide", Morgan Kauffman/ Elsevier, 2006.
7. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", VPT, 2014.

WEB REFERENCES:

1. https://www.academia.edu/31736611/The_8051_Microcontroller_and_Embedde d_Sy stems_Mazidi_pdf
2. http://www.csit-sun.pub.ro/~cpop/Documentatie_SMP/Sisteme_incorporate/ Embedded%20Systems%20Architecture%20- %20A%20Comprehensive%20Guide
3. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf
4. https://books.google.co.in/books/about/Internet_of_Things.html?id=JPK GBAAAQBAJ&printsec=frontcover&source=kp_read_button&redir_esc =y
5. http://14.99.188.242:8080/jspui/bitstream/123456789/6107/1/The%20Internet%2 0of %20Things%20in%20the%20Cloud.pdf
6. https://nasrinword.files.wordpress.com/2018/05/olivier-hersent-david- boswarthick- omar-elloumi-e28095the-internet-of-things-e28093-key- applications-and-protocols- ref-5.pdf

ONLINE COURSES/RESOURCES:

1. https://www.udacity.com/course/compilers-theory-and-practice--ud168
2. https://nptel.ac.in/courses/108102045
3. https://nptel.ac.in/courses/106105166
4. https://www.coursera.org/specializations/iot
5. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs63/

21IT1511	WEB TECHNOLOGIES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To develop simple Java programs using object orientation concepts.
- To program using files and threads for concurrent operations.
- To introduce scripting language concepts for developing client-side applications.
- To design attractive GUI using framework.
- To create dynamic web pages using CSS, JavaScript and AJAX.
- To develop mobile based web applications in cloud environment.

LIST OF EXPERIMENTS

1. Design the following static web pages required for an online book store web site.
    - HOME PAGE: The static home page must contain three frames.
    - LOGIN PAGE
    - CATOLOGUE PAGE: The catalogue page should contain the details of all thebooks available in the web site in a table.
    - REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
    - First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characterslength).
    - E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
    - Mobile Number (Phone number should contain 10 digits only).
    - Last Name and Address (should not be Empty).
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Simple GUI application development using applet and SWING.
5. Implement multithreaded program for concurrent operations.
6. Develop program to set priority and synchronize java threads.
7. Input and Output manipulation on files (Read/Write).
8. Java programs on generic and collections.
9. Client-Server network application using java sockets.
10. Dynamic web page creation using Javascript, Jquery and AJAX.
11. Develop servlet and JSF application with JDBC access.
12. Manage sessions in JSP using cookies
13. Create simple Node Javascript functions for server.
14. Android application for location based service.
15. Develop Cloud based web application.
16. Web Based Mini Project

TOTAL: 60 PERIODS

ADDITIONAL EXPERIMENTS

17. Java Script form validation
18. Three Tier Application Using JSP and Databases for Online Exam
19. Program for web services
20. GPS Location Program
21. Cloud based application

COURSE OUTCOMES:

On successful completion of the course student will be able to:

CO1: Implement object oriented concepts using Java language.
CO2: Develop GUI application by including I/O streams and threads.
CO3: Create web pages with proper client-side features.
CO4: Design dynamic web pages with server-side and other technologies
CO5: Develop simple android based mobile application
CO6: Deploy web applications in a cloud based environment.

WEB REFERENCES:

1. https://beginnersbook.com/2013/03/multithreading-in-java/
2. https://www.cmi.ac.in/~madhavan/courses/pl2009/lecturenotes/lecture-notes/node51.html
3. https://www.programiz.com/java-programming/exception-handling
4. https://docs.oracle.com/javase/tutorial/java/IandI/abstract.html
5. https://examples.javacodegeeks.com/java-basics/generics/generic-method-example-in- java/
6. https://www.w3schools.com/java/java_arraylist.asp

21IT1512	EMBEDDED SYSTEMS AND INTERNET OF THINGS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn tools relevant to Embedded System and IoT development.
- To write simple assembly programs that uses various features of the processor.
- To explore Embedded C Programs for different embedded processors.
- To develop simple applications using Arduino/Raspberry Pi/open platform.
- To design and develop IOT application for real world scenario.

LIST OF EXPERIMENTS

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Using interrupts generate waveforms and test Timers.
5. Write assembly language experiments using Kit to test interfaces and interrupts usingTraffic Generator, DAC, ADC, Stepper Motor .
6. Write Basic and arithmetic Programs Using Embedded C.
7. Write Embedded C program to test interrupt and timers.
8. Develop Real time applications – clock generation, wave form generation, and counter – using embedded C.
9. Develop simple application – testing infrared sensor – IoT Applications – usingAurdino.
10. Develop simple application – testing temperature, light sensor – IOT Application -using open platform/Raspberry Pi.
11. Deploy IOT applications using platforms such as Bluemix.
12. Interfacing Arduino with Zigbee/GSM/Bluetooth/Wi-Fi Module
13. Mini Project on IoT based Systems
    - (i) Smart Home application.
    - (ii) Smart Agriculture application.
    - (iii) Smart Parking / Traffic Management application.
    - (iv) Health monitoring application.
    - (v) Industry Safety and Security application.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop micro controller based application
2. Write and implement simple assembly programs that use various features of theprocessor
3. Write an Embedded C Program, debug and interpret the results
4. Test and experiment different sensors for application development.

5. Develop IoT applications using Arduino/Raspberry Pi/open platform
6. Explore deployment platforms for IoT applications

WEB REFERENCES:

1. https://www.inspirenignite.com/mh/isl803c-internet-of-things-iot-lab-syllabus-for-is-8th- sem-2019-pattern-mumbai-university-department-level-optional-course-lab-4/
2. https://www.uotechnology.edu.iq/dep-ee/LAB/PDF/Microprocessor%20Laboratory%20II.pdf
3. https://www.coursehero.com/file/56324039/Lab-4-Programming-for-data-transfer- between-registers-and-memory-locations1docx/
4. https://www.youtube.com/watch?v=A3D2I7Bu7DE
5. https://www.javatpoint.com/embedded-system-interrupts-in-8051-microcontroller
6. https://www.elprocus.com/pic-microcontroller-programming-using-c-language/
7. https://www.survivingwithandroid.com/learn-iot-creating-a-sensor-project-with-raspberry-pi-and-sensors/
8. https://www.ibm.com/blogs/cloud-computing/2014/10/08/internet-things-iot-ibm-bluemix-growth-innovation/

21IT1601	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts of machine learning and probability theory.
- To appreciate supervised learning and their applications.
- To understand unsupervised learning like clustering and EM algorithms.
- To understand the theoretical and practical aspects of probabilistic graphical models.
- To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies

UNIT - I INTRODUCTION 9

Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Tradeoff.

Suggested Activities:

- Assignments on Artificial Intelligence and Expert Systems.
- Practical - Installing Python and exploring the packages required for machine learning including numpy, scikit-learn, and matplotlib, IPythonhmmpytk and pgmpy.

Suggested Evaluation Methods:

- Assignments on different types of learnings.
- Tutorials on probability theory.

UNIT - II SUPERVISED LEARNING 9

Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines

Suggested Activities:

- Assignments on basics about classification and regression.
- Practical - Collection of data from different recourses and summarize the data.
- Practical - Build linear, multi-linear, logistic regression model to predict the data

Suggested Evaluation Methods:

- Evaluation of the practical assignment against appropriate test sets.

UNIT- III UNSUPERVISED LEARNING 9

Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA).

Suggested Activities:

- External learning - Improving performance of the model using kernel methods.

Suggested Evaluation Methods:

- Assignments on mixture models

UNIT- IV GRAPHICAL MODELS 9

Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.

Suggested Activities:

- External learning on Bayesian and Markov models.
- Practical - Implementation of Naive Bayes classifier for credit card analysis.
- Practical - Implement HMM for an application.
- External learning - Gaussian Processes and Topic Modeling

Suggested Evaluation Methods:

- Quizzes on Markov model and HMM.
- Evaluation of the HMM application

UNIT-V ADVANCED LEARNING 9

Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning, Federated Learning.

Suggested Activities:

- Practical - Implement bagging approach for credit card analysis.
- External learning - Deep networks

SUGGESTED EVALUATION METHODS:

- Evaluation of the practical implementation.
- Assignments on deep networks.

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Choose and implement classification or regression algorithms for an Application using an open source tool.
2. Implement probabilistic discriminative and generative algorithms for an application and analyze the results.
3. Use a tool to implement typical clustering algorithms for different types of

applications.

4. Design and implement an HMM for a sequence model type of application.
5. Implement appropriate learning algorithms for any real time application using an open source tool.
6. Identify applications suitable for different types of machine learning with suitable justification.

TEXTBOOKS:

1. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, CRC Press, 2014.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall ofIndia, 2015.

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
2. Tom Mitchell, “Machine Learning”, McGraw-Hill, 2017.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, Second Edition, Springer, 2008.
4. Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition, Apress, 2018.

WEBREFERENCES:

1. https://www.cs.cmu.edu/~tom/mlbook.html
2. https://www.kdnuggets.com/2020/04/10-best-machine-learning-textbooks-data-scientists.html

ONLINECOURSES/RESOURCES:

1. https://www.youtube.com/watch?v=GwIo3gDZCVQ
2. https://www.youtube.com/watch?v=kE5QZ8G_78c
3. https://www.youtube.com/watch?v=lEfrr0Yr684
4. https://www.youtube.com/watch?v=gpKzZiUDjxM

21IT1602	CLOUD COMPUTING AND BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To study the basics of cloud computing.
- To study about virtualization and cloud resource management.
- To be aware of different cloud platforms.
- To learn the fundamentals of data science and big data
- To gain knowledge to implement simple to complex analytical. Algorithms in big data frameworks.

UNIT-I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Evolution of Cloud Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning – NIST Cloud Computing Reference Architecture- Architectural Design Challenges - Deployment Models: Public, Private and Hybrid Clouds - Service Models: IaaS - PaaS - SaaS - Benefits of Cloud Computing.

Suggested Activities :

- Use Google Collaboration Tools: Create Google Docs, Sheets, and Slides and share it with others.
- Explore public cloud services like Amazon, Google, Sales force, and Digital Ocean etc.

Suggested Evaluation Methods:

- Quiz on different architectural styles of cloud.
- Report Submission - Comparison of various services provided by different Cloud Service Providers (Configuration of VM, Cost, Network Bandwidth etc.).

UNIT-II CLOUD ENABLING TECHNOLOGIES 9

Introduction to Web Service and Service Oriented Architecture – SOAP – REST – Basics of Virtualization – Full and Para Virtualization- Implementation Levels of Virtualization – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices - Desktop Virtualization - Server Virtualization.

Suggested Activities :

- Create a simple web service using Python Flask /Java /any language [Web service: Client-server model should be implemented using socket/http].
- Install Oracle Virtual Box/VMware Workstation and Create a chat

application [Note: Launch two Virtual Machines for chat application].

Suggested Evaluation Methods:

- Review the web service implementation - Proper Connection should be established between the client and server to make use of the service offered by the Server.
- Review the working of Application in virtual environment.

UNIT-III CLOUD MANAGEMENT, STORAGE AND SECURITY 9

Resource Provisioning and Methods – Cloud Management Products – Cloud Storage – Provisioning Cloud Storage – Managed and Unmanaged Cloud Storage – Cloud Security Overview – Cloud Security Challenges –Security Architecture design – Virtual Machine Security – Application Security –Data Security.

Suggested Activities:

- Use security tools like ACUNETIX, ETTERCAP to scan web applications on the cloud, cloud networks for finding vulnerabilities, verifying leakage of information to an unauthorized third party.

Suggested Evaluation Methods:

- Report Submission - Generate a detailed report describing vulnerabilities along with the suitable action that can be taken to remedy the loopholes.

UNIT-IV INTRODUCTION TO DATA SCIENCE AND BIG DATA 9

Data Science – Fundamentals and Components – Data Scientist – Terminologies Used in Big Data Environments – Types of Digital Data – Classification of Digital Data – Introduction to Big Data – Characteristics of Data – Evolution of Big Data – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics – Data Analytics Tools.

Suggested Activities:

- Case studies on big data application domain.
- Real world domain specific problems involving big data and listing out the challenges.
- Demonstration on data analytics tools.

Suggested Evaluation Methods:

- Student assignment on case studies related to healthcare, climate change, ecommerce, retail business, manufacturing etc.
- Group presentation on big data applications with societal need.
- Quizzes on topics like big data terminologies, big data applications, etc

UNIT-V DATA ANALYTICAL FRAMEWORKS 9

Introducing Hadoop -Hadoop Overview - RDBMS versus Hadoop - HDFS (Hadoop Distributed File System): Components and Block Replication - Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Introduction to NoSQL: CAP theorem – MongoDB: RDBMS VsMongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL).IBM SPSS predictive analytics tool.

Suggested Activities :

- Case studies on applications involving usage of data analytical frameworks.
- Demonstration of Installation and configuring Hadoop and MapReduce.
- Design and develop algorithms to be executed in Map Reduce involving numerical methods for analytics.
- Installation of MongoDB and simple data management.

Suggested Evaluation Methods:

- Mini Project (Group) – Real time data collection, saving in Hive, implement analytical techniques using Map-Reduce Tasks and Result Projection.
- Practical – Programming assignments in MongoDB.
- Quiz on Hive query language

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloudComputing.
2. Develop the ability to understand and use the architecture of compute and Storage cloud, service and delivery models..
3. Explain the core issues of cloud computing such as resource management and security.
4. Identify the real world business problems and model with analytical solutions
5. Write and demonstrate simple applications involving analytics using Hadoop and Map Reduce.
6. Use open source frameworks for modelling and storing data.

TEXTBOOKS:

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, JohnWiley, 2011.
2. John W. Rittinghouse, James F. Ransome, “Cloud Computing: Implementation “Management and Security”, CRC Press, 2010.
3. SeemaAcharya, SubhashiniChellapan, “Big Data and Analytics”, Wiley, 2019

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers,2012.
2. Alberto Boschetti, Luca Massaron, “Python Data Science Essentials”, Packt Publications, 3rd Edition, 2018.

WEBREFERENCES:

1. https://www.javatpoint.com/cloud-computing-tutorial
2. https://www.ibm.com/in-en/cloud-computing-tutorial
3. https://www.tutorialpoints.com/cloud-computing
4. https://www.ibm.com/in-en/analytics/big-data-analytics
5. https://www.teradata.com/Trends/Data-Management/Data-Analytics-Framework

ONLINE COURSES/RESOURCES:

1. http://www.udemey.com
2. http://www.coursera.org
3. http://www.simplelearn.com

21IT1611	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To apply the concepts of Machine Learning to solve real-world problems
- To implement basic algorithms in clustering & classification applied to text & numeric data
- To implement algorithms emphasizing the importance of bagging & boosting in classification & regression
- To implement algorithms related to dimensionality reduction
- To apply machine learning algorithms for Natural Language Processing applications

LIST OF EXPERIMENTS

1. Solving Regression & Classification using Decision Trees
2. Root Node Attribute Selection for Decision Trees using Information Gain
3. Bayesian Inference in Gene Expression Analysis
4. Pattern Recognition Application using Bayesian Inference
5. Bagging in Classification
6. Bagging, Boosting applications using Regression Trees
7. Data & Text Classification using Neural Networks
8. Using Weka tool for SVM classification for chosen domain application
9. Data & Text Clustering using K-means algorithm
10. Data & Text Clustering using Gaussian Mixture Models
11. Dimensionality Reduction Algorithms in Image Processing applications
12. Creating a simple Federated Learning experiment, deploy and score the model.
13. Mini Project

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. To learn to use Weka tool for implementing machine learning algorithms related to numeric data
2. To learn the application of machine learning algorithms for text data.
3. To use dimensionality reduction algorithms for image processing applications
4. To apply CRFs in text processing a applications.
5. To use fundamental and advanced neural network algorithms for solving real-worlddata.

6. To implement algorithms related to dimensionality reduction

WEB REFERENCES:

1. https://www.cs.cmu.edu/~tom/mlbook.html
2. https://www.kdnuggets.com/2020/04/10-best-machine-learning-textbooks-data-scientists.html

ONLINE COURSES/RESOURCES:

1. https://www.youtube.com/watch?v=GwIo3gDZCVQ
2. https://www.youtube.com/watch?v=kE5QZ8G_78c
3. https://www.youtube.com/watch?v=lEfrr0Yr684
4. https://www.youtube.com/watch?v=gpKzZiUDjxM
5. https://www.youtube.com/watch?v=HNKb4Q72KpA

21IT1612	CLOUD COMPUTING AND BIGDATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To provide hands-on experience to cloud and data analytics frameworks and tools.
- To use the Python packages for performing analytics.
- To learn using analytical tools for real world problems.
- To familiarize the usage of distributed frameworks for handling voluminous data.
- To write and deploy analytical algorithms as Map Reduce tasks

LIST OF EXPERIMENTS

Analytics Using Python:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodelsand Pandas packages.
    a. Reading data from text file, Excel and the web.
    b. Exploring various commands for doing descriptive analytics on Iris data set.
2. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing thefollowing:
    a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, StandardDeviation, Skewness and Kurtosis.
    b. Bivariate analysis: Linear and logistic regression modeling
    c. Multiple Regression analysis
        i. Also compare the results of the above analysis for the two data sets.
3. Apply Bayesian and SVM techniques on Iris and Diabetes data set.
4. Apply and explore various plotting functions on UCI data sets.
5. Mini Project on Disease prediction based on symptom.
    a. Cloud Computing:
6. Installation of OpenStack.
7. Creation of VMs and installing applications and executing simple programs in OpenStack.

8. Simple applications for communication across VMs. Hadoop, MapReduce, DFS, Hive.

9. Install and configure Hadoop in its two operating modes: Pseudo distributed and fully distributed.

10. Implement the following file management tasks in Hadoop: Adding files and directories, retrieving files and deleting files.

11. Create a retail data base with the following tables: Product, Customer, Manufacturer,Shipping and Time using MongoDB and perform data replication using sharding techniques.

12. Install HIVE and implement the above retail schema definition and perform CRUDoperations.

13. Mini Project on Making a chatbot or Secure text transfer.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Install analytical tools and configure distributed file system.
2. Have skills in developing and executing analytical procedures in various distributedframeworks and databases.
3. Develop, implement and deploy simple applications on very large datasets.
4. Implement simple to complex data modeling in NoSQL databases
5. Develop and deploy simple applications in OpenStack cloud.
6. Implement real world applications by using suitable analytical framework and tools.

WEBREFERENCES:

1. https://careerfoundry.com/en/blog/data-analytics/data-analytics-tools/
2. https://cloud.google.com/

21IT1701	MOBILE COMPUTING WITH MOBILE APPLICATION DEVELOPMENT (LAB INTEGRATED)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the basics of wireless communication and cellular networks.
- To study the popular cellular networking technologies.
- To explore various protocols that support mobility at network layer and transportlayer.
- To understand the intricacies of UI required by mobile applications and the design aspects of mobile application
- To study various mobile app development platforms and learn developing mobileapplications.

UNIT-I WIRELESS COMMUNICATION AND CELLULAR NETWORKS 9

Electromagnetic Spectrum – Antenna – Propagation Ranges and Effects – Multipath Propagation – Spread Spectrum –Multiple Access Techniques: FDMA, TDMA, CDMA, OFDMA – Duplexing Techniques: FDD, TDD – Cellular Networks – Tessellation, Frequency Reuse and Handoff – Generations of Cellular Networks – 2G Systems.

Suggested activities:

- External learning - Performing a survey of popular mobile phones and exploring their configuration (performance in terms of processor core, clock speed, RAM), display (technology, screen size and resolution), camera features and battery features, LTESim and Players in 5G networks and exploring the structure and operation of a cell phone tower.
- Exploring frequency reuse and reuse factor in cellular network deployment

Suggested Evaluation Methods:

- Assignments on features of modern mobile phones and structure and operation of a cell phone tower.
- Solving frequency reuse relayed problems.
- Quiz and discussion on CDMA and its variants and HSPA and its Variants

UNIT-II 3G AND 4G WIRELESS MOBILE NETWORKS 9

3GPP – UMTS and IMT-2000: Architecture, User Equipment, RNS, UTRAN, Node B, RNC Functions – IP Multimedia Subsystem – 4G Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC And NAC – IMT- Advanced Standard – Features Of LTE- Advanced- Introduction to 5G-5G Roadmap-Ten Pillars of 5G

Suggested activities:

- External learning - Explore 5G networks.

- Analysis and requirements of cellular networks.

Suggested Evaluation Methods:

- Assignments on 5G networks.
- Quiz and discussion on IP multimedia subsystem.
- Design a cellular network for the given case study.

UNIT-III MOBILITY SUPPORT IN IP AND TCP 9

Mobile IP – Mobile Agent, Foreign Agent, Care of Address, Registration, Advertisement and Discovery, Tunneling, IP within IP – Mobility Support in IPV6 – Mobility Header, Mobility Options, Dynamic Home Agent Address Discovery, Cache Management, Bidirectional Tunneling - TCP Over Wireless Networks - Indirect TCP - Snoop TCP – Mobile TCP.

Suggested activities:

- External learning - Performing a survey of popular wireless routers and exploring their configuration (Built in radio interfaces in terms of IEEE 802.11 and its variants, support for MU - MIMO technology, external antennas, clock speed of the processor, data rate supported).
- Exploring the task list required to configure mobile IP and getting familiar with the networking operating system commands required to configure mobile IP.

Suggested Evaluation Methods:

- Assignments on features of wireless routers and their configuration.
- Configuring mobile IP using network operating system commands.
- Quiz and discussion on mobility support in IPv6.

UNIT-IV APPLICATION DESIGN 9

Aspects of Mobility – Middleware and Gateways – Mobile Devices and Profiles – Generic UI Development – Multimodal and Multichannel UI – Mobile Memory Management – Design Patterns for Limited Memory – Work Flow for Application Development - Techniques for Composing Applications - Dynamic Linking - Plug-ins and Rule of Thumb for Using DLLs.

Suggested activities:

- External learning - Exploring XForms processing model and location based services.
- Analyzing problems in designing mobile applications where location and energy are the constraints.

Suggested Evaluation Methods:

- Assignments on XForms and location based services.
- Quiz and discussion on GUI features supported in WAP, J2ME, BREW and MS platforms.
- Designing and implementing location and energy constrained mobile Applications

UNIT-V APPLICATION DEVELOPMENT 9

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event Based Programming - Apple Iphone Platform - UI Tool Kit Interfaces - Cross Platform Design and Tools - Event Handling and Graphics Services - Layer Animation – Location Based Services – Resilient Programming Practices – Packaging and Deployment - Security And Hacking.

Suggested Activities:

- External learning - Performing a comparative study of Android TV vs. Google Chromecast.
- Developing mobile apps using Android web APIs, location based services APIs.

Suggested Evaluation Methods:

- Quiz and discussion on Android emulator, DDMS, Debug-bridge and SQLite.
- Assignments on Android TV and Google chromecast.
- Developing and testing simple mobile apps in Android and Apple iOS.
- Quiz and discussion on device configurations and languages

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Have knowledge on the architecture and protocols of 2G, 3G, and 4G cellular system.
2. Deploy various protocols that support mobility at network layer and transport layer.
3. Design and implement the user interfaces for mobile applications.
4. Design the mobile applications that are aware of the resource constraints of mobile devices.
5. Develop advanced mobile applications that access the databases and the web.
6. Understand the intricacies in deploying cellular networks and developing mobileapplications based on resilient programming practices.

TEXTBOOKS:

1. Clint Smith, Daniel Collins, “Wireless Networks”, Third Edition, McGraw Hill Publications, 2014.
2. Share Conder, Lauren Darcey, “Android Wireless Application Development” ,Volume I, Third Edition, Pearson, 2014.

REFERENCES:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson, 2009.
2. Paul Bedell, “Cellular networks: Design and Operation – A real world Perspective”,Outskirts Press, 2014.
3. Saad Z. Asif, “5G Mobile Communications Concepts and Technologies, CRC Press,1st Edition, 2019.
4. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O’Reilly, 2011.

5. Alasdair Allan, “iPhone Programming”, O’Reilly, 2010. 5. Donny Wals, “Mastering iOS 12 Programming”, Packt, 2018. 6. Reza B’Far, “Mobile Computing principles”, Cambridge University Press, 2005.

WEBREFERENCES:

1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com
5. https://www.javatpoint.com/mobile-computing

ONLINECOURSES/RESOURCES:

1. https://www.coursera.org/learn/mobile-architecture?action=enroll
2. https://www.udemy.com/course/cellular-wireless-network-architecture-and-management/
3. https://siit.co/courses/mobile-computing-course-and-certification/718

LABORATORY EXERCISES

1. Develop an application that uses GUI components, Font, Layout Managers and eventlisteners.
2. Develop an application that makes use of databases
3. Develop a native application that uses GPS location information
4. Implement an application that creates an alert upon receiving a message
5. Develop an application that makes use of RSS Feed.
6. Create an application using Sensor Manager
7. Create an android application that converts the user input text to voice.
8. Develop a Mobile application for simple and day to day needs (Mini Project)

30 PERIODS

TOTAL: 75 PERIODS

21CS1701	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand Cryptography Theories, Algorithms and Systems
- To understand necessary Approaches and Techniques.
- To learn to build protection mechanisms in order to secure computer networks.
- To learn the various Authentication schemes.
- To understand various Security practices and System security standards

UNIT-I INTRODUCTION **9**

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model Of Network Security – Security attacks - Services And Mechanisms – OSI Security Architecture – Classical Encryption Techniques : Substitution techniques, Transposition techniques - Steganography -Foundations of Modern Cryptography: Perfect Security – Information Theory – Product Cryptosystem – Cryptanalysis.

Suggested Activities

- Implementation of steganography concept.
- Comparing substitution techniques and transposition techniques
- Different Approaches in cryptanalysis in Real Time Problems

Suggested Evaluation Methods

- Quiz on Security and attacks.
- Assignments on substitution techniques, transposition technique problems.

Quiz on simple Classical encryption techniques.

UNIT-II SYMMETRIC KEY CRYPTOGRAPHY **9**

Mathematics of Symmetric Key Cryptography: Algebraic Structures - Modular Arithmetic- Euclid'S Algorithm- Congruence And Matrices – Groups- Symmetric Key Ciphers: SDES – Block Cipher Principles of DES – Strength of DES- Differential And Linear Cryptanalysis - Block Cipher Design Principles – Block Cipher Mode of Operation – Evaluation Criteria for AES – Advanced Encryption Standard - Triple Des-Blowfish- RC4 -RC5 algorithm - key distribution.

Suggested Activities

- Problem Solving on Algebraic structures.
- Implementation of Symmetric key ciphers and RC4 Algorithm.

Suggested Evaluation Methods

- Quiz on SDES and mode of operation.
- Assignments on AES and DES algorithms.

UNIT-III PUBLIC KEY CRYPTOGRAPHY **9**

Mathematics Of Asymmetric Key Cryptography: Primes – Primality Testing – Factorization – Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve cryptography.

Suggested Activities

- Problem solving on Prime numbers and Factorization.
- Solving Puzzles on Chinese Remainder Theorem.

Suggested Evaluation Methods

- Quiz on Primes.
- Assignment on Asymmetric key ciphers
- Quiz on Key distribution

UNIT-IV MESSAGE AUTHENTICATION AND INTEGRITY **9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC - MD5 - SHA - HMAC – CMAC – Digital signature and authentication protocols – DSA - Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509.

Suggested Activities

- Comparing different authentication Algorithms
- Implementing MD5 algorithm

Suggested Evaluation Methods

- Assignment on Authentication applications
- Assignment on Digital signature
- Quiz on different Kerberos versions.

UNIT-V SECURITY PRACTICE AND SYSTEM SECURITY **9**

Electronic Mail security – PGP, S/MIME – IP security – Web Security: SET - OWASP-XSS- SQL Injection- SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

Suggested Activities

- Set up a Honeypot and monitor the honeypot on network (KF Sensor).
- Demonstrate intrusion detection system (IDS) using any tool (snort or any other s/w)
- Installation of rootkits and study about the variety of options

Suggested Evaluation Methods

- Assignment on SQL Injection
- Quiz on Viruses and Firewalls.

TOTAL : 45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamentals of network security, security architecture,
2. Apply the different cryptographic operations of symmetric cryptographic algorithms.
3. Apply the different cryptographic operations of public key cryptography.
4. Apply the various Authentication schemes to simulate different applications.
5. Understand various Security practices and System security standards.
6. Analyze various threats and vulnerabilities in systems.

TEXTBOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 8th Edition, 2020. BehrouzA. Ferouzan, "Cryptography & Network Security", Tata McGrawHill,2nd edition 2015.

REFERENCES:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hallof India,3rd Edition-2020.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and NetworkSecurity, Wiley India Pvt.Ltd.
3. Charles Pfleeger, "Security in Computing", 5th Edition, Prentice Hall of India, 2015
4. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATECommunication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2
5. Douglas R Simson "Cryptography-Theory and practice", Third Edition, CRC Press,2006.

21MG1701	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To enable the students to know about the evolution, functions and principles of Management.
- To make the students understand about planning, setting up of objectives & Decision Making.
- To enable students, understand about organisation structure, delegation of authority, HRM, Training & Development.
- To enable students know about effective communication in the organization
- To study the system and process of effective controlling and application of the principles in the organization.

UNIT-I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization Environment – Current trends and issues in Management.

UNIT-II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Planning Tools and Techniques – Decision making steps and process.

UNIT-III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT-IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT-V CONTROLLING 9

Controlling and its types & Process – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

COURSE OUTCOMES: On successful completion of the course student will be able to:

1. Understand foundation in management principles equipping students with the knowledge and skills to effectively manage and lead in diverse business environments.
2. Apply planning function in management, equipping students with the skills and knowledge to evaluate effective plans in diverse organizational settings.
3. Analyse how organizational structures and processes influence the effectiveness and efficiency of organizations.
4. Apply human Resource Management and job design, equipping them with the knowledge and skills needed to manage and develop an organization
5. Apply comprehensive understanding of the directing function to lead, motivate, and guide employees toward achieving organizational goals.
6. Understanding of controlling function to monitor, evaluate, and adjust organizational activities to achieve desired results.

TEXTBOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6eth - Edition, Pearson Education, 2018.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., 15th Edition, 2021.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, 11th edition, Tata McGraw Hill, 2020.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata Mcgraw Hill, 2010.

21CS1712	CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn different cipher techniques
- To implement the algorithms DES, RSA,SHA-1
- To understand the usage of security tools

LIST OF EXPERIMENTS

1. Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill cipher iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques i) Rail Fence ii) Row & Column Transformation
3. Implementation DES algorithm.
4. Implementation AES algorithm.
5. Implement RSA Algorithm using HTML and JavaScript
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - DSA.
9. Demonstrate intrusion detection system (IDS) using any tool eg. Snort.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a VulnerabilityAssessment Tool
11. Implementation of XSS and SQL injection

MINI PROJECTS:

1. Keylogger projects.
2. Antivirus.
3. Analysis and Assessment of different Cyber-Attacks
4. Network Monitoring and Anomalies Discovery.
5. Bug Bounties.

TOTAL:60 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop code for classical Encryption Techniques to solve the problems.
2. Build cryptosystems by applying symmetric key encryption algorithms
3. Develop public key encryption algorithms.
4. Construct code for authentication algorithms.
5. Develop a signature scheme using Digital signature standard.
6. Demonstrate the system security using open-source tools.

VERTICAL I : DATA SCIENCE

21AD1901	EXPLORATORY DATA ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT - I EXPLORATORY DATA ANALYSIS 9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT - II EDA USING PYTHON 9

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations..

UNIT - III UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

UNIT -IV BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT -V MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamentals of exploratory data analysis.
2. Implement the data visualization using Matplotlib.
3. Perform univariate data exploration and analysis.
4. Apply bivariate data exploration and analysis.
5. Use Data exploration techniques for multivariate and time series data.
6. Use Data visualization techniques for multivariate and time series data.

TEXT BOOKS:

8. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
9. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.
10. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

REFERENCES:

10. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
11. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
12. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

21AD1902	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

1. To understand the foundations of the recommender system.
2. To learn the significance of machine learning and data mining algorithms for Recommender systems
3. To learn about collaborative filtering
4. To make students design and implement a recommender system.
5. To learn collaborative filtering.

UNIT - I INTRODUCTION 9

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT - II CONTENT-BASED RECOMMENDATION SYSTEMS 9

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT - III COLLABORATIVE FILTERING 9

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT -IV ATTACK-RESISTANT RECOMMENDER SYSTEMS 9

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

UNIT -V EVALUATING RECOMMENDER SYSTEMS 9

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic concepts of recommender systems.
2. Implement machine-learning and data-mining algorithms in recommender systems data sets.
3. Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
4. Design and implement a simple recommender system.
5. Learn about advanced topics of recommender systems.
6. Learn about advanced topics of recommender systems applications

TEXT BOOKS:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st ed, Springer (2011),
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

21AD1918	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

6. To understand the basics in deep neural networks
7. To understand the basics of associative memory and unsupervised learning networks
8. To apply CNN architectures of deep neural networks
9. To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
10. To apply autoencoders and generative models for suitable applications.

UNIT - I INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT - II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT - III THIRD-GENERATION NEURAL NETWORKS 9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis - Applications: Computer Vision, Image Generation, Image Compression.

UNIT -IV DEEP FEEDFORWARD NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization-VC Dimension and Neural Nets.

UNIT -V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs - Deep Recurrent Networks - Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders,Contractive Encoders, LSTM networks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Apply Convolution Neural Network for image processing.
2. Understand the basics of associative memory and unsupervised learning networks.
3. Apply CNN and its variants for suitable applications.
4. Analyze the key computations underlying deep learning
5. Use the key computations to build and train deepneural networks for various tasks.
6. Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, François Chollet, Manning Shelter Island,2017.
7. S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

21AD1919	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

11. Understand natural language processing basics
12. Apply classification algorithms to text documents
13. Build question-answering and dialogue systems
14. Develop a speech recognition system
15. Develop a speech synthesizer

UNIT - I NATURAL LANGUAGE BASICS 9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

UNIT - II TEXT CLASSIFICATION 9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

UNIT - III QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems –- evaluating dialogue systems

UNIT -IV TEXT-TO-SPEECH SYNTHESIS 9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems

UNIT -V AUTOMATIC SPEECH RECOGNITION 9

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Explain existing and emerging deep learning architectures for text and speech processing
2. Apply deep learning techniques for NLP tasks, language modelling and machine translation
3. Explain coreference and coherence for text processing
4. Build question-answering systems, chatbots and dialogue systems
5. Apply deep learning models for building speech recognition
6. Apply deep learning models for building text-to-speech systems

TEXT BOOKS:

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

REFERENCES:

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

21AD1920	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

16. To understand the Analytics Life Cycle.
17. To comprehend the process of acquiring Business Intelligence
18. To understand various types of analytics for Business Forecasting
19. To model the supply chain management for Analytics.
20. To apply analytics for different functions of a business

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 – Interpretation – Deployment and Iteration

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 Modelling –Machine Learning for Predictive analytics.

UNIT -IV HR & SUPPLY CHAIN ANALYTICS 9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.

UNIT -V MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Explain the real world business problems and model with analytical solutions.
2. Explain the real world business problems and model with analytical solutions.

3. Identify the business processes for extracting Business Intelligence
4. Apply predictive analytics for business fore-casting
5. Apply predictive analytics for business fore-casting
6. Use analytics for marketing and sales.

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.

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 Education,2018.

21AD1906	IMAGE AND VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

21. To understand the basics of image processing techniques for computer vision.
22. To learn the techniques used for image pre-processing.
23. To discuss the various object detection techniques.
24. To understand the various Object recognition mechanisms.
25. To elaborate on the video analytics techniques.

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- T-pyramid of an image- the quad tree representation of an image using the homogeneity criterion of equal intensity

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 – Geometric transformations -Case study of MNIST.

UNIT - III OBJECT DETECTION USING MACHINE LEARNING 9

Object detection- Object detection methods – Deep Learning framework for Object detection- bounding box approach-Intersection over Union (IoU) -Deep Learning Architectures-R-CNN-Faster R- CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures - motion analysis using moving edges - Case study: Geospatial objet detection.

UNIT -IV FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- DeepFace solution by Facebook-FaceNet for Face Recognition-Implementation using FaceNet- Gesture Recognition – Implementation of Facial Detection and Recognition - static hand gesture.

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. Case study: Airport Projects - event detection in video surveillance system.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics of image processing techniques for computer vision.
2. Understand the basics of image processing techniques for video analysis.
3. Explain the techniques used for image pre-processing.
4. Develop various object detection techniques.
5. Understand the various face recognition mechanisms.
6. Elaborate on deep learning-based video analytics.

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

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.

21AD1921	COMPUTER VISION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

26. To understand the fundamental concepts related to Image formation and processing.
27. To learn feature detection, matching and detection
28. To become familiar with feature based alignment and motion estimation
29. To develop skills on 3D reconstruction
30. To understand image based rendering and recognition

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, MATCHING AND SEGMENTATION 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.

UNIT - III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration – Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNIT -IV 3D RECONSTRUCTION 9

Shape from X - Active range finding - 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: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. To understand basic knowledge, theories and methods in image processing and computer vision.

2. To implement basic image processing techniques in OpenCV.
3. To implement some advanced image processing techniques in OpenCV.
4. To apply 2D feature-based image alignment, segmentation and motion estimations.
5. To apply 3D image reconstruction techniques
6. To design and develop innovative image processing and computer vision applications.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard Eugene Woods," Digital Image Processing", Pearson,2018.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Texts in Computer Science, Second Edition, 2022.
3. 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.

21AD1922	DATA VISUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

31. To understand the fundamental concepts related to visualization data
32. To learn foundations for visualization
33. To learn foundations for visualization
34. To learn interaction concepts and techniques
35. To use visualization techniques for research

UNIT - I INTRODUCTION AND DATA FOUNDATION 9

Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT - II FOUNDATIONS FOR VISUALIZATION 9

Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing.

UNIT - III VISUALIZATION TECHNIQUES 9

Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data - Dynamic Data - Combining Techniques. Geospatial Data : Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization Multivariate Data : Point-Based Techniques - LineBased Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT -IV INTERACTION CONCEPTS AND TECHNIQUES 9

Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations -Interaction Control.

UNIT -V RESEARCH DIRECTIONS IN VISUALIZATIONS 9

Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation , Hardware and Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamental concepts related to visualization data
2. Learn foundations for visualization and become familiar with visualization techniques
3. Visualize the objects in different dimensions
4. Design and process the data for Visualization.
5. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical sciences
6. Apply the virtualization techniques for research projects.

REFERENCES:

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Margon Kaufmann Publishers, 2004.
3. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007.
4. Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd, 2008.

VERTICAL II: FULL STACK DEVELOPMENT

21IT1901	OPEN SOURCE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

36. Understand the difference between open-source software and commercial software.
37. Understand the policies, licensing procedures and ethics of FOSS.
38. Understand open-source philosophy, methodology and ecosystem.
39. Awareness with Open-Source Technologies
40. Knowledge to start, manage open-source projects

UNIT - I INTRODUCTION 9

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

UNIT - II OPEN-SOURCE PRINCIPLES AND METHODOLOGY 9

Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization - Licensing: What is a License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - III OPEN SOURCE PROJECT 9

Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Open-source media.Collaboration: Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student's choice

UNIT -IV UNDERSTANDING OPEN-SOURCE ECOSYSTEM 9

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies.

UNIT -V OPEN SOURCE ETHICS & CASE STUDIES 9

Open Source Ethics – Open Vs Closed Source – Government – Ethics – Impact of Open source Technology – Shared Software – Shared Source.

Example Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Free BSD, Open Solaris, Open Office. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies.

Study: Understanding the developmental models, licensing, mode of funding, commercial/non- commercial use.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Differentiate between Open Source and Proprietary software and Licensing.
2. Understand the policies, licensing procedures and ethics of FOSS
3. Build and modify one or more Free and Open Source Software packages.
4. Recognize the applications, benefits and features of Open-Source Technologies
5. Contribute software to and interact with Free and Open Source Software development projects.
6. Gain knowledge to start, manage open-source projects.

TEXT BOOKS:

1. Kailash Vadera, Bhavyesh Gandhi, “Open Source Technology”, Laxmi Publications Pvt Ltd 2012, 1st Edition.
2. Open Source Software, P.Rizwan Ahmed, Margham Publication, Chennai, 2015

REFERENCES:

1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2009.
2. “Open-Source Technology”, Kailash Vadera&Bhavyesh Gandhi, University Science Press, Laxmi Publications, 2009
3. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill Education, 2006
4. The official Ubuntu Book, 8th Edition
5. “Perspectives on Free and Open-Source Software”, Clay Shirky and Michael Cusumano, MIT press.
6. “Understanding Open Source and Free Software Licensing”, Andrew M. St. Laurent, O’Reilly Media.

7. “Open Source for the Enterprise”, Dan Woods, GautamGuliani, O’Reilly Media
8. Linux kernel Home: http://kernel.org4
9. Open-Source Initiative: https://opensource.org/5
10. The Linux Foundation: http://www.linuxfoundation.org/
11. The Linux Documentation Project: http://www.tldp.org/2
12. Docker Project Home: http://www.docker.com3.
13. Linux Documentation Project: http://www.tldp.org/6
14. Wikipedia: https://en.wikipedia.org/7.https://en.wikipedia.org/wiki/Wikipedia:Contributing_to_Wikipedia8
15. GitHub: https://help.github.com/9
16. The Linux Foundation: http://www.linuxfoundation.org/

21IT1902	APP DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

41. To learn development of native applications with basic GUI Components
42. To develop cross-platform applications with event handling
43. To develop applications with location and data storage capabilities
44. To develop web applications with database access

UNIT - I **FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT** **9**

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design,

UNIT - II **NATIVE APP DEVELOPMENT USING JAVA** **9**

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props

UNIT - III **HYBRID APP DEVELOPMENT** **9**

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova,

UNIT -IV **CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE** **9**

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props

UNIT -V **NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS** **9**

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop Native applications with GUI Components.
2. Develop hybrid applications with basic event handling.

3. Implement cross-platform applications with location and data storage capabilities.
4. Implement cross platform applications with basic GUI and event handling.
5. Develop web applications with cloud database access.
6. To gain in-depth Knowledge of Popular Frameworks, Server, APIs

TEXT BOOKS:

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition, November 2021
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing, 2019.

REFERENCES:

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition, 2018.
2. Native Mobile Development by Shaun Lewis, Mike Dunn, November 2019
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras, 2015
4. Apache Cordova 4 Programming, John M Wargo, 2015
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition, 2019

21CS1903	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT - I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models

UNIT - II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

UNIT - III CLOUD SERVICE MANAGEMENT 9

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

UNIT -IV CLOUD SERVICE ECONOMICS 9

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

UNIT -V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand Cloud Service Management terminology, definition & concepts
2. Compare and contrast cloud service management with traditional IT service management
3. Build and automate business solutions using cloud technologies.
4. Identify strategies to reduce risk and eliminate issues associated with adoption of Cloud services
5. Select appropriate structures for designing, deploying and running cloud-based services In business environment
6. Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

TEXT BOOKS:

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

REFERENCES:

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

21IT1903	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT - I FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT - II FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT - III FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNIT -IV WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT -V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the various Research Methods used in Design
2. Build UI for user Applications
3. Evaluate UX design of any product or application
4. Demonstrate UX Skills in product development
5. Implement Sketching principles
6. Create Wireframe and Prototype

TEXT BOOKS:

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

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly 2020
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

21IT1904	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT - I FOUNDATIONS OF SOFTWARE TESTING 9

Why do we test Software?, 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: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic concepts of software testing and the need for software testing
2. Design Test planning and different activities involved in test planning
3. Design effective test cases that can uncover critical defects in the application
4. Focus on wide aspects of testing
5. Understand multiple facets of testing
6. Automate the software testing using Selenium and TestNG

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, Software 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.

21IT1905	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools

UNIT - I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

UNIT - II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT - III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT -IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database- based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT -V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understanding the basic concepts of web application security and the need for it
2. Be acquainted with the process for secure development and deployment of web applications
3. Acquire the skill to design and develop Secure Web Applications that use Secure APIs
4. Be able to get the importance of carrying out vulnerability assessment and penetration testing
5. Using the acquired knowledge into practice for testing the vulnerabilities and identifying threats.
6. Using the acquired knowledge into practice for testing the vulnerabilities and identifying threats.

TEXT BOOKS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw- Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCES:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

21IT1906	DEVOPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

UNIT - I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github - Gerrit Code review.

UNIT - II COMPILE AND BUILD USING MAVEN , GRADLE & ANT 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 – Introduction to ANT- Installation of ANT – Understand and Build using ANT.

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 - Testing and Monitoring - Selenium, Jira, ELK

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand different actions performed through Version control tools like Git.
2. Understand the various installation procedure of SDK
3. Ability to Perform Automated Continuous Deployment
4. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
5. Ability to do configuration management using Ansible
6. Understand to leverage Cloud-based DevOps tools using Azure DevOps

TEXT BOOKS:

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

REFERENCES:

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

21IT1907	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

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: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Describe syntax and semantics of programming languages
2. Explain data, data types, and basic statements of programming languages
3. Design and implement subprogram constructs
4. Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog
5. Understand and adopt new programming languages
6. Applying the programming Languages in creating various applications

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.
3. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, Prentice Hall, 2011.
4. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Pearson, 1997.
5. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

VERTICAL III: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

21CS1901	CLOUD TOOLS AND TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To develop the cloud application using various programming model of Hadoop and Aneka

UNIT - I CLOUD PLATFORM ARCHITECTURE 9

Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges

UNIT - II VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE 9

Basics of Virtual Machines - Taxonomy of Virtual Machines - Virtualization – Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization - Implementation levels of virtualization - Virtualization structure - Virtualization of CPU, Memory and I/O devices – Virtual clusters and Resource Management – Virtualization for data center automation

UNIT - III PAAS CLOUD PLATFORM 9

Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services- REST API- Blops

UNIT -IV AWS CLOUD PLATFORM – IAAS 9

Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools: Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager.

UNIT -V PROGRAMMING MODEL 9

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Employ the concepts of virtualization in the cloud computing
2. Identify the architecture, infrastructure and delivery models of cloud computing
3. Deploy practical virtualization solution
4. Develop the Cloud Application in AWS platform
5. Apply concepts to design Cloud Applications
6. Develop services using various Cloud computing programming models.

TEXT BOOKS:

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

REFERENCES:

1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019. 3. Sriram Krishnan, Programming: Windows Azure, O’Reilly,2010
3. Sriram Krishnan, Programming: Windows Azure, O’Reilly,2010
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.

5. Danielle Ruest, Nelson Ruest, ¯Virtualization: A Beginner‟s Guide‖, McGraw-Hill Osborne Media, 2009. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
6. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
7. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
8. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

21CS1902	VIRTUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT - I INTRODUCTION TO VIRTUALIZATION 9

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

UNIT - II SERVER AND DESKTOP VIRTUALIZATION 9

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization

UNIT - III NETWORK VIRTUALIZATION 9

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

UNIT -IV STORAGE VIRTUALIZATION 9

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNIT -V VIRTUALIZATION TOOLS 9

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM-Google Virtualization- Case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics and types of Virtualization
2. Understand the Hypervisors and its types
3. Analyze the virtualization concepts for server and Desktop
4. Apply the Virtualization for real-world applications
5. Install & Configure the different VM platforms

6. Experiment with the VM with various software

TEXT BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3. David Marshall, Wade A. Reynolds, Dave McCrory , Advanced Server Virtualization: VMware and MicrosoftPlatform in the Virtual Data Center, Auerbach,2006
4. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress, 2005.

REFERENCES:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

21CS1903	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT - I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models

UNIT - II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

UNIT - III CLOUD SERVICE MANAGEMENT 9

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

UNIT -IV CLOUD SERVICE ECONOMICS 9

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

UNIT -V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand Cloud Service Management terminology, definition & concepts
2. Compare and contrast cloud service management with traditional IT service management
3. Build and automate business solutions using cloud technologies.
4. Identify strategies to reduce risk and eliminate issues associated with adoption of Cloud services
5. Select appropriate structures for designing, deploying and running cloud-based services In business environment
6. Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

TEXT BOOKS:

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

REFERENCES:

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

21CS1904	STORAGE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT - I STORAGE SYSTEMS 9

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.

UNIT - II INTELLIGENT STORAGE SYSTEMS AND RAID 9

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture- Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage.

UNIT - III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9

FibreChannel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol,connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT -IV BACKUP, ARCHIVE AND REPLICATION 9

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT -V SECURING STORAGE INFRASTRUCTURE 9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
2. Illustrate the usage of advanced intelligent storage systems and RAID
3. Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
4. Examine the different role in providing disaster recovery and remote replication technologies
5. Discuss the different backup and recovery strategies
6. Infer the security needs and security measures to be employed in information storage management

TEXT BOOKS:

1. EMC Corporation, Information Storage and Management, Wiley, India,2012.
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017.
3. Ulf Troppens,Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Second Edition, Wiley, 2009

21CS1905	SITE RELIABILITY ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the organizational impact of introducing SRE
- To gain knowledge of how to develop service-level objectives from business objectives.
- To gain familiarity with incident and problem analysis.
- To explore the knowledge in the production system towards the monitoring of services.
- To gain insights into building incident management and scaling processes for better reliability and performance

UNIT - I INTRODUCTION 9

Introduction to Site Reliability Engineering (SRE) - Tenets of SRE - Production Environment – Hardware - Software Infrastructure- Development Environment - Sample Service - SRE and DevOps - Technology to support SRE - Google SRE model

UNIT - II PRINCIPLES OF SRE 9

Embracing Risk - Service Level Objectives - Monitoring Distributed Systems - Release Engineering – Simplicity - Minimal APIs

UNIT - III EFFECTIVE SRE MANAGEMENT AND PRACTICES 9

Practical Alerting from Time-Series Data - Being On-Call - Effective Troubleshooting - Emergency Response - Learn from the Past - Managing Incidents - Postmortem Culture: Learning from Failure - Tracking Outages - Testing for Reliability - Software Engineering in SRE

UNIT -IV LOAD BALANCING AND CRITICAL STATE MANAGEMENT 9

Load Balancing at the Frontend - Load Balancing in the Datacenter - Handling Overload - Addressing Cascading Failures - Managing Critical State: Distributed Consensus for Reliability - Distributed Periodic Scheduling with Cron - Data Processing Pipelines and Data Integrity

UNIT -V MANAGEMENT OF SRE 9

Accelerating SREs to On-Call and Beyond – Interrupts handling - Embedding an SRE to Recover from Operational Overload - Communication and Collaboration in SRE - Evolving SRE Engagement Model - Availability Table - Collection of Best Practices for Production Services - Example Incident State Document - Example Postmortem - Example Production Meeting Minutes

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the organizational impact of introducing SRE
2. Gain knowledge of how to develop service-level objectives from business objectives
3. Differentiate between service level agreement of user with organizational service level agreement
4. Become familiar with incident and problem analysis.
5. Become familiar with incident and problem analysis.
6. Confirm the scaling processes for better reliability and performance.

TEXT BOOKS:

1. Betsy Beyer, Chris Jones, Niall Richard Murphy, Jennifer Petoff, “Site Reliability Engineering”, O'Reilly Media, Inc., 2016
2. Heather Adkins, Betsy Beyer, Paul Blankinship, Ana Oprea, Piotr Lewandowski, Adam Stubblefield, “Building Secure & Reliable Systems”, 2020
3. Betsy Beyer, Niall Richard Murphy, David K. Rensin, Kent Kawahara and Stephen Thorne, “The Site Reliability Workbook”, 2018

REFERENCES:

1. Enterprise Roadmap to SRE - Google - Site Reliability Engineering - https://static. Googleusercontent.com /media/sre.google/en//static/pdf/enterprise-roadmap-to-sre.pdf
2. Anatomy of an Incident - Google - Site Reliability Engineering - https://static.googleusercontent. com/media/sre.google/en//static/pdf/TrainingSiteReliabilityEngineers.pdf
3. Incident Metrics in SRE - Google - Site Reliability Engineering - https://static. googleusercontent.com/media/sre.google/en//static/pdf/IncidentMeticsInSre. pdf

21CS1906	STREAM PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
- Explain the concepts of Real-time Data processing
- Select appropriate structures for designing and running real-time data services in a business environment
- Illustrate the benefits and drive the adoption of real-time data services to solve real world problems

UNIT - I FOUNDATIONS OF DATA SYSTEMS 9

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT - II REAL-TIME DATA PROCESSING 9

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

UNIT - III DATA MODELS AND QUERY LANGUAGES 9

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT -IV EVENT PROCESSING WITH APACHE KAFKA 9

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API.

UNIT -V REAL-TIME PROCESSING USING SPARK STREAMING 9

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand data Processing terminology, definition & concepts
2. Understand the applicability and utility of different streaming algorithms.
3. Describe and apply current research trends in data-stream processing.
4. Analyze the suitability of stream mining algorithms for data stream systems.
5. Program and build stream processing systems, services and applications.
6. Solve problems in real-world applications that process data streams.

TEXT BOOKS:

1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication,2018
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media,2017
3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing,2017

REFERENCES:

1. https://spark.apache.org/docs/latest/streaming-programming-guide.html
2. Kafka.apache.org

21IT1906	DEVOPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

UNIT - I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github - Gerrit Code review.

UNIT - II COMPILE AND BUILD USING MAVEN , GRADLE & ANT 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 – Introduction to ANT- Installation of ANT – Understand and Build using ANT.

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 - Testing and Monitoring - Selenium, Jira, ELK

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand different actions performed through Version control tools like Git.
2. Understand the various installation procedure of SDK
3. Ability to Perform Automated Continuous Deployment
4. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
5. Ability to do configuration management using Ansible
6. Understand to leverage Cloud-based DevOps tools using Azure DevOps

TEXT BOOKS:

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

REFERENCES:

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

21CS1907	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT - I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT - II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

UNIT - III ACCESS CONTROL AND IDENTITY MANAGEMENT 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention

UNIT -IV CLOUD SECURITY DESIGN PATTERNS 9

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

UNIT -V MONITORING, AUDITING AND MANAGEMENT 9

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the cloud concepts and fundamentals.
2. Explain the security challenges in the cloud.
3. Define cloud policy and Identity and Access Management.
4. Design cloud security patterns
5. Understand various risks and audit and monitoring mechanisms in the cloud.
6. Define the various architectural and design considerations for security in the cloud.

TEXT BOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, “Cloud Computing:‖, Wiley 2013
2. Dave shackleford, “Virtualization Security‖, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, “Cloud Security and Privacy‖, OREILLY 2011

REFERENCES:

1. Mark C. Chu-Carroll “Code in the Cloud‖,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi,2013

VERTICAL IV – CYBER SECURITY AND DATA PRIVACY

21IT1908	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of computer based vulnerabilities.
- To explore different foot printing, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods
- To understand hacking options available in Web and wireless applications
- To explore the options for network protection.
- To practice tools to perform ethical hacking to expose the vulnerabilities.

UNIT - I INTRODUCTION 9

Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - ProtectingAgainst Malware Attacks.- Intruder Attacks - Addressing Physical Security

UNIT - II FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 9

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNIT - III ENUMERATION AND VULNERABILITY ANALYSIS 9

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss

UNIT - IV SYSTEM HACKING 9

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade

UNIT - V NETWORK PROTECTION SYSTEMS 9

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. To express knowledge on basics of computer based vulnerabilities
2. To gain understanding on different foot printing, reconnaissance and scanning methods.
3. To demonstrate the enumeration and vulnerability analysis methods
4. To gain knowledge on hacking options available in Web and wireless applications
5. To acquire knowledge on the options for network protection.
6. To use tools to perform ethical hacking to expose the vulnerabilities

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, DafyddStuttard and Marcus Pinto, 2011.

REFERENCES:

1. 1.Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

21IT1909	DIGITAL AND MOBILE FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for iOS devices
- To understand and use forensics tools for Android devices.

UNIT - I INTRODUCTION TO DIGITAL FORENSICS 9

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase - The Analysis Phase - The Presentation Phase

UNIT - II DIGITAL CRIME AND INVESTIGATION 9

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methodsfor Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNIT - III DIGITAL FORENSIC READINESS 9

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNIT - IV iOS FORENSICS 9

Mobile Hardware and Operating Systems - iOS Fundamentals - Jailbreaking - File System - Hardware - iPhone Security - iOS Forensics - Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

UNIT - V ANDROID FORENSICS 9

Android basics - Key Codes - ADB - Rooting Android - Boot Process - File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools - Dual Use Tools-Oxygen Forensics - MobilEdit - Android App Decompiling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Have knowledge on digital forensics.
2. Know about digital crime and investigations.
3. Be forensic ready.

4. Investigate, identify and extract digital evidence from iOS devices.
5. Investigate, identify and extract digital evidence from Android devices.
6. Exploration of digital evidence using various OS

TEXT BOOKS:

1. Andre Arnes, “Digital Forensics”, Wiley, 2018.
2. Chuck Easttom, “An In-depth Guide to Mobile Device Forensics”, First Edition, CRCPress, 2022.

REFERENCES:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, CharlesRiver Media, 2005, ISBN: 1-58450-389.

21IT1910	SOCIAL NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To develop semantic web related simple applications
- To explain Privacy and Security issues in Social Networking
- To explain the data extraction and mining of social networks
- To discuss the prediction of human behavior in social communities
- To describe the Access Control, Privacy and Security management of social networks

UNIT - I FUNDAMENTALS OF SOCIAL NETWORKING 9

Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security

UNIT - II SECURITY ISSUES IN SOCIAL NETWORKS 9

The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNIT - III EXTRACTION AND MINING IN SOCIAL NETWORKING DATA 9

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy

UNIT - IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES 9

Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties.

UNIT - V ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT 9

Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and

Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Develop semantic web related simple applications
2. Address Privacy and Security issues in Social Networking
3. Explain the data extraction and mining of social networks
4. Explain the access control policies and identities for network services
5. Discuss the prediction of human behavior in social communities
6. Describe the applications of social networks

TEXT BOOKS:

1. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2. BorkoFurht, Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.
3. Learning Neo4j 3.x Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing, 2017
4. David Easley, Jon Kleinberg, Networks, Crowds, and Markets: Reasoning about a Highly Connected World‖, First Edition, Cambridge University Press, 2010.

REFERENCES:

1. Easley D. Kleinberg J., Networks, Crowds, and Markets – Reasoning about a Highly Connected World‖, Cambridge University Press, 2010.
2. Jackson, Matthew O., Social and Economic Networks‖, Princeton University Press, 2008.
3. GuandongXu ,Yanchun Zhang and Lin Li, ¯Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling‖, IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web‖, Springer, 2009.

21IT1911	MODERN CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn about Modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a Pseudorandom permutation.
- To construct Basic cryptanalytic techniques.
- To provide instruction on how to use the concepts of block ciphers and messageauthentication codes.

UNIT - I INTRODUCTION 9

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations

UNIT - II FORMAL NOTIONS OF ATTACKS 9

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM- CPA and NM- CCA2, Inter-relations among the attack model

UNIT - III RANDOM ORACLES 9

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo- random Functions (PRF)

UNIT - IV BUILDING A PSEUDORANDOM PERMUTATION 9

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction

UNIT - V MESSAGE AUTHENTICATION CODES 9

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes:One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. FormallyAnalyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Interpret the basic principles of cryptography and general cryptanalysis.
2. Determine the concepts of symmetric encryption and authenticatio
3. Identify the use of public key encryption, digital signatures, and key establishment.
4. Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
5. Express the use of Message Authentication Codes.
6. Identify the modern cryptographic methods in implementing a closed network with authentication

TEXT BOOKS:

1. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications,Springer Verlag, 2002.
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low PricedEdition), 2016.
3. Introduction to Modern Cryptography: Principles and Protocols (Chapman & Hall/CRCCryptography and Network Security Series), 2007

REFERENCES:

1. ShaffiGoldwasser and MihirBellare, Lecture Notes on Cryptography, Available athttp://citeseerx.ist.psu.edu/.
2. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced EditionAvailable),Part 1 and Part 23, 2009.
3. William Stallings, “Cryptography and Network Security: Principles and Practice”, PHI 3rdEdition, 2006

21IT1912	ENGINEERING SECURE SOFTWARE SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Know the importance and need for software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.

UNIT-I NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS 9

Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory- Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks

UNIT-II SECURE SOFTWARE DESIGN 9

Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles.

UNIT-III SECURITY RISK MANAGEMENT 9

Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation - Risk Assessment Techniques - Threat and Vulnerability Management.

UNIT-IV SECURITY TESTING 9

Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation - Web Application Exploitation - Exploits and Client Side Attacks - Post Exploitation - Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing.

UNIT-V SECURE PROJECT MANAGEMENT 9

Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Identify various vulnerabilities related to memory attacks.

2. Apply security principles in software development.
3. Evaluate the extent of risks.
4. Involve selection of testing techniques related to software security in the testingphase of software development.
5. Use tools for securing software.
6. Justify the adopted security testing in the created application

TEXTBOOKS:

1. Julia H. Allen, “Software Security Engineering”, Pearson Education, 2008
2. Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011
3. Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, “The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-Wesley Professional,2006

REFERENCES:

1. Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005.
2. Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008.
3. Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012
4. Bryan Sullivan and Vincent Liu, “Web Application Security, A Beginner's Guide”, Kindle Edition, McGraw Hill, 2012
5. Lee Allen, “Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)”, Kindle Edition, Packt Publishing,2012
6. Jason Grembi, Secure Software Development: A Security Programmer's Guide, 2008.

21IT1913	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT-I INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT-II BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT-III BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopolyproblem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT-IV HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT-V BLOCKCHAIN APPLICATIONS 9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

TOTAL:45PERIODS

COURSE OUTCOMES:

Onsuccessfulcompletionofthecoursestudentwillbeableto:

1. Understand emerging abstract models for Blockchain Technology
2. Identify major research challenges and technical gaps existing between theory and practicein the crypto currency domain.
3. Understand the function of Blockchain as a method of securingdistributed ledgers, howconsensus on their contents is achieved, and the new applications that they enable.
4. Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.

5. Apply security features in blockchain technologies.
6. Be familiar with existing and potential applications of blockchain technology

TEXTBOOKS:

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography,Bitcoin, and popular Blockchain frameworks, 2017.
2. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”,O’Reilly, 2014.

REFERENCES:

1. Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton UniversityPress, 2016.
3. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015
4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contractsfor Ethereum and Blockchain”, Packt Publishing, 2018.
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

21IT1914	CYBER PHYSICAL SYSTEMS SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn about design of cyber-physical systems.
- To know about MATLAB usage.
- To learn about analysis of cyber-physical systems.
- How to implement safety assurance in these systems.
- To do the software analysis
- To know basic security measures to take in Cyber-Physical Systems

UNIT-I INTRODUCTION TO CYBER-PHYSICAL SYSTEMS 9

Cyber-Physical Systems (CPS) in the real world, Basic principles of design and validation of CPS, Industry 4.0, AutoSAR, IIOT implications, Building Automation, Medical CPS.

UNIT-II CPS - PLATFORM COMPONENTS 9

CPS - Platform components: CPS HW platforms - Processors, Sensors, Actuators, CPS Network - WirelessHart, CAN, Automotive Ethernet, CPS Sw stack – RTOS, Scheduling Real Time control tasks Principles of Automated Control Design: Dynamical Systems and Stability Controller Design Techniques, Stability Analysis: CLFs, MLFs, stability under slow switching, Performance under Packet drop and Noise.

UNIT-III USING MATLAB 9

Matlab toolboxes - Simulink, Stateflow CPS implementation: From features to software components, Mapping software components to ECUs, CPS Performance Analysis - effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion

UNIT-IV CPS SAFETY ASSURANCE AND SOFTWARE ANALYSIS 9

Formal Methods for Safety Assurance of Cyber-Physical Systems: Advanced Automata based modeling and analysis, Basic introduction, and examples, Timed and Hybrid Automata, Definition of trajectories, Formal Analysis: Flow pipe construction, reachability analysis Analysis of CPS Software: Weakest Pre-conditions, Bounded Model checking, CPS SW Verification: Frama-C, CBMC Secure Deployment of CPS: Attack models, Secure Task mapping and Partitioning, State estimation for attack detection Automotive Case study: Vehicle ABS hacking Power Distribution Case study: Attacks on Smart Grids

UNIT-V CPS SECURITY 9

CPS vulnerabilities, threats, attacks & failures, CPS security threats, CPS vulnerabilities, Cyberphysical system attacks, CPS failures, Evaluating risks, Securing CPS, CPS security challenges, CPS security solutions, CPS forensics, Limitations,

CPS protection recommendations

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the core principles behind CPS.
2. Identify safety specifications and critical properties.
3. Understand abstraction in system designs.
4. Express pre and post conditions and invariants for CPS models.
5. Identify CPS security threats and do the software analysis.
6. Justify the basic security measures in Cyber-Physical Systems ensuring security technologies

TEXTBOOKS:

1. Raj Rajkumar, Dionisio De Niz , and Mark Klein, Cyber-Physical Systems, Addison-Wesley Professional, 2017.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015.

REFERENCES:

1. André Platzer, Logical Analysis of Hybrid Systems: Proving Theorems for Complex Dynamics., Springer, 2010. 426 pages,ISBN 978-3-642-14508-7.
2. Jean J. Labrosse, Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C, The publisher, Paul Temme, 2011.
3. Jean-Paul A. Yaacoub, Ola Salman, Hassan N. Noura, NesrineKaaniche, Ali Chehab, Mohamad Malli, "Cyber-physical systems security: Limitations, issues and future trends", Microprocessors and Microsystems, Vol 77, 2020, ISSN 0141-9331 (Unit 5)
4. Sajal Das, Krishna Kant, and Nan Zhang, “Handbook on Securing Cyber-Physical CriticalInfrastructure – Foundations & Challenges”, Morgan Kaufmann, 2012.
5. Awad, A.I., Furnell, S., Paprzycki, M., Sharma, S.K., Security in Cyber-Physical Systems Foundations and Applications, Springer International Publishing, 2021

21CS1907	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT-I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT-II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

UNIT-III ACCESS CONTROL AND IDENTITY MANAGEMENT 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention

UNIT-IV CLOUD SECURITY DESIGN PATTERNS 9

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

UNIT-V MONITORING, AUDITING AND MANAGEMENT 9

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management

TOTAL:45PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the cloud concepts and fundamentals.

2. Explain the security challenges in the cloud.
3. Define cloud policy and Identity and Access Management.
4. Design cloud security patterns
5. Understand various risks and audit and monitoring mechanisms in the cloud.
6. Define the various architectural and design considerations for security in the cloud.

TEXTBOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, “Cloud Computing:‖, Wiley 2013
2. Dave shackleford, “Virtualization Security‖, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, “Cloud Security and Privacy‖, OREILLY 2011

WEBREFERENCES:

1. Mark C. Chu-Carroll “Code in the Cloud‖,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya,Christian Vechhiola, S. ThamaraiSelvi,2013

VERTICAL V : CREATIVE MEDIA TECHNOLOGIES

21CS1908	AUGMENTED REALITY/VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in thedevelopment of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

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

Introduction to Virtual Reality and Augmented Reality - Definition - Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality - Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices - 3D Position Trackers - Types of Trackers - Navigation and Manipulation Interfaces - Gesture Interfaces - Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System - Personal Graphics Displays - Large Volume Displays - Sound Displays - Human Auditory System.

UNIT - II **VR MODELING** **9**

Modeling - Geometric Modeling - Virtual Object Shape - Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants -Object Hierarchies - Viewing the 3D World - Physical Modeling - Collision Detection - Surface Deformation - Force Computation - Force Smoothing and Mapping - Behavior Modeling - Model Management.

UNIT - III **VR PROGRAMMING** **9**

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT -IV **APPLICATIONS** **9**

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment - Military VR Applications

– Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics

– Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNIT -V **AUGMENTED REALITY** **9**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

1. Understand the basic concepts of AR and VR
2. Understand the tools and technologies related to AR/VR
3. Understand the graphical processing units and their architectures.
4. Know the working principle of AR/VR related Sensor devices
5. Design of various models using modeling techniques
6. Develop AR/VR applications in different domains

TEXT BOOKS:

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018
2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

REFERENCES:

1. John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.
2. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.

21CS1909	MULTIMEDIA AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To grasp the fundamental knowledge of Multimedia elements and systems
- To get familiar with Multimedia file formats and standards
- To learn the process of Authoring multimedia presentations
- To learn the techniques of animation in 2D and 3D and for the mobile UI
- To explore different popular applications of multimedia

UNIT - I INTRODUCTION TO MULTIMEDIA 9

Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.

UNIT - II MULTIMEDIA FILE FORMATS AND STANDARDS 9

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.

UNIT - III MULTIMEDIA AUTHORING 9

Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools,Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools,audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning,simulations.

UNIT -IV ANIMATION 9

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNIT -V MULTIMEDIA APPLICATIONS 9

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

TOTAL: 45 PERIODS

COURSE OUTCOMES: Upon completion of the course, the students will be able to:

1. Get the bigger picture of the context of Multimedia and its applications
2. Use the different types of media elements of different formats on content pages
3. Author 2D and 3D creative and interactive presentations for different target multimedia applications.
4. Use different standard animation techniques for 2D, 21/2 D, 3D applications for the mobile UI
5. Explore different popular applications of multimedia
6. Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,

TEXT BOOKS:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021.

REFERENCES:

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2. Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018.
3. Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design", Pearson Education, 1st Edition, 2015.
4. Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature, 1st Edition, 2021.
5. Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.
6. Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.
7. Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
8. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.

WEB REFERENCES:

1. https://itsfoss.com/
2. https://www.ucl.ac.uk/slade/know/3396
3. https://handbrake.fr/
4. https://opensource.com/article/18/2/open-source-audio-visual-production- tools
5. https://camstudio.org/
6. https://developer.android.com/training/animation/overview
7. https://developer.android.com/training/animation/overview

21CS1910	VIDEO CREATION AND EDITING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the broad perspective of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with audio and video recording.
- To apply different media tools.
- To learn and understand the concepts of AVID XPRESS DV 4.

UNIT - I FUNDAMENTALS 9

Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.

UNIT - II STORYTELLING 9

Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management.

UNIT - III USING AUDIO AND VIDEO 9

Capturing digital and analog video importing audio putting video on exporting digital video to tape recording to CDs and VCDs.

UNIT -IV WORKING WITH FINAL CUT PRO 9

Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

UNIT -V WORKING WITH AVID XPRESS DV 4 9

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:
Understand the broad perspective of linear and nonlinear editing concepts

1. Compare the strengths and limitations of Nonlinear editing.
2. Identify the infrastructure and significance of storytelling.
3. Apply suitable methods for recording to CDs and VCDs.
4. Apply different media tools.

5. Address the core issues of advanced editing and training techniques.
6. Design and develop projects using AVID XPRESS DV 4

TEXT BOOKS:

1. Avid Xpress DV 4 User Guide, 2007.
2. Final Cut Pro 6 User Manual, 2004.
3. Keith Underdahl, “Digital Video for Dummies”, Third Edition, Dummy Series, 2001.
4. Robert M. Goodman and Partick McGarth, “Editing Digital Video: The Complete Creative and Technical Guide”, Digital Video and Audio, McGraw – Hill 2003.

21IT1903	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT - I FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT - II FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT - III FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNIT -IV WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools

- Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT -V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

TOTAL: 45 PERIODS

COURSE OUTCOMES: On completion of the course, the students will be able to:

1. Understand the various Research Methods used in Design
2. Build UI for user Applications
3. Evaluate UX design of any product or application
4. Demonstrate UX Skills in product development
5. Implement Sketching principles

6. Create Wireframe and Prototype

TEXT BOOKS:

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

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly 2020
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

21CS1911	DIGITAL MARKETING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To examine and explore the role and importance ofdigital marketing in today's rapidly changing business environment.
- Focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT - I INTRODUCTION TO ONLINE MARKET 9

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

UNIT - II SEARCH ENGINE OPTIMISATION 9

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

UNIT - III E- MAIL MARKETING 9

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

UNIT -IV SOCIAL MEDIA MARKETING 9

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

UNIT -V DIGITAL TRANSFORMATION 9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
2. To know the key elements of a digital marketing strategy.

3. Focuses on how digital marketing can be utilized by organizations
4. Study how the effectiveness of a digital marketing campaign can be measured
5. Undertand social media marketing
6. Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TEXT BOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition , 2017;ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press, 2015, ISBN-10: 0199455449
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition, 2017; ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
4. Ryan, D.,2014, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited,2014.
5. Barker, Barker, Bormann and Neher, Social Media Marketing: A Strategic Approach,2E South-Western ,Cengage Learning,2017.
6. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education,2015.

21CS1912	VISUAL EFFECTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To get a basic idea on animation principles and techniques
- To get exposure to CGI, color and light elements of VFX
- To have a better understanding of basic special effects techniques
- To have a knowledge of state of the art vfx techniques
- To become familiar with popular compositing techniques

UNIT - I ANIMATION BASICS 9

VFX production pipeline, Principles of animation, Techniques: Keyframe, kinematics, Full animation, limited animation, Rotoscoping, stop motion, object animation, pixilation, rigging, shape keys, motion paths.

UNIT - II CGI, COLOR, LIGHT 9

CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering: color - Color spaces, color depth, Color grading, color effects, HDRI, Light – Area and mesh lights, image based lights, PBR lights, photometric light, BRDF shading model

UNIT - III SPECIAL EFFECTS 9

Special Effects - props, scaled models, animatronics, pyrotechniques, Schüfftan process, Particle effects – wind, rain, fog, fire

UNIT -IV VISUAL EFFECTS TECHNIQUES 9

Motion Capture, Matt Painting, Rigging, Front Projection.Rotoscoping, Match Moving – Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving

UNIT -V COMPOSITING 9

Compositing - chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools - Blender, Natron, GIMP.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

1. Implement animation in 2D / 3D following the principles and techniques
2. Use CGI, color and light elements in VFX applications
3. Create special effects using any of the state of the art tools
4. Apply popular visual effects techniques using advanced tools
5. Use compositing tools for creating VFX for a variety of applications

6. Understand the state of the art vfx techniques

TEXT BOOKS:

1. Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.
2. Steve Wright, Digital Compositing for film and video, Routledge, 4th Edition, 2017.
3. John Gress, Digital Visual Effects and Compositing, New Riders Press, 1st Edition, 2014.

REFERENCES:

1. Jon Gress, “Digital Visual Effects and Compositing”, New Riders Press, 1st Edition, 2014.
2. Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics”, Morgan Kauffman, 2008.
3. Luiz Velho, Bruno Madeira, “Introduction to Visual Effects A Computational Approach”, Routledge, 2023.
4. Jasmine Katatikarn, Michael Tanzillo, “Lighting for Animation: The art of visual storytelling
, Routledge, 1st Edition, 2016.
5. Eran Dinur, “The Complete guide to Photorealism, for Visual Effects, Visualization
6. Jeffrey A. Okun, Susan Zwerman, Christopher McKittrick, “ The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures”, Third Edition, 2020.and Games”, Routledge, 1st Edition, 2022.
7. https://www.blender.org/features/vfx/
8. https://natrongithub.github.io/

21CS1913	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT - I 3D GRAPHICS FOR GAME DESIGN 9

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT - II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design - Proposals – Writing for Preproduction, Production and Post – Production.

UNIT - III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT -IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT -V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games

– Puzzle Games.

TOTAL: 45 PERIODS

COURSE OUTCOMES: On completion of the course, the students will be able to:

1. Explain the concepts of 2D and 3d Graphics
2. Understand the stages of game development
3. Design game design documents.
4. Implementation of gaming engines.
5. Survey gaming environments and frameworks.
6. Implement a simple game in Pygame.

TEXT BOOKS:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley,2013.
2. David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press,2006.
3. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress,2007.

REFERENCES:

1. Paul Craven, “Python Arcade games”, Apress Publishers,2016.
2. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

21CS1914	MULTIMEDIA DATA COMPRESSION AND STORAGE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of compression techniques
- To understand the categories of compression for text, image and video
- To explore the modalities of text, image and video compression algorithms
- To know about basics of consistency of data availability in storage devices
- To understand the concepts of data streaming services

UNIT - I BASICS OF DATA COMPRESSION 9

Introduction — Lossless and Lossy Compression– Basics of Huffmann coding- Arithmetic coding- Dictionary techniques- Context based compression – Applications

UNIT - II IMAGE COMPRESSION 9

Lossless Image compression - JPEG-CALIC-JPEG LS-Prediction using conditional averages – Progressive Image Transmission – Lossless Image compression formats – Applications - Facsimile encoding

UNIT - III VIDEO COMPRESSION 9

Introduction – Motion Compensation – Video Signal Representation – H.261 – MPEG-1- MPEG-2- H.263.

UNIT -IV DATA PLACEMENT ON DISKS 9

Statistical placement on Disks – Striping on Disks – Replication Placement on Disks – Constraint allocation on Disks – Tertiary storage Devices – Continuous Placement on Hierarchical storage system – Statistical placement on Hierarchical storage systems – Constraint allocation on Hierarchical storage system

UNIT -V DISK SCHEDULING METHODS 9

Scheduling methods for disk requests – Feasibility conditions of concurrent streams- Scheduling methods for request streams

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Understand the basics of text, Image and Video compression
2. Understand the categories of compression for text, image and video
3. Understand the various compression algorithms for multimedia content
4. Explore the applications of various compression techniques
5. Explore knowledge on multimedia storage on disks
6. Understand scheduling methods for request streams

TEXT BOOKS:

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

REFERENCES:

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

VERTICAL VI: EMERGING TECHNOLOGIES

21CS1908	AUGMENTED REALITY/VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT - I INTRODUCTION 9

Introduction to Virtual Reality and Augmented Reality - Definition - Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality - Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices - 3D Position Trackers - Types of Trackers - Navigation and Manipulation Interfaces - Gesture Interfaces - Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System - Personal Graphics Displays - Large Volume Displays - Sound Displays - Human Auditory System.

UNIT - II VR MODELING 9

Modeling - Geometric Modeling - Virtual Object Shape - Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants -Object Hierarchies - Viewing the 3D World - Physical Modeling - Collision Detection - Surface Deformation - Force Computation - Force Smoothing and Mapping - Behavior Modeling - Model Management.

UNIT - III VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT -IV APPLICATIONS 9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization - VR in Business - VR in Entertainment - VR in Education.

UNIT -V **AUGMENTED REALITY** **9**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

1. Understand the basic concepts of AR and VR
2. Understand the tools and technologies related to AR/VR
3. Understand the graphical processing units and their architectures.
4. Know the working principle of AR/VR related Sensor devices
5. Design of various models using modeling techniques
6. Develop AR/VR applications in different domains

TEXT BOOKS:

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018
2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016
3. John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.
4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.

21CS1915	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and Maintain the software bot.

UNIT - I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION 9

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.

UNIT - II AUTOMATION PROCESS ACTIVITIES 9

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNIT - III APP INTEGRATION, RECORDING AND SCRAPING 9

App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.

UNIT -IV EXCEPTION HANDLING AND CODE MANAGEMENT 9

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.

UNIT -V DEPLOYMENT AND MAINTENANCE 9

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of this course, the students will be able to

1. Understand the basic concepts of Robotic Process Automation.
2. Enunciate the key distinctions between RPA and existing automation techniques and platforms.
3. Use UiPath to design control flows and work flows for the target process
4. Implement recording, web scraping andprocess mining by automation
5. Use UIPath Studio to detect, and handle exceptions in automation processes
6. Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes.

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.
2. Tom Taulli , “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems”, Apress publications, 2020.

REFERENCES:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
3. A Gerardus Blokdyk, “Robotic Process Automation Rpa A Complete Guide “, 2020

21AD1918	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications.

UNIT - I INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT - II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT - III THIRD-GENERATION NEURAL NETWORKS 9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT -IV DEEP FEEDFORWARD NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization-VC Dimension and Neural Nets.

UNIT -V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs - Deep Recurrent Networks - Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders,Contractive Encoders, LSTM networks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

7. Apply Convolution Neural Network for image processing.
8. Understand the basics of associative memory and unsupervised learning networks.
9. Apply CNN and its variants for suitable applications.
10. Analyze the key computations underlying deep learning
11. Use the key computations to build and train deepneural networks for various tasks.
12. Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:

3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
4. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

10. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
11. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
12. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018.
13. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
14. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
15. Deep Learning with Python, François Chollet, Manning Shelter Island,2017.
16. S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
17. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
18. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

21IT1915	CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn cybercrime and cyber law.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT - I INTRODUCTION 9

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime - Need for Cyber Security - History of Cyber Crime; Cybercriminals - Classification of Cybercrimes - A Global Perspective on Cyber Crimes; Cyber Laws - The Indian IT Act - Cybercrime and Punishment.

UNIT - II ATTACKS AND COUNTERMEASURES 9

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks - Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack - Attack Tools - Countermeasures.

UNIT - III RECONNAISSANCE 9

Harvester - Whois - Netcraft - Host - Extracting Information from DNS - Extracting Information from E-mail Servers - Social Engineering Reconnaissance; Scanning - Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT -IV INTRUSION DETECTION 9

Host -Based Intrusion Detection - Network -Based Intrusion Detection - Distributed or Hybrid Intrusion Detection - Intrusion Detection Exchange Format - Honeypots - Example System Snort.

UNIT -V INTRUSION PREVENTION 9

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy - Types of Firewalls - Firewall Basing - Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL: 45 PERIODS

COURSE OUTCOMES: On successful completion of this course, the student will be able to

1. Explain the basics of cyber security, cyber crime and cyber law
2. Classify various types of attacks and learn the tools to launch the attacks
3. Apply various tools to perform information gathering
4. Apply intrusion techniques to detect intrusion
5. Apply intrusion prevention techniques to prevent intrusion
6. Design and explore the firewalls to defined networks

TEXT BOOKS:

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011
3. https://owasp.org/www-project-top-ten/

REFERENCES:

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013
2. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015
5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014 (Lab)

21CS1916	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT - I QUANTUM COMPUTING BASIC CONCEPTS 9

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Superpositions

UNIT - II QUANTUM GATES AND CIRCUITS 9

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT - III QUANTUM ALGORITHMS 9

Quantum parallelism - Deutsch's algorithm - The Deutsch-Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT -IV QUANTUM INFORMATION THEORY 9

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT -V QUANTUM CRYPTOGRAPHY 9

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

TOTAL: 45 PERIODS

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Understand the background of classical computing and quantum computing.
2. Gain knowledge about the basic hardware and mathematical models of quantumcomputation.
3. Understand the background of Quantum Mechanics.
4. Analyze the computation models

5. Model the circuits using quantum computation,environments and frameworks.
6. Understand the quantum operations such as noise and error-correction.

TEXT BOOKS:

1. Parag K Lala, Mc Graw Hill Education, “Quantum Computing, A Beginners Introduction”, First edition, 2020.
2. Michael A. Nielsen, Issac L. Chuang, “Quantum Computation and Quantum Information”, Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition, 2020, “Quantum Computingfor Everyone”.

REFERENCES:

1. Scott Aaronson, “Quantum Computing Since Democritus”, Cambridge University Press, 2013.
2. N. David Mermin, “Quantum Computer Science: An Introduction”, Cambridge University Press, 2007.

21IT1913	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT - I INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT - II BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT - III BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT -IV HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT -V BLOCKCHAIN APPLICATIONS 9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

TOTAL: 45 PERIODS

COURSE OUTCOMES: On completion of the course, the students will be able to:

1. Understand emerging abstract models for Blockchain Technology
2. Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.

3. Understand the function of Blockchain as a method of securingdistributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
4. Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
5. Apply security features in blockchain technologies.
6. Be familiar with existing and potential applications of blockchain technology

TEXT BOOKS:

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCES:

1. Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015
4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing, 2018.
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

21CS1913	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT - I 3D GRAPHICS FOR GAME DESIGN 9

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT - II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

UNIT - III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT -IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT -V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

TOTAL: 45 PERIODS

COURSE OUTCOMES: On completion of the course, the students will be able to:

1. Explain the concepts of 2D and 3d Graphics
2. Understand the stages of game development
3. Design game design documents.
4. Implementation of gaming engines.
5. Survey gaming environments and frameworks.
6. Implement a simple game in Pygame.

TEXT BOOKS:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley,2013.
2. David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press,2006.
3. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress,2007.

REFERENCES:

1. Paul Craven, “Python Arcade games”, Apress Publishers,2016.
2. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

21CS1917	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT - I INTRODUCTION 9

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT - II 3D PRINTING PRINCIPLES 9

Processes – Extrusion, Wire, Granular, Lamination, Photopolymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations;

UNIT - III INKJET TECHNOLOGY 9

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

UNIT -IV LASER TECHNOLOGY 9

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;

UNIT -V INDUSTRIAL APPLICATIONS 9

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of this course, the students will be able to:

1. Outline and examine the basic concepts of 3D printing technology
2. Explain the principles of 3D printing technique
3. Outline 3D printing workflow
4. Explain and categorize the concepts and working principles of 3D printing using inkjet technique

5. Explain and categorize the working principles of 3D printing using laser technique
6. Explain various method for designing and modeling for industrial applications

TEXT BOOKS:

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.

REFERENCES:

1. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
2. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
3. Joan Horvath, Mastering 3D Printing, APress, 2014

VERTICAL VII - ARTIFICIAL INTELLIGENCE TECHNIQUES

21AD1923	KNOWLEDGE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning

.

UNIT - I REASONING UNDER UNCERTAINTY 9

Introduction - Propositional Logic - Predicate logic - 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.

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 AND RULES 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.

UNIT -V LEARNING AND RULE LEARNING 9

Machine Learning - Concepts - Generalization and Specialization Rules - Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Understand the basics of Knowledge Engineering.
2. Understand different reasoning concepts related to uncertainty
3. Apply methodologies and modelling for Agent Design and Development.
4. Design and develop ontologies.
5. Apply reasoning with ontologies and rules.
6. Understand learning and rule learning.

TEXT BOOKS:

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.

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 ComputationalFoundations, Brooks/Cole, Thomson Learning, 2000.
4. King , Knowledge Management and Organizational Learning , Springer, 2009.
5. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1stEdition,2001.

21AD1903	SOFT COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization associated withneural network learning
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples andgeneralize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior ofprograms based on soft computing

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 - Case study : AHP Approach.

UNIT - II NEURAL NETWORKS 9

Supervised Learning Neural Networks - Perceptrons - Backpropagation - Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks- CNN.

UNIT - III GENETIC ALGORITHMS 9

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over — Mutation - Fitness Function — Maximizing function- maximizing a function program - Case study: Job scheduling.

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 - Analysisof Adaptive Learning Capability- Two input sine function- three input non linear function.

UNIT -V APPLICATIONS 9

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction- Hybrid Approach

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Understand the fundamentals of fuzzy logic operators and inference mechanisms
2. Understand the mathematical background for carrying out the optimization associated with neural network learning
3. Understand neural network architecture for AI applications such as classification andclustering
4. Learn the functionality of Genetic Algorithms in Optimization
5. Use hybrid techniques involving Neural networks and Fuzzy logic
6. Apply soft computing techniques in real world applications

TEXT BOOKS:

1. Sajang, J.-S. R., Sun, C.T., & Mizutani, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python Case Studiesand Applications from the Industry, Apress, 2020

REFERENCES:

1. Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques andApplications,1st Edition, McGraw Hill, 2018.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI,2003.
3. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and GeneticAlgorithms, Pearson Education, 2013.
4. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India PvtLtd, 2019.
5. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, APProfessional, Boston, 1996

21AD1918	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications.

UNIT - I INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network.

UNIT - II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9 9

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT - III THIRD-GENERATION NEURAL NETWORKS 9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT -IV DEEP FEEDFORWARD NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT -V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders,Contractive Encoders, LSTM networks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Apply Convolution Neural Network for image processing.
2. Understand the basics of associative memory and unsupervised learning networks.
3. Apply CNN and its variants for suitable applications.
4. Analyze the key computations underlying deep learning
5. Use the key computations to build and train deepneural networks for various tasks.
6. Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:

1. 1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Francois Chollet, “Deep Learning with Python”, Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow”, Oreilly, 2018.
2. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
3. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, François Chollet, Manning Shelter Island,2017.

7. S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and GeneticAlgorithm, Synthesis and Applications”, PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9. James A Freeman, David M S Kapura, “Neural Networks Algorithms, Applications, andProgramming Techniques”, Addison Wesley, 2003.

21AD1919	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand natural language processing basics
- Apply classification algorithms to text documents
- Build question-answering and dialogue systems
- Develop a speech recognition system
- Develop a speech synthesizer

UNIT - I NATURAL LANGUAGE BASICS 9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming - Lemmatization - Removing stop-words - Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

UNIT - II TEXT CLASSIFICATION 9

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models

UNIT - III QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval - IR-based question answering - knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -- evaluating dialogue systems

UNIT -IV TEXT-TO-SPEECH SYNTHESIS 9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems

UNIT -V AUTOMATIC SPEECH RECOGNITION 9

Speech recognition: Acoustic modelling - Feature Extraction - HMM, HMM-DNN systems

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Explain existing and emerging deep learning architectures for text and speech processing
2. Apply deep learning techniques for NLP tasks, language modelling and machine translation

3. Explain coreference and coherence for text processing
4. Build question-answering systems, chatbots and dialogue systems
5. Apply deep learning models for building speech recognition
6. Apply deep learning models for building text-to-speech systems

TEXT BOOKS:

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

REFERENCES:

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

21AD1924	OPTIMIZATION TECHNIQUES IN MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To formulate and solve linear programming problems
- To understand and analyze how to deal with changing data.
- To identify and interpret potential unintended effects in the project.
- To understand and define procedures to operationalize the machine learning model
- To maintain the applied machine learning model.

UNIT - I INTRODUCTION 9

What is optimization, Formulation of LPP, Solution of LPP: Simplex method, Basic Calculus for optimization: Limits and multivariate functions, Derivatives and linear approximations: Single variate functions and multivariate functions.

UNIT - II MACHINE LEARNING STRATEGY 9

ML readiness, Risk mitigation, Experimental mindset, Build/buy/partner, setting up a team, Understanding and communicating change.

UNIT - III RESPONSIBLE MACHINE LEARNING 9

AI for good and all, Positive feedback loops and negative feedback loops, Metric design andobserving behaviours, Secondary effects of optimization, Regulatory concerns.

UNIT -IV MACHINE LEARNING IN PRODUCTION AND PLANNING 9

Integrating info systems, users break things, time and space complexity in production, when to retain the model- Logging ML model versioning, Knowledge transfer, Reporting performance to stakeholders.

UNIT -V CARE AND FEEDING OF MACHINE LEARNING MODEL 9

MLPL Recap, Post deployment challenges, QUAM monitoring and logging, QUAM Testing, QUAM maintenance, QUAM updating, Separating Datastack from Production, Dashboard Essentials and Metrics monitoring.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will able to

1. Formulate and solve linear programming problems
2. Understand and analyze how to deal with changing data.
3. Understand and interpret potential unintended effects in their project.
4. Understand and define procedures to operationalize the applied machine learning model.

5. Understand and define procedures to maintain the applied machine learning model.
6. Understand how to optimize the use of Machine Learning in real-life problems.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
2. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing, 2020.
3. Optimization in Machine Learning and Applications, Suresh Chandra Satapathy, Anand J.Kulkarni, Springer, 2019.

REFERENCES:

1. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill,2017.
2. Optimization for Machine Learning, Suvrit Sra, Sebastian Nowozin and Stephen J. Wright, MITPress, 2011.
3. Algorithms for Optimization by Mykel J. Kochenderfer and Tim A. Wheeler, MIT Press, 2019.
4. Accelerated Optimization for Machine Learning: First-Order Algorithms by Cong Fang, Huan Li,and Zhouchen Lin, Springer, 2020.

21AD1916	GAME THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate,including electronic trading markets.
- To formalize the notion of strategic thinking and rational choice by using the tools of gametheory, and to provide insights into using game theory in modelling applications.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT - I INTRODUCTION 9

Introduction — Making rational choices: basics of Games — strategy — preferences – payoffs – Mathematical basics – Game theory – Rational Choice — Basic solution concepts-non- cooperative versus cooperative games — Basic computational issues — finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).

UNIT - II GAMES WITH PERFECT INFORMATION 9

Games with Perfect Information — Strategic games — prisoner's dilemma, matching pennies - Nash equilibria –mixed strategy equilibrium — zero-sum games

UNIT - III GAMES WITH IMPERFECT INFORMATION 9

Games with Imperfect Information – Bayesian Games –Motivational Examples – General Definitions – Information aspects–Illustrations — Extensive Games with Imperfect – Information– Strategies – Nash Equilibrium – Repeated Games – The Prisoner's Dilemma Bargaining

UNIT -IV NON-COOPERATIVE GAME THEORY 9

Non-cooperative Game Theory – Self-interested agents – Games in normal form — Analyzing games: from optimality to equilibrium — Computing Solution Concepts of Normal – Form Games —Computing Nash equilibria of two-player, zero-sum games —Computing Nash equilibria of two- player, general- sum games — Identifying dominated strategies

UNIT -V **MECHANISM DESIGN** **9**

Aggregating Preferences — Social Choice — Formal Model — Voting — Existence of social functions — Ranking systems — Protocols for Strategic Agents: Mechanism Design — Mechanism design with unrestricted preferences

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
2. Formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modeling applications.
3. Discuss the use of Nash Equilibrium for other problems.
4. Identify key strategic aspects and be able to connect them to appropriate theoretic concepts given a real world situation.
5. Identify some applications that need aspects of Bayesian Games.
6. Implement a typical Virtual Business scenario using Game theory.

TEXT BOOKS:

1. M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2012.
2. M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013.
3. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, Algorithmic Game Theory. Cambridge University Press, 2007.
4. A.Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.
5. YoavShoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic,and Logical Foundations, Cambridge University Press 2008.

REFERENCES:

1. Zhu Han, DusitNiyato, WalidSaad, TamerBasar and Are Hjorungnes, “Game Theory in Wireless and Communication Networks”, Cambridge University Press, 2012.
2. Y.Narahari, “Game Theory and Mechanism Design”, IISC Press, World Scientific.
3. William Spaniel, “Game Theory 101: The Complete Textbook”, CreateSpace Independent Publishing, 2011.

21AD1917	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

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: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Understand the underlying theory behind cognition.
2. Connect to the cognition elements to computational intelligence.
3. Explore probabilistic programming language.
4. Implement mathematical functions through WebPPL.
5. Develop applications using cognitive inference model.
6. Develop applications using cognitive learning model.

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 MITPress, 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 ProbabilisticProgramming Languages", Electronic version of book, https://dippl.org/.

2. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "ProbabilisticModels of Cognition", Second Edition, 2016, https://probmods.org/.

21AD1907	ETHICS AND AI	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the need for ensuring ethics in AI
- To understand ethical issues with the development of AI agents
- To apply the ethical considerations in different AI applications
- To evaluate the relation of ethics with nature
- To overcome the risk for Human rights and other fundamental values
- To understand ethics in all AI applications

UNIT - I INTRODUCTION TO ETHICS OF AI 9

Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities, Ethics of AI and big data.

UNIT - II FRAMEWORK AND MODELS 9

AI Governance by Human-right centered design, Normative models, Role of professionalnorms, 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, Trust and Transparency.

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, Deep 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, Chatbots.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Understand the ethical issues in the development of AI agents
2. Learn the ethical considerations of AI with perspectives on ethical values
3. Apply the ethical policies in AI based applications and Robot development

4. To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights
5. This study will help to overcome the evil genesis in the concepts of AI.
6. To apply ethics in all AI applications

TEXT BOOKS:

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

REFERENCES:

1. S. Matthew Liao, “Ethics of Artificial Intelligence”, Oxford University Press EditedBook, 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, pages316-334. Cambridge University Press, Cambridge, 2014.
3. Wallach, W., & Allen, C, “Moral machines: ceaching robots right from wrong”, Oxford University Press, 2008.

VERTICAL VIII – NETWORKING

21CS1918	COMMUNICATION THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the concepts of various analog modulations and their spectral characteristics
- To understand the properties of random process
- To know the effect of noise on communication systems
- To know the principles of sampling & quantization

UNIT - I AMPLITUDE MODULATION 9

Amplitude Modulation- DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope –comparison of different AM techniques, Superheterodyne Receiver.

UNIT - II ANGLE MODULATION 9

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth - FM modulation – Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT - III RANDOM PROCESS 9

Random variables, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT -IV NOISE CHARACTERIZATION 9

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase – Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de- emphasis for FM.

UNIT -V SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding – PAM, PPM, PWM, PCM – TDM, FDM.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the concepts of various analog modulations and their spectral characteristics
2. Design AM communication systems
3. Design Angle modulated communication systems
4. Apply the concepts of Random Process to the design of Communication systems
5. Analyze the noise performance of AM and FM systems
6. Gain knowledge in sampling and quantization

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, Pearson Education 2014.
2. Simon Haykin, “Communication Systems”, 4th Edition, Wiley, 2014.

REFERENCES:

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford University Press, 2007.
2. D.Roody, J.Coolen, ¯Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, “Probability, Random variables and Stochastic Processes”, McGraw Hill, 3rd edition, 1991
4. B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education 2007
5. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson, 2001.

21CS1919	NETWORK DESIGN AND PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic networking principles
- To explore various networking devices and protocols required for network design andmanagement
- To study two novel networking technologies: SDN and DTN
- To learn network programming in UNIX C

UNIT - I NETWORKING PRINCIPLES 9

Advanced multiplexing – Code Division Multiplexing, DWDM and OFDM – Shared media networks – Collision detection and collision avoidance, Hidden and Exposed Terminals – Switched networks – Datagrams, Virtual circuits, Cell switching and Label switching – Wireless Networks – Infrastructure based, ad hoc and hybrid – End to end semantics – Connectionless, Connection oriented, Wireless Scenarios –Applications, Quality of Service – End to end level and network level solutions.

UNIT - II PHYSICAL NETWORK DESIGN 9

LAN cabling topologies – Ethernet Switches – High speed and Gigabit and 10Gbps – Building cabling topologies and Campus cabling topologies – Routers, Firewalls and L3 switches –Remote Access Technologies and Devices — Modems and DSLs — SLIP and PPP - WAN Design and Enterprise Networks – Core networks, distribution networks and access networks

UNIT - III LOGICAL DESIGN AND MANAGEMENT 9

IPv4 and IPv6 Dynamic Addressing –Hierarchical routing – VLSMand CIDR – Transition from IPv4 to IPv6 – NAT and DHCP – Static and Dynamic routes – RIP, OSPF and BGP – VPN –RMON and SNMP

UNIT -IV INNOVATIVE NETWORKS 9

Software Defined Networks – Evolution of switches and control planes – Centralized and distributed data and control planes – OpenFlow and SDN Controllers – Network Function Virtualization – Needs of the Data Centres – SDN solutions for data centres - Delay Tolerant Networks — Overlay architecture — Bundle Protocol — Opportunistic routing and Epidemic routing

UNIT -V NETWORK PROGRAMMING IN UNIX C 9

Socket address structures – Byte ordering and byte manipulation functions – Elementary TCP sockets - socket, connect, bind, listen, accept and close functions – TCP client and server – Elementary UDP sockets –recvfrom and sendto functions , connect function with UDP – Raw sockets – Client-server design alternatives – Iterative and Concurrent servers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Apply the networking principles to design a network
2. Explore various networking devices
3. Explore protocols required for network design and management
4. Apply SDN in computing paradigms like Cloud Computing and Internet of Things
5. Configure the networking devices and protocols
6. Develop network applications in various platforms

TEXT BOOKS:

1. Larry Peterson and Bruce Davie, ―Computer Networks: A Systems Approach‖, 5th edition,Morgan Kauffman, 2011
2. W.Richard Stevens, Bill Fenner and Andrew M Rudoff, ―Unix Network Programming: TheSockets Networking API: Volume 1‖, 3rd Edition, Addison Wesley, 2003
3. Paul Goransson, Chuck Black, ―Software Defined Networks: A Comprehensive Approach‖,Morgan Kauffman, 2014

REFERENCES:

1. ParitoshPuri, M.P.Singh,- Asurvey paper on routing in delay tolerant networks, International Conference on Information and Computer Networks (ISCON), 2013, DOI:10.1109/ICISCON 2013.6524206
2. Ying Dar Lin, Ren-Hung Hwang and Fred Baker, ―Computer Networks: An Open Source Approach‖, McGraw Hill, 2011

21IT1916	WIRELESS TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the concepts of various wireless technologies
- To review the concepts of wireless networks
- To explore the emerging wireless technologies and their potential impact

UNIT - I **WIRELESS LAN and PAN** **9**

Introduction, fundamentals of WLAN -technical issues, network architecture, IEEE 802.11- physical layer, Mac layer mechanism, CSMA/CA,RTS/CTS, Polling, Bluetooth- User scenarios, Architecture, Radio layer, Baseband layer, Link manager protocol, L2CAP, Security, SDP, IEEE 802.15.3. 19

UNIT - II **WIRELESS INTERNET** **9**

Introduction – Wireless Internet, address mobility, inefficiency of transport layer and Application layer protocol, mobile IP — simultaneous binding, route optimization, mobile IP variations, handoffs, IPv6 advancements, IP for wireless domain, security in mobile IP, TCP in wireless domain — TCP over wireless , TCPs -traditional, snoop, indirect, mobile, transaction- oriented, impact of mobility.

UNIT - III **AD-HOC SENSOR NETWORK** **9**

Wireless Sensor Network — Applications, design Challenges, Protocol stack, comparisons with MANET node architecture, network architecture, MAC protocols-requirements, IEEE 802.15.4 MAC protocol, Routing Protocol – energy aware routing, Location based routing, clustering, aggregation, QoS, security protocol, Zigbee standard.

UNIT -IV **3G NETWORKS** **9**

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA — HSUPA- HSDPA- CDMA 1X - EVDO Rev -0, Rev- A, Rev-B, Rev-C Architecture- Protocol stack, Cognitive Radio network, Spectrum Sensing.

UNIT -V **4G - LTE** **9**

Overview of LTE Networks - Need for LTE- From LTE to LTE-Advanced SAE :- LTE Architecture, Radio Protocol stack , Interfaces, Concept of HetNET, Quality of Service and Bandwidth Reservation - QoS metrics, Signaling for Bandwidth Requests and Grants, Bandwidth Allocation and Traffic Handling, Mobility Management, Security Protocols

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the concepts of various wireless technologies
2. Design the various wireless networks.
3. Design the 4G and LTE networks
4. Design application sensor networks.
5. Design Heterogeneous networks
6. Explore the emerging wireless technologies and their potential impact

TEXT BOOKS:

1. Vijay. K. Garg, ¯Wireless Communication and Networking‖, Morgan Kaufmann Publishers, 2007
2. Abd-Elhamid M. Taha and Hossam S. Hassanein and Najah Abu Ali, ¯LTE, LTE- Advanced andWimax towards IMT-advanced networks‖ John Wiley &Sons , 2012.
3. Jochen Schiller, ¯Mobile Communication‖, Pearson education, 2nd edition 2005.

REFERENCES:

1. HarriHolma and Antti Toskala, ¯HSDPA/HSUPA for UMTS‖, John Wiley & Sons, 2006.
2. Holger Karl and Andreas Willing, ¯Protocols and Architecture for Wireless Sensor Network‖,John Wiley & Sons, 2007
3. JuhaKorhonen, ¯Introduction to 3G Mobile Communication‖, Artech House, 2003.
4. Larry J. Greenstein, Andrea J. Goldsmith, ¯Principles of Cognitive Radio‖, Cambridge Universitypress, 2013

21IT1917	NETWORK MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To appreciate the need for interoperable network management as a typical distributed application
- To familiarize concepts and terminology associated with SNMP
- To be aware of current trends in network management technologies

UNIT - I OSI NETWORK MANAGEMENT **9**

OSI Network management model - Organizational model - Information model, Communication model. Abstract Syntax Notation - Encoding Structure, Macros Functional Model CMIP/CMIS.

UNIT - II BROADBAND NETWORK MANAGEMENT **9**

Broadband networks and services, ATM Technology - VP, VC, ATM Packet, Integrated service, ATM LAN emulation, Virtual LAN, ATM Network Management - ATM Network reference model, Integrated local Management Interface. ATM Management Information base, Role of SNMP and ILMI in ATM Management, M1, M2, M3, M4 interface. ATM Digital Exchange Interface Management.

UNIT - III SIMPLE NETWORK MANAGEMENT PROTOCOL **9**

SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model. SNMP Management SNMPv2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base,SNMPv2 Protocol, Compatibility With SNMPv1.Configuration management, Fault management, Performance management, Event Correlation Techniques 168 security management, Accounting management, Report Management, Policy Based Management, Services Level Management.

UNIT -IV NETWORK MANAGEMENT SYSTEMS **9**

Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Commercial Network management Systems, System Management and Enterprise Management Solutions.

UNIT -V **WEB-BASED MANAGEMENT** **9**

NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web- Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the need for interoperable network management as a typical distributed application
2. Diagnose problems and make minor repairs to computer networks using appropriate diagnosticssoftware
3. Demonstrate how to correctly maintain LAN computer systems
4. Maintain the network by performing routine maintenance tasks
5. Apply network management tools
6. Understand the concepts and terminology associated with web based management

TEXT BOOKS:

1. Lakshmi G Raman, "Fundamentals of Telecommunication Network Management", EasternEconomy Edition IEEE Press, New Delhi, 1999.
2. Mani Subramanian, "Network Management - Principles and Practice", Pearson Education, Secondedition, 2010.
3. Mani Subramanian, "Network Management Principles and Practice", Addison Wesley, Secondedition, 2010.

REFERENCES:

1. Mark Burges, "Principles of Network System Administration", Wiley, 2000.
2. Salah Aiidarons and Thomas Plevayk, "Telecommunications Network Technologies andImplementations‖, Eastern Economy Edition IEEE press, New Delhi, 1998.
3. Stephen Morris, "Network Management, MIBs and MPLS- Principles, Design and Implementation", Pearson Education, 2003.

21CS1920	WIRELESS ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the correspondingsolutions.

UNIT - I MAC & ROUTING IN AD HOC NETWORKS 9

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas - Multiple- Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks – Design Issues –Proactive, Reactive and Hybrid Routing Protocols

UNIT - II TRANSPORT & QOS IN AD HOC NETWORKS 9

TCP‟s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions –QoS Model

UNIT - III MAC & ROUTING IN WIRELESS SENSOR NETWORKS 9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols

UNIT -IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples

UNIT -V SECURITY IN AD HOC AND SENSOR NETWORKS 9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tampertechniques - Water marking techniques - Defense against routing attacks - Secure Ad hoc routing protocols — Broadcast authentication WSN protocols — TESLA — Biba — Sensor Network Security Protocols — SPINS

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Identify different issues and challenges in the design of wireless adhoc and sensor networks
2. Understand the working of MAC and Routing Protocols for ad hoc and sensor networks
3. Understand the Transport Layer protocols and
4. Analyze the QoS for ad hoc and sensor networks.
5. Analyze protocols developed for ad hoc and sensor networks.
6. Identify and understand security issues in ad hoc and sensor networks.

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, ¯Ad Hoc Wireless Networks – Architectures and Protocols‖,Pearson Education, 2006.
2. Holger Karl, Andreas Willing, ¯Protocols and Architectures for Wireless Sensor Networks‖, JohnWiley & Sons, Inc., 2005.

REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, ¯Ad Hoc Mobile Wireless Networks‖,Auerbach Publications, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ¯Ad Hoc and Sensor Networks: Theoryand Applications (2nd Edition)‖, World Scientific Publishing, 2011.
3. Waltenegus Dargie, Christian Poellabauer, ¯Fundamentals of Wireless Sensor Networks Theoryand Practice‖, John Wiley and Sons, 2010
4. Xiang-Yang Li , “Wireless Ad Hoc and Sensor Networks: Theory and Applications‖, 1227 thedition, Cambridge university Press,2008.

21IT1918	PROTOCOLS AND ARCHITECTURES FOR WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the concepts of wireless sensor networks
- To understand the protocols for WSN
- To get exposure on WSN environment with TinyOS and like
- To understand the layered approach in sensor networks
- To design WSN and analyse performance

UNIT - I WIRELESS SENSOR NETWORK ARCHITECTURE **9**

ntroduction to wireless sensor networks- Challenges, Comparison with ad hoc network, Node architecture and Network architecture, design principles, Service interfaces, Gateway, Short range radio communication standards-IEEE 802.15.4, Zigbee and Bluetooth. Physical layer and transceiver design considerations.

UNIT - II DATA LINK LAYER **9**

MAC protocols — fundamentals, low duty cycle protocols and wakeup concepts, contention- based protocols, Schedule-based protocols - SMAC, BMAC,TRAMA, Link Layer protocols – fundamentals task and requirements, error control, framing, link management, Naming and addressing – address assignment, unique, Content-based and geographical addressing.

UNIT - III NETWORK LAYER **9**

Routing protocols – Requirements, Taxonomy - Data-centric routing – SPIN, Directed Diffusion, Energy aware routing, Gradient-based routing – COUGAR, ACQUIRE, Hierarchical Routing – LEACH, PEGASIS, Location Based Routing – GAF, GEAR, Data aggregation – Various aggregation techniques, Localization and positioning - Properties, Approaches, Mathematical basics for single hop and multi-hop environment.

UNIT -IV TRANSPORT LAYER **9**

Transport Protocol, Coverage and deployments - Sensing models, Coverage measures, Random deployments: Poisson model, Boolean sensing model, general sensing model, Coverage determination, grid deployment, Reliable data transport, Single packet delivery, Block delivery, Congestion control and rate control, Time synchronization - Issues and protocol - Sender/Receiver, Security – protocols and KeyDistribution Techniques.

UNIT -V **TOOLS FOR WSN** **9**

TinyOS – Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, TOSSIM, Contiki – Structure, Communication Stack, Simulation environment – Cooja simulator, Programming.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the concepts of wireless sensor networks
2. Understand the protocols for WSN
3. Understand the layered approach in sensor networks
4. Design energy efficient WSNs.
5. Design and implement protocols in TinyOS and Contiki.
6. Design application dependent WSNs.

TEXT BOOKS:

1. Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, JohnWiley Publication, 2006.
2. KazemSohraby, Daniel Minoli and TaiebZnati, ―Wireless Sensor NetworksTechnology Protocols and Applications‖, John Wiley & Sons, 2007.
3. Paolo Santi, ―Topology Control in Wireless Adhoc and Sensor Networks‖, John Wiley & Sons,2005.

REFERENCES:

1. Anna Hac, ―Wireless Sensor Network Design‖, John Wiley & Sons, 2003.
2. C.S.Raghavendra Krishna, M.Sivalingam and Taribznati,―Wireless SensorNetworks‖, Springer Publication, 2004
3. Philip Levis, David Gay,"TinyOS Programming", Cambridge University Press, 2009
4. Contiki - Open Source Operating System for IOT - http://www.contiki-os.org/

21CS1921	NEXT GENERATION NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To learn the technical, economic and service advantages of next generation networks.
- To learn the evolution of technologies of 4G and beyond.
- To learn Software defined Mobile Network issues and integrating challenges with LTE.
- To explore the NGN framework catering the services of end user with QoS provisioning.
- To learn about the NGM management and standards.

UNIT - I INTRODUCTION 9

Evolution of public mobile services -motivations for IP based services, Wireless IP network architecture — 3GPP packet data network architecture. Introduction to next generation networks - Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next Generation Society, future Trends.

UNIT - II 4G and BEYOND 9

Introduction to LTE-A -Requirements and Challenges, network architectures – EPC, E-UTRAN architecture-mobility management, resource management, services, channel -logical and transport channel mapping, downlink/uplink data transfer, MAC control element, PDU packet formats, scheduling services, random access procedure.

UNIT - III SDMN-LTE INTEGRATION 9

SDN paradigm and applications, SDN for wireless-challenges, Leveraging SDN for 5G networks- ubiquitous connectivity-mobile cloud-cooperative cellular network-restructuring mobile networks to SDN- SDN/LTE integration benefits.

UNIT -IV NGN ARCHITECTURE 9

Evolution towards NGN-Technology requirements, NGN functional architecture-Transport stratum, service stratum, service/ content layer and customer terminal equipment function. NGN entities, Network and Service evolution -fixed, mobile, cable and internet evolution towards NGN.

UNIT -V NGN MANAGEMENT AND STANDARDIZATION 9

NGN requirements on Management-Customer, third party, Configuration, Accounting, performance, device and information management. Service and control management- End-to-End QoS and security. ITU and GSI-NGN releases, ETSI-NGN concept and releases, NGMN alliance and NGMN.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the technical, economic and service advantages of next generation networks.
2. Understand the issues and challenges of wireless domain in future generation network design.
3. Understand the evolution of technologies of 4G and beyond.
4. Explore the LTE concepts and technologies.
5. Understand the integration of SDN with LTE.
6. Understand the NGN management and standardizations.

TEXT BOOKS:

1. Jingming Li Salina, Pascal Salina "Next Generation Networks-perspectives and potentials" Wiley,January 2008.
2. Martin Sauter,"3G,4G and Beyond bringing networks, devices and web together", Wiley, 2ndedition-2013.
3. Thomas Plavyk, ¯Next generation Telecommunication Networks, Services and Management‖,Wiley & IEEE Press Publications, 2010.

REFERENCES:

1. Madhusanga Liyanage, Andrei Gurtov, Mika Ylianttila, "Software Defined Mobile Networks beyondLTE Network Architecture", Wiley, June 2015.
2. Savo G Glisic," Advanced Wireless Networks- Technology and Business models", Wiley, 3rdedition- 2016.

21IT1919	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

UNIT - I SDN: INTRODUCTION 9

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Controlplane and Application Plane

UNIT - II SDN DATA PLANE AND CONTROL PLANE 9

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers

UNIT - III SDN APPLICATIONS 9

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking

UNIT -IV NETWORK FUNCTION VIRTUALIZATION 9

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture

UNIT -V NFV FUNCTIONALITY 9

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the need for SDN and its data plane operations
2. Describe the motivation behind SDN
3. Identify the functions of the data plane and control plane
4. Design and develop network applications using SDN
5. Orchestrate network services using NFV

6. Explain various use cases of SDN and NFV

TEXT BOOKS:

1. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”,Pearson Education, 1st Edition, 2015.

REFERENCES:

1. Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016.
2. Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.
3. Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, 1st Edition,CRC Press, 2014.
4. Paul Goransson, Chuck Black Timothy Culver, “Software Defined Networks: AComprehensive Approach”, 2nd Edition, Morgan Kaufmann Press, 2016.
5. Oswald Coker, Siamak Azodolmolky, “Software-Defined Networking with OpenFlow”, 2nd Edition,O’Reilly Media, 2017.