K.L.N. COLLEGE OF ENGINEERING

Pottapalayam-630612, Sivagangai District

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

Estd: 1994

CURRICULUM AND SYLLABUS

I TO VIII SEMESTERS

REGULATIONS 2020

For Under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

(For the students admitted in the academic year 2021-2022)

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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

VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry**.**

VISION OF THE DEPARTMENT

To evolve in the field of Computer Science & Engineering through sustainable technical education with innovative research and to foster competent professionals to serve and lead the society

MISSION OF THE DEPARTMENT

- Imparting demand based proficient education through quality teaching – learning process in tune with the interdisciplinary needs of global work environment.
- Inculcating the attitude of continuous learning through industry institution interaction, consultancy and research activities.
- Cultivating professionalism, ethics and integrity of character for positive contributions to society.

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Contribute effectively to the society by applying principles of Computer Science and Engineering for analyzing the real world problems to produce optimal and sustainable technical solutions.

PEO 2: Sustain as good professionals by pursuing career / advanced studies and practice innovation in emerging technologies and current trends through lifelong learning.

PEO 3: Build professionalism, team work, effective communication, ethical values and leadership qualities**.**

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Ability to apply good analytical, design and implementation skills to formulate and solve scientific and business applications pertaining to Algorithms, Computer Systems, Networks, Security, Data Analytics and Artificial Intelligence.

PSO2: Ability to update knowledge continuously in various domains like Virtualization, Mobile Application Development, Data Visualization, Machine Learning and Technologies like Storage, Computing, Communication to meet the industry requirements

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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PO1: Engineering knowledge

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

PO2: Problem analysis

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

PO3: Design/development of solutions

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for 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 member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

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

PO11: Project management and finance

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

PO12: Life-long learning

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

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REGULATIONS 2020

For Under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

i. **Humanities and Social Sciences / Management Elective (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics, human values, Communication Skills, Total Quality Management etc.

ii. **Basic Sciences (BS**) **Courses** include Mathematics, Physics, and Chemistry.

iii. **Engineering Sciences (ES) Courses** include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.

iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.

v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.

vi. **Open Elective (OE) Courses** include courses from other departments which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.

vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

viii. **Mandatory (MC) Courses** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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REGULATIONS 2020

CHOICE BASED CREDIT SYSTEM

(For the students admitted during the academic year 2021-2022)

B.E. COMPUTER SCIENCE AND ENGINEERING

I TO VIII SEMESTERS

CURRICULUM AND SYLLABI

SEMESTER I

(Common to all B.E. / B.Tech Programmes)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20HS101	English for Technical Communication	HS	3	3	0	0	3
2.	20BS101	Fundamentals of Engineering Mathematics	BS	4	3	1	0	4
3.	20BS102	Engineering Physics	BS	3	3	0	0	3
4.	20BS103	Engineering Chemistry	BS	3	3	0	0	3
5.	20GE101	Problem Solving using Python Programming	ES	3	3	0	0	3
PRACTICAL								
6.	20BS1L1	Basic Science Laboratory	BS	3	0	0	3	1.5
7.	20GE1L1	Python Programming Laboratory	ES	4	0	0	4	2
8.	20GE1L2	Industrial Practices Workshop	ES	3	0	0	3	1.5
						Total Credits		**21**

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20HS201	Advanced Technical Communication (Common to all B.E. / B.Tech programmes)	HS	3	3	0	0	3
2.	20BS201	Laplace Transform and Advanced Calculus (Common to all B.E. / B.Tech programmes)	BS	4	3	1	0	4
3.	20BS204	Physics for Information Science (Common to B.E. CSE & B.Tech IT programmes)	BS	3	3	0	0	3
4.	20GE201	Engineering Graphics (Common to all B.E. / B.Tech programmes)	ES	4	2	0	2	3
5.	20GE205	Basic Electrical and Electronics Engineering (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	ES	3	3	0	0	3
6.	20CS201	Programming in C (Common to B.E. EEE, B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	3	3	0	0	3
PRACTICAL								
7.	20HS2L1	Communication Skills Laboratory (Common to B.E. Mech, B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	HS	2	0	0	2	1
8.	20CS2L1	C Programming Laboratory (Common to B.E. EEE, B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	4	0	0	4	2
						Total Credits		**22**

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20BS303	Discrete Mathematics (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	BS	4	3	1	0	4
2.	20CS301	Digital Principles and System Design (Common to B.E. CSE & B.Tech IT programmes)	ES	4	3	1	0	4
3.	20CS302	Data Structures and Algorithms (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	3	3	0	0	3
4.	20EC304	Analog and Digital Communication (Common to B.E. CSE & B.Tech IT programmes)	ES	3	3	0	0	3
5.	20HS301	Universal Human Values (Common to all B.E. / B.Tech programmes)	HS	3	2	1	0	3
PRACTICAL								
6.	20CS3L1	Digital Systems Laboratory (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	ES	4	0	0	4	2
7.	20CS3L2	Data Structures and Algorithms Laboratory (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	4	0	0	4	2
8.	20CS3L3	Object Oriented Programming Laboratory (Common to B.E. CSE & B.Tech IT Programmes)	PC	4	0	0	4	2
							Total Credits	**23**

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20BS403	Probability, Statistics and Queuing Theory	BS	4	3	1	0	4
2.	20CS401	Computer Organization and Architecture (Common to B.E. CSE & B.Tech IT programmes)	PC	3	3	0	0	3
3.	20CS402	Database Management Systems (Common to B.E. CSE , B.Tech IT & B.Tech AIDS programmes)	PC	3	3	0	0	3
4.	20CS403	Design and Analysis of Parallel Algorithms	PC	3	3	0	0	3
5.	20HS401	Environmental Science and Engineering (Common to all B.E. / B.Tech programmes)	HS	2	2	0	0	2
THEORY CUM PRACTICAL								
6.	20CS404	Operating Systems (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	5	3	0	2	4
PRACTICAL								
7.	20CS4L1	Database Management Systems Laboratory (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	4	0	0	4	2
8.	20HS4L2	Professional Communication Laboratory (Common to B.E. EEE, B.E CSE, B.Tech IT & B.Tech AIDS programmes)	EEC	2	0	0	2	1
							Total Credits	**22**

SEMESTER V

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20CS501	Computer Networks (Common to B.E. CSE & B.Tech IT programmes)	PC	3	3	0	0	3
2.	20CS503	Theory of Computation	PC	4	3	1	0	4
3.		Professional Elective I	PE	-	-	-	-	3
4.		Professional Elective II	PE	-	-	-	-	3
5.	20MC501	Constitution of India (Common to all B.E. / B.Tech programmes)	MC	1	1	0	0	-
THEORY CUM PRACTICAL								
6.	20CS504	Software Engineering	PC	5	3	0	2	4
7.	20EC512	Embedded System Design and IOT	PC	5	3	0	2	4
PRACTICAL								
8.	20CS5L1	Networks Laboratory (Common to B.E. CSE & B.Tech IT programmes)	PC	4	0	0	4	2
							Total Credits	**23**

SEMESTER VI

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20CS602	Cryptography and Network Security	PC	3	3	0	0	3
2.	20CS603	Compiler Design	PC	3	3	0	0	3
3.		Professional Elective III	PE	-	-	-	-	3
4.		Professional Elective IV	PE	-	-	-	-	3
5.		Open Elective I	OE	3	3	0	0	3
THEORY CUM PRACTICAL								
6.	20CS604	Machine Learning (Common to B.E. CSE & B.Tech IT programmes)	PC	5	3	0	2	4
7.	20CS605	Web Technology	PC	5	3	0	2	4
PRACTICAL								
8.	20CS6L1	Mobile Application Development Laboratory (Common to B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	PC	4	0	0	4	2
							Total Credits	**25**

SEMESTER VII

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20CS701	Data Analytics (Common to B.E. CSE & B.Tech AIDS programmes)	PC	3	3	0	0	3
2.	20CS702	Artificial Intelligence	PC	3	3	0	0	3
3.		Professional Elective V	PE	-	-	-	-	3
4.		Professional Elective VI	PE	-	-	-	-	3
5.		Open Elective II	OE	3	3	0	0	3
6.		Management Elective	HS	3	3	0	0	3
PRACTICAL								
7.	20CS7L1	Data Analytics Laboratory	PC	4	0	0	4	2
8.	20CS7L2	Mini Project	EEC	4	0	0	4	2
							Total Credits	**22**

SEMESTER VIII

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PRACTICAL								
1.	20CS8L1	Project Work	EEC	20	0	0	20	10
							Total Credits	**10**

TOTAL NO. OF CREDITS: 168

PROFESSIONAL ELECTIVE (PE): VERTICALS

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V
Cloud Computing and Data Center Technologies	**Cyber Security and Data Privacy**	**Full Stack Development for IT**	**Innovative Computing Technologies**	**Artificial Intelligence and Machine Learning**
Cloud Computing Techniques	Social Network Analysis	Principles of Programming Languages	Data and Information Security	Business Intelligence System
Data Warehousing and Data Mining	Cyber Physical Systems	UI and UX Design	Quantum Computing	Data Communication and Computer Networks
Cloud Services Management	Digital and Mobile Forensics	Cloud Services Management	Neural Networks and Deep Learning	Neural Networks and Deep Learning
Software Defined Networks	Cryptocurrency and Blockchain Technologies	Software Testing and Automation	Cryptocurrency and Blockchain Technologies	Robotic Process Automation
Storage Technologies	Web Application Security	Web Application Security	Cyber Security	Text and Speech Analysis
Computer Vision	Engineering Secure Software Systems	Information Retrieval Techniques	3D Printing and Design	Fuzzy Logic and Applications
Security and Privacy in Cloud	Security and Privacy in Cloud	DevOps	Agile Methodologies	Ethics and AI
Reinforcement Learning Techniques	Malware Analysis	Reinforcement Learning Techniques	Virtual Reality and Augmented Reality	Health Care Analytics

Vertical I: Cloud Computing and Data Center Technologies

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20CSV11	Cloud Computing Techniques	PE	4	2	0	2	3
2.	20CSV21	Data Warehousing and Data Mining	PE	3	3	0	0	3
3.	20CSV31	Cloud Services Management	PE	3	3	0	0	3
4.	20CSV41	Software Defined Networks	PE	3	3	0	0	3
5.	20ADV51	Storage Technologies	PE	3	3	0	0	3
6.	20CSV61	Computer Vision	PE	3	3	0	0	3
7.	20SCV71	Security and Privacy in Cloud	PE	3	3	0	0	3
8.	20ITV81	Reinforcement Learning Techniques	PE	3	3	0	0	3

Vertical II: Cyber Security and Data Privacy

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20CSV12	Social Network Analysis	PE	3	3	0	0	3
2.	20ITV22	Cyber Physical Systems	PE	3	3	0	0	3
3.	20SCV32	Digital and Mobile Forensics	PE	4	2	0	2	3
4.	20ITV42	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
5.	20SCV52	Web Application Security	PE	3	3	0	0	3
6.	20CSV62	Engineering Secure Software Systems	PE	3	3	0	0	3
7.	20SCV71	Security and Privacy in Cloud	PE	3	3	0	0	3
8.	20SCV82	Malware Analysis	PE	4	2	0	2	3

Vertical III: Full Stack Development for IT

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20ITV13	Principles of Programming Languages	PE	3	3	0	0	3
2.	20CSV23	UI and UX Design	PE	4	2	0	2	3
3.	20CSV31	Cloud Services Management	PE	3	3	0	0	3
4.	20ITV43	Software Testing and Automation	PE	3	3	0	0	3
5.	20SCV52	Web Application Security	PE	3	3	0	0	3
6.	20ITV63	Information Retrieval Techniques	PE	3	3	0	0	3
7.	20ITV73	DevOps	PE	4	2	0	2	3
8.	20ITV81	Reinforcement Learning Techniques	PE	3	3	0	0	3

Vertical IV: Innovative Computing Technologies

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20ADV14	Data and Information Security	PE	3	3	0	0	3
2.	20ITV24	Quantum Computing	PE	3	3	0	0	3
3.	20ADV34	Neural Networks and Deep Learning	PE	4	2	0	2	3
4.	20ITV42	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
5.	20SCV54	Cyber Security	PE	3	3	0	0	3
6.	20ITV64	3D Printing and Design	PE	3	3	0	0	3
7.	20CSV74	Agile Methodologies	PE	3	3	0	0	3
8.	20CSV84	Virtual Reality and Augmented Reality	PE	3	3	0	0	3

Vertical V: Artificial Intelligence and Machine Learning

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20ADV15	Business Intelligence System	PE	3	3	0	0	3
2.	20ADV25	Data Communication and Computer Networks	PE	3	3	0	0	3
3.	20ADV34	Neural Networks and Deep Learning	PE	4	2	0	2	3
4.	20ADV45	Robotic Process Automation	PE	3	3	0	0	3
5.	20ADV55	Text and Speech Analysis	PE	3	3	0	0	3
6.	20ITV65	Fuzzy Logic and Applications	PE	3	3	0	0	3
7.	20ADV75	Ethics and AI	PE	3	3	0	0	3
8.	20ADV85	Health Care Analytics	PE	3	3	0	0	3

MANAGEMENT ELECTIVE

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20HS5A1	Management Concepts and Organizational Behaviour	HS	3	3	0	0	3
2.	20HS5A2	Industrial Marketing	HS	3	3	0	0	3
3.	20HS6A1	Intellectual Property Rights	HS	3	3	0	0	3
4.	20HS6B1	Project Management and Entrepreneurship	HS	3	3	0	0	3
5.	20HS7A2	Total Quality Management	HS	3	3	0	0	3
6.	20HS8A1	Human Relations at Work	HS	3	3	0	0	3
7.	20HS8B2	Economics for Engineers	HS	3	3	0	0	3

OPEN ELECTIVE I (OE I)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20OE103	Refrigeration and Air Conditioning	OE	3	3	0	0	3
2.	20OE201	Fundamentals of Renewable Energy System	OE	3	3	0	0	3
3.	20OE202	Principles of Measurements and Instrumentation	OE	3	3	0	0	3
4.	20OE203	Introduction to Nanoscience	OE	3	3	0	0	3
5.	20OE303	Fundamentals of Wireless Communication	OE	3	3	0	0	3
6.	20OE601	Fundamentals of Electric Vehicles	OE	3	3	0	0	3
7.	20OE602	Supply Chain Management	OE	3	3	0	0	3
8.	20OE603	Automotive Safety Systems	OE	3	3	0	0	3
9.	20OE701	Biomedical Instrumentation and Measurements	OE	3	3	0	0	3
10.	20OE801	Linear Algebra and Number Theory	OE	3	3	0	0	3

OPEN ELECTIVE II (OE II)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20OE106	Fundamentals of Product Design	OE	3	3	0	0	3
2.	20OE108	Industrial Safety Practices	OE	3	3	0	0	3
3.	20OE206	Fundamentals of Fibre Optics and Lasers	OE	3	3	0	0	3
4.	20OE305	Fundamentals of Image Processing	OE	3	3	0	0	3
5.	20OE306	Consumer Electronics	OE	3	3	0	0	3
6.	20OE308	Introduction to VLSI Technology	OE	3	3	0	0	3
7.	20OE507	Concepts of Ethical Hacking	OE	3	3	0	0	3
8.	20OE605	Lean Manufacturing Practices	OE	3	3	0	0	3
9.	20OE706	Industrial Computer Networks	OE	3	3	0	0	3
10.	20OE708	Instrumentation for Agro Food Industry	OE	3	3	0	0	3

OPEN ELECTIVE - I (VI SEMESTER) - offered to other Departments

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20OE401	Fundamentals of Artificial Intelligence	OE	3	3	0	0	3
2.	20OE402	Introduction to Database Management Systems	OE	3	3	0	0	3
3.	20OE403	Computer Communication Networks	OE	3	3	0	0	3
4.	20OE404	Cloud Infrastructure and Technologies	OE	3	3	0	0	3

OPEN ELECTIVE - II (VII SEMESTER) - offered to other Departments

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20OE405	Machine Learning Techniques	OE	3	3	0	0	3
2.	20OE406	Java Script Programming	OE	3	3	0	0	3
3.	20OE407	Computer Graphics	OE	3	3	0	0	3
4.	20OE408	Essentials of Data Analytics	OE	3	3	0	0	3

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20HS101	English for Technical Communication	HS	3	3	0	0	3
2.	20HS201	Advanced Technical Communication	HS	3	3	0	0	3
3.	20HS2L1	Communication Skills Laboratory	HS	2	0	0	2	1
4.	20HS301	Universal Human Values	HS	3	2	1	0	3
5.	20HS401	Environmental Science and Engineering	HS	2	2	0	0	2
Total Credits (HS)								**12**

BASIC SCIENCES (BS)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20BS101	Fundamentals of Engineering Mathematics	BS	4	3	1	0	4
2.	20BS102	Engineering Physics	BS	3	3	0	0	3
3.	20BS103	Engineering Chemistry	BS	3	3	0	0	3
4.	20BS1L1	Basic Science Laboratory	BS	3	0	0	3	1.5
5.	20BS201	Laplace Transform and Advanced Calculus	BS	4	3	1	0	4
6.	20BS204	Physics for Information Science	BS	3	3	0	0	3
7.	20BS303	Discrete Mathematics	BS	4	3	1	0	4
8.	20BS403	Probability, Statistics and Queuing Theory	BS	4	3	1	0	4
Total Credits (BS)								**26.5**

PROFESSIONAL CORE (PC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20CS201	Programming in C	PC	3	3	0	0	3
2.	20CS2L1	C Programming Laboratory	PC	4	0	0	4	2
3.	20CS302	Data Structures and Algorithms	PC	3	3	0	0	3

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
4.	20CS3L2	Data Structures and Algorithms Laboratory	PC	4	0	0	4	2
5.	20CS3L3	Object Oriented Programming Laboratory	PC	4	0	0	4	2
6.	20CS401	Computer Organization and Architecture	PC	3	3	0	0	3
7.	20CS402	Database Management Systems	PC	3	3	0	0	3
8.	20CS403	Design and Analysis of Parallel Algorithms	PC	3	3	0	0	3
9.	20CS404	Operating Systems	PC	5	3	0	2	4
10.	20CS4L1	Database Management Systems Laboratory	PC	4	0	0	4	2
11.	20CS501	Computer Networks	PC	3	3	0	0	3
12.	20CS503	Theory of Computation	PC	4	3	1	0	4
13.	20CS504	Software Engineering	PC	5	3	0	2	4
14.	20EC512	Embedded System Design and IOT	PC	5	3	0	2	4
15.	20CS5L1	Networks Laboratory	PC	4	0	0	4	2
16.	20CS602	Cryptography and Network Security	PC	3	3	0	0	3
17.	20CS603	Compiler Design	PC	3	3	0	0	3
18.	20CS604	Machine Learning	PC	5	3	0	2	4
19.	20CS605	Web Technology	PC	5	3	0	2	4
20.	20CS6L1	Mobile Application Development Laboratory	PC	4	0	0	4	2
21.	20CS701	Data Analytics	PC	3	3	0	0	3
22.	20CS702	Artificial Intelligence	PC	3	3	0	0	3
23.	20CS7L1	Data Analytics Laboratory	PC	4	0	0	4	2
							Total Credits (PC)	**68**

ENGINEERING SCIENCES (ES)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20GE101	Problem Solving using Python Programming	ES	3	3	0	0	3
2.	20GE1L1	Python Programming Laboratory	ES	4	0	0	4	2
3.	20GE1L2	Industrial Practices Workshop	ES	3	0	0	3	1.5
4.	20GE201	Engineering Graphics	ES	4	2	0	2	3
5.	20GE205	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
6.	20CS301	Digital Principles and System Design	ES	4	3	1	0	4
7.	20EC304	Analog and Digital Communication	ES	3	3	0	0	3
8.	20CS3L1	Digital Systems Laboratory	ES	4	0	0	4	2
							Total Credits (ES)	**21.5**

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20HS4L2	Professional Communication Laboratory	EEC	2	0	0	2	1
2.	20CS7L2	Mini Project	EEC	4	0	0	4	2
3.	20CS8L1	Project Work	EEC	20	0	0	20	10
Total Credits (EEC)								**13**

MANDATORY COURSES (MC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20MC501	Constitution of India	MC	1	1	0	0	-

SUMMARY

S.No.	CATEGORY	NUMBER OF CREDITS									
		I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM	VIII SEM	Total Credits	Credit %
1.	Humanities and Social Sciences / Management Elective (HS)	3	4	3	2			3		15	8.93
2.	Basic Sciences (BS)	11.5	7	4	4					26.5	15.77
3.	Engineering Sciences (ES)	6.5	6	9						21.5	12.8
4.	Employability Enhancement Courses (EEC)				1			2	10	13	7.74
5.	Professional Core (PC)		5	7	15	17	16	8		68	40.48
6.	Professional Elective (PE)					6	6	6		18	10.71
7.	Open Elective (OE)						3	3		6	3.57
8.	Mandatory Courses (MC)					-				-	
Credits per Semester		21	22	23	22	23	25	22	10	168	
Credits per Year		43		45		48		32		168	
Total Credits		**168**									

20HS101 ENGLISH FOR TECHNICAL COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course is designed for entry level Engineering and Technology curriculum enabling the students to learn, acquire and apply for their learning and career.
- The course is aimed at providing effective skills for promoting communication skills through English.
- Students will benefit in conversing with the peers, faculty and fellow professionals.
- The outcome of this course contains refined level of English proficiency by acquiring all four skills, listening, speaking, reading and writing to prepare them for global readiness.

PRE-REQUISITE: NIL

UNIT -I FOCUSING LANGUAGE DEVELOPMENT 9

Listening: Listening to TV News, Guest Lecturers, Note – taking. **Speaking**: Pronunciation Common Vocabulary – Technical Vocabulary – Answering Peer Questions – Conversation with Teacher. **Reading**: News magazines, Reading for unfamiliar words, Variety of News Items

Writing: Word formation – Auxiliary verbs – Modal Verbs – Sentence Types – Affirmative, Negative, Interrogative, Concord – Dialogue Writing, Letter to Principal / Director – Instructions using Auxiliary

UNIT-II GRAMMAR AND TECHNICAL READING 9

Listening: Listening to Peer Conversations – Brief Speeches – Listening for Specific Information – Recap of Speeches. **Speaking**: Wh Questions, Day today conversations, Telephonic enquiries official/formal enquiries. **Reading**: Technical Essays – Identifying Sentence Types – Classifying the verb patterns. **Writing**: Tenses – Simple Present, Present Progressive, Present Perfect, Present Perfect Continuous – Voice – Active & Passive – Précis Writing – Essay Writing

UNIT - III GRAMMAR AND LANGUAGE DEVELOPMENT 9

Listening: TV interviews, Commentaries, Digital Videos for World Information. **Speaking**: Telephonic Conversation – Classroom Activities – Conversing Information.**Reading**: Coherence, Development of Thoughts. **Writing**: Tenses – Simple Past, Past Progressive, Past Perfect, Past perfect continuous – Impersonal Passive-Narrating the past events, Letter to friend/father about Industrial Visit/Functions held – Narrating the past experience using Impersonal Passive voice

UNIT - IV READING AND LANGUAGE DEVELOPMENT 9

Listening: Listening to Dialects of English – British & American Regional. **Speaking**: Role Plays, Extempore, Responding to specific questions. **Reading**: Comprehensive passages, Reading for specific points. **Writing**: Tenses – Simple Future, Future progressive, Future Perfect, Future Perfect continuous – Definition – Phrases of Reason – Cause & Effect, Recommendations, Argumentative Essays, Letter to the Editor on Social Issues – Analytical Essays on Social hazards using Cause and Effect.

UNIT - V EXTENDED WRITING 9

Listening: Listening to Technical Seminar speeches – Listening to achievers, eminent personalities – Dialects – Australian – African – Asian. **Speaking**: Welcome address, Compeering, Vote of Thanks, Peer debates. **Reading**: Texts on self-confidence, motivation, success path. **Writing**: Contracted forms, Conditionals, Articles, Preposition, Tense – 'going to' - Error Spotting, Sequence Words – Rearranging – Writing a Book Review – Summary writing – Rearranging Sentences using Sequence Words, Note Making

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Listen, Comprehend and Correspond with others at various contexts [AD]
- Speak legibly and fluently under various life-time situations by applying proper communication modules. [AD]
- Read and understand a variety of writings and technical text by analyzing the meaning and language. [AD]
- Apply clear and legible writing skills in error free style in coherent manner. [AD]
- Remember and use various communicative skills in precise and efficient way on technological contexts. [AD]
- Form situational conversations and technical writing styles for interpersonal and effective communication [AD]

TEXT BOOKS:

1. Board of Editors. Using English "A Course book for Undergraduate Engineers and Technologists". Orient Black Swan Limited, Hyderabad, 2015
2. Richards, C. Jack. "Interchange Students' Book-2" New Delhi: CUP, 2015

REFERENCES:

- Murphy, "Raymond English Grammar in Use with Answers: Reference and Practice for Intermediate Students", Cambridge: CUP, 2004
- Thomson, A.J. and Martinet, A.V. A Practical English Grammar, OUP, New Delhi: 1986.
  Anne Laws, "Writing Skills", Orient Black Swan, Hyderabad, 2011
- Board of Editor, "English for Technical Communication", Great Mind Publication, Chennai, 2018

20BS101	**FUNDAMENTALS OF ENGINEERING MATHEMATICS**	**L**	**T**	**P**	**C**
		3	1	0	4

OBJECTIVES:

- To relate various methods of Matrix Algebra to handle practical problems arising in the field of engineering.
- The main aim of this course is to achieve conceptual understanding and to retain the best traditions of Calculus.
- The syllabus is designed to provide the basic tools of Calculus of Single and Multivariable, mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.

PRE-REQUISITE: NIL

UNIT-I MATRICES 12

Introduction to Matrices-Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a Quadratic form to Canonical form by Orthogonal transformation – Nature of Quadratic forms.

UNIT -II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Differentiation of Polynomials, Exponential, Trigonometric, Hyperbolic, Logarithmic and Implicit functions- Maxima and Minima of functions of single variable.

UNIT – III FUNCTIONS OF SEVERAL VARIABLES 12

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 12

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

UNIT – V 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.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Determine the Eigen values, Eigen vectors to diagonalize a matrix and reduce quadratic form to canonical form. [K3]
- Apply the concept of limits, continuity and rules of differentiation to differentiate some standard functions and apply the techniques of differentiation to differentiate various types of functions. [K3]
- Apply the concepts of Concavity, Convexity to determine the critical points, point of Inflection, Maxima and Minima of Single variable functions. [K3].
- Compute the derivatives of functions of two variables and apply them to

calculate the maxima and minima. [K3]

- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts. [K3]
- Apply various techniques to solve higher order differential equations with constant and variable coefficients. [K3]

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan., "Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition, 2018

REFERENCES:

1. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7thEdition, New Delhi, 2015. [For units II & III].
2. 2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9thEdition, New Delhi, 2006.
3. Wiley, "Calculus- International Student version", 10thEdition, Wiley India Pvt. Ltd, New Delhi 2017.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications,New Delhi, 5th Edition , 2016.
5. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9thEdition, 2014.

20BS102	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To inculcate the fundamental knowledge in properties of matter and crystal physics.
- To enrich the knowledge on Laser, fiber optics and ultrasonics and their applications relevant to various streams of Engineering and Technology.
- To introduce quantum physics and its applications

PRE-REQUISITE: NIL

UNIT - I PROPERTIESOFMATTER **9**

Elasticity – Hooke's Law – Stress-strain diagram and its uses – Three modulus of elasticity (qualitative) – Poisson's ratio – factors affecting elastic modulus and tensile strength – twisting couple – torsional pendulum: theory and experiment – bending of beams – bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – **I** -shaped girders.

UNIT - II LASER AND FIBER OPTICS **9**

Lasers: Interaction of radiation with atomic energy states – Einstein's A and B coefficients derivation – Population inversion – resonant cavity, optical amplification (qualitative) – solid statelasers – Nd:YAG laser, Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – losses associated with optical fibers – fiber optic sensors: pressure and displacement sensor.

UNIT - III ULTRASONICS **9**

Ultrasonics – classification (qualitative) – properties – generation – magnetostriction and piezoelectric methods – detection of ultrasound – cavitations – velocity measurement – acoustic grating – Industrial applications (Drilling, Welding, Soldering and Cleaning) – SONAR – NDT – Pulse Echo system through Transmission and Reflection modes – A, B and C scan displays - Medical application – sonogram.

UNIT - IV QUANTUMPHYSICS **9**

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – wave function and its physical significance – Schrodinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunneling (qualitative) – scanning tunneling microscope.

UNIT - V CRYSTALPHYSICS **9**

Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, lattice planes - Miller indices – Inter planar spacing in cubic lattice – coordination number and packing factor for SC, BCC, FCC, HCP structures – growth of single crystals: solution and melt growth techniques – Mechanisms of plastic deformation, slip and twinning.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Demonstrate the properties of elasticity and measure the different moduli of elasticity. [K3]
- Discuss the characteristics of laser and optical fiber. [K2]
- Explain the concepts of ultrasonics in engineering. [K2]
- Explain black body radiation, properties of matter waves and Schrodinger equation. [K2]
- Classify the Bravais lattices and different types of crystal structures. [K3]
- Summarize the information on growth of crystals and deformations. [K2]

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta, “Engineering Physics”, Dhanpat Rai Publications, 2012.
2. B. K. Pandey and S. Chaturvedi, “Engineering Physics”, Cengage Learning India, 2018.
3. V.Rajendran, “Engineering Physics”, Tata McGraw Hill Education Private Limited, 2011.

REFERENCES:

1. D.Halliday, R. Resnick and J. Walker, “Principles of Physics”, Wiley publisher, 10th Edition, 2015.
2. R.A.Serway and J.W. Jewett, “Physics for Scientists and Engineers”, Cengage Learning, 2014.
3. P.A.Tipler and G. Mosca, “Physics for Scientists and Engineers with Modern Physics”, W.H.Freeman, 2007.
4. D.K.Bhattacharya and T. Poonam, “Engineering Physics”, Oxford University Press, 2017.

20BS103	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**C**
		3	0	0	3

OBJECTIVES:

- To make the students, familiar with boiler feed water requirements, related problems and water treatment techniques.
- To learn the principle of electrochemical cell, types of corrosion and its control.
- To develop an understanding of the basic concepts of phase rule and its applications to one and two component systems and appreciate the purpose and significance of alloys.
- To be familiar with different types of fuel and their characteristics and also functioning of energy storage devices.
- To understand the techniques of spectra and chromatography for analytical purpose.

PRE-REQUISITE: NIL

UNIT - I WATER AND ITS TREATMENT 9

Characteristics of water; Hard water, Soft water, difference; Hardness – types of hardness, expression of hardness, units, removal of hardness (boiling, soda lime process), estimation of hardness of water by EDTA method (problems); Boiler feed water – requirements – disadvantages of using hard water in boilers (scale and sludge, priming and foaming, caustic embrittlement, boiler corrosion); Treatment of boiler feed water – internal treatment (carbonate, phosphate, and calgon conditioning) external treatment – ion exchange process, zeolite process**;** Purification of water- reverseosmosis, electro dialysis, Application of nanomaterials in water purification.

UNIT - II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential, - electrochemical series and its significance - Nernst equation (derivation and problems).

Corrosion- causes- factors, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method **–** corrosion inhibitors. Metallic coating – Electroplating – Factors - Electroplating of Copper and Electroless plating of Nickel.

UNIT - III PHASE RULE AND ALLOYS 9

Phase rule - introduction, definition of terms with examples; One component system - water system; Reduced phase rule - two component system, classification, lead-silver system; Alloys – introduction, definition, properties of alloys, significance of alloying; Functions and effects of alloying elements; Heat treatment of steel - annealing, hardening, tempering, carburizing, nitriding; Ferrous alloys- nichrome and stainless steel (18/8); Non-ferrous alloys – brass and bronze.

UNIT - IV FUELS AND BATTERIES 9

Fuels – classification, characteristics; Petrol – characteristics, knocking, octane number; Diesel – characteristics, cetane number; Natural gas (CNG), LPG, Power alcohol, Biodiesel, Gasohol; Combustion of fuels – calorific value, GCV and NCV (Problems),calculationof theoretical air for combustion (Problems), Ignition temperature, explosive range, flue gas analysis (Orsatapparatus);

Batteries – primary and secondary batteries, lead-acid battery, lithium ion battery, Fuel cell (hydrogen oxygen fuel cell).

UNIT - V ANALYTICAL TECHNIQUES **9**

Spectroscopic techniques – UV-visible (Principle and Instrumentation – Block Diagram only and applications), IR (Principle and Instrumentation – Block Diagram only and applications), ^{1}HNMR (Principle and Instrumentation – Block Diagram only) – Chromatography – HPLC - Flame photometry – Estimation of sodium by Flame photometry.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Determine the hardness of water and explain the water treatment methods. [K2]
- Apply Nernst equation to determine the EMF of the cell and explain various corrosion control methods. [K3]
- Describe the phase diagram of one component and two component system and various methods of heat treatment of steel. [K2]
- Classify the various types of fuels by their characteristics and explain the flue gas analysis by Orsat method. [K2]
- Illustrate the working of Lead acid battery, lithium ion battery and fuel cell. [K2]
- Describe the instrumentation and working of UV, IR, 1HNMR, HPLC and flame photometry. [K2]

TEXT BOOKS:

1. P.C. Jain and Monika Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2017
2. S.S Dara and S.S Umare, “A Text Book of Engineering Chemistry”, S.Chand& Company Limited, 20th Edition, 2018

REFERENCES:

1. Shashi Chawla, “A Textbook of Engineering Chemistry”, Dhanpat Rai & CO. (PVT) LTD, New Delhi, 2012.
2. B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal, “Principles of Physical Chemistry”, Vishal Publishing Co., Punjab, 47th Edition, 2017.
3. G Palanna, “Engineering Chemistry”, McGraw Hill Education (India) PVT, LTD, Chennai, 2017.
4. Dr. Sunita Rattan, “A Textbook of Engineering Chemistry”, S.K.Kataria & Sons, New Delhi, 2012

20GE101 PROBLEM SOLVING USING PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the basics of Computers and algorithmic problem solving
- To understand Python programs with conditional and looping constructs.
- To define Python functions and strings.
- To use Python data structures – lists, tuples, sets and dictionaries.
- To do input/output with files in Python.

PRE-REQUISITE: NIL

UNIT-I COMPUTER FUNDAMENTALS AND PROBLEM SOLVING 9

Introduction to Computer System – Block Diagram of Computer, Types of Memory, I/O Devices, Application Programs, System Programs – Loader, linker, assembler, compiler, interpreter, Programming process – source code to executable code, Problem Solving Strategies – Problem analysis, Algorithms, Flow Charts, Pseudo Code. Illustrative problems: odd or even number, Leap year, Biggest of three numbers, square root of a number, Sum of n numbers, Armstrong number, Palindrome, Fibonacci Series, Prime number, Bubble Sort and Linear Search.

UNIT-II DATA, EXPRESSIONS, CONTROL FLOW STATEMENTS 9

Python interpreter and interactive mode, values and types – int, float, boolean, string, and list, variables, expressions, statements, tuple assignment, operators and precedence of operators, comments, Control Flow Statements – Conditionals – conditional (if), alternative (if-else), chained conditional (if-elif-else), Iteration – state, while, for, break, continue, pass, Illustrative programs – exchange the values with and without using temporary variables, circulate the values of n variables, distance between two points.

UNIT - III FUNCTIONS, STRINGS 9

Functions – function definition and use, flow of execution, parameters and arguments, function composition, Fruitful functions – return values, parameters, local and global scope, recursion, Strings – string slices, immutability, string functions and methods, string module, Illustrative programs – square root, GCD, exponentiation, Factorial of a number, linear search, binary search.

UNIT - IV LISTS, TUPLES, SETS, DICTIONARIES 9

Lists – list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, Lists as arrays, Tuples – tuple assignment, tuple as return value, Sets - Creating a set, Modifying a set, Removing elements from a set, Set operations- Set Union, Set intersection, Set difference, Set membership test, Iterating through a set, Set methods, Built-in functions with set, Frozen set - Dictionaries – operations and methods, Advanced list processing –List comprehension, Illustrative programs – selection sort, insertion sort, Matrix addition and subtraction, sum an array of numbers.

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 – Math and Rand, Illustrative programs – word count, copy file, merge two files.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain Components of a Computer System, types of programming languages, types of software with examples and purpose. [K3]
- Perform problem analysis, use algorithms and prepare flow charts, pseudo code for solving simple problems. [K3]
- Use Conditional, iteration constructs of python programming and apply to solve simple

problems. [K3]

- Use Functions, recursive function, String functions in python programming and apply to perform linear and binary search. [K3]
- Explain the various operations for manipulating Tuples, Sets, Dictionaries and Use List to perform simple and sorting operations. [K3]
- Explain file handling operations, exception handling, modules and packages and illustrate programs for word count, file copy, merge operations and exception handling. [K3]

TEXT BOOKS:

1. E. Balagurusamy, “Problem solving and Python Programming”, First edition, McGraw Hill Education (India) Private Limited, 2017.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

REFERENCES:

1. Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, 2nd Edition, BPB Publications, 2020.
2. John V Guttag, “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, 2nd Edition, PHI Publisher,2017.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,2015.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3.6”, 3rd edition, Shroff/O’ Reilly Publishers,2018.
6. Dr.A.Kannan,Dr.L.SaiRamesh,“Problem Solving and Python Programming”, Updated Edition, United Global Publishers Pvt. Ltd., April 2018.

20BS1L1 **BASIC SCIENCE LABORATORY**

L	T	P	C
0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

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

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS
(Any five to be carried out & one demonstration experiment)

1. Determination of Rigidity modulus – Torsional Pendulum.
2. Determination of Young's modulus – Non Uniform Bending.
3. a. Determination of wavelength and particle size using diode laser.
   b. Determination of acceptance angle in an optical fiber.
4. Determination of velocity of sound and compressibility of liquid using ultrasonic interferometer.
5. Determination of band gap of a semiconductor diode.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of dispersive power of a prism – Spectrometer*
8. Determination of wavelength of mercury spectrum – Spectrometer grating

*Demonstration experiment

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Calculate rigidity modulus and Young's modulus of a given material. [K3]
- Examine the size of a given particle, parameters of optical fiber and compute the thickness of a given thin wire. [K3]
- Calculate the velocity of ultrasound, compressibility of a given liquid and band gap of a given semiconductor diode. [K3]
- Predict dispersive power of prism and wavelength of mercury spectrum. [K2]

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1	Torsional pendulum set	6
2	Travelling microscope & accessories	6
3	Laser kit	6
4	Ultrasonic interferometer	6
5	Semiconductor band gap kit	6
6	Air wedge set up	6
7	Spectrometer & prism	6
8	Spectrometer & Grating	6

CHEMISTRY LABORATORY

OBJECTIVES:

- To make the students to acquire practical skill in the determination of water quality parameters through volumetric analysis.
- To have hands on experience in using instruments like pH meter, conductivity meter, potentiometer.
- To acquaint the students with the determination of molecular weight of polymer by viscometer.

PRE-REQUISITE: NIL

Any Five experiments to be given

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of dissolved oxygen content of water sample by Winkler's method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of iron content of the given solution using potentiometer.
6. Conductometric titration of a strong acid Vs a strong base.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Corrosion Experiment – Weight Loss Method.
10. Estimation of sodium present in water using flame photometer.

TOTAL(Physics & Chemistry): 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Estimate the Chemical quality parameter of a water sample. [K3]
- Estimate the strength of acid by conductometric and pH metric titration. [K3]
- Estimate the amount of iron content in a given solution using potentiometer and the amount of sodium in water using flame photometer. [K3]
- Determine the molecular weight of polyvinyl alcohol using Ostwald viscometer and rate of corrosion by weight loss method demo. [K2]

REFERENCE:

- Vogel's "Text book of quantitative chemical analysis" (8th edition, 2014)

LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1	Burette	30
2	Pipette	30
3	Beaker (100ml)	30
4	Conical Flask (250ml)	30
5	Conductivity meter	10
6	Potentiometer	10
7	pH meter	10
8	Viscometer	10
9	Flame Photometer	1
10	Electronic Balance	1

20GE1L1	**PYTHON PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	0	4	2

OBJECTIVES:

- To write, test, and debug simple Python programs using conditional statements.
- To implement Python programs using loops.
- To use functions for structuring Python programs.
- To implement Python programs using lists.
- To write Python programs for implementing file operations.

PRE-REQUISITE: NIL

LIST OF PROGRAMS

1. Biggest of three numbers, odd or even number, Leap year.
2. GCD, Armstrong Number, Palindrome, Fibonacci Series, Prime number
3. Find the square root and exponentiation of a number with and without built-in functions
4. Linear search and Binary search using Recursion.
5. Find the maximum of a list of numbers
6. Selection sort, Insertion sort
7. First n prime numbers
8. Transpose of a Matrix
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Merge two files

PLATFORM NEEDED: Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop simple Python programs using conditional and iterative constructs. [K3]
- Develop simple Python programs using built-in functions and user-defined functions. [K3]
- Develop a Python program using recursion to implement linear and binary search. [K3]
- Develop a Python program using list to implement selection and insertion sort. [K3]
- Develop Python programs to implement matrix operations. [K3]
- Develop a Python program to implement file handling. [K3]

20GE1L2	**INDUSTRIAL PRACTICES WORKSHOP**	**L**	**T**	**P**	**C**
		0	0	3	1.5

OBJECTIVES:

- To provide exposure to the students with Hands on Experience on various Basic Industrial Practices in Civil, Mechanical, Electrical and Electronics Engineering.

PRE-REQUISITE: NIL

GROUP A (CIVIL & MECHANICAL)
LIST OF EXPERIMENTS

I CIVIL ENGINEERING PRACTICE

UNIT-I CARPENTRY PRACTICE

1. Study of carpentry tools.
2. Preparation of Cross lap joint
3. Preparation of Dovetail joint
4. Preparation of T joint

UNIT-II PLUMBING PRACTICE

1. Study of plumbing tools, pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
2. Exercise on Preparation of plumbing line sketches for water supply and sewage works.
3. Exercise on providing of basic water line connection for a residential house using plumbing components.
4. Exercise on providing Water line pipe connections for household utilities like water heater, wash basin etc.,

II MECHANICAL ENGINEERING PRACTICE

UNIT - III SHEET METAL PRACTICE

1. Study of sheet metal forming tools.
2. Preparation of a Model of rectangular tray.
3. Preparation of a Model of Conical Funnel.

UNIT - IV MACHINING PRACTICE

1. Study of machining tools.
2. Exercise on Simple turning, Facing, Chamfering
3. Exercise on Taper turning.
4. Exercise on Drilling and Tapping.

UNIT – V METAL JOINING PROCESS

1. Study of welding tools.
2. Exercise to join two metal plates by single butt joint using arc welding.
3. Exercise to join two metal plates by T Fillet joint using arc welding.
4. Exercise to join two metal plates by lap joint using arc welding.

DEMONSTRATION

1. Gas welding process.
2. Refrigeration and Air conditioning process.

GROUP B (ELECTRICAL & ELECTRONICS)
LIST OF EXPERIMENTS

I ELECTRICAL ENGINEERINGPRACTICE

1. Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter.
2. Measurement of Power consumption for CFL, Fluorescent Lamp, LED Lamp and Incandescent lamp.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

II ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components – Resistor colour coding, Capacitor, Inductor- Measurement using LCR meter, Transistor &Diode – Terminal identification using Multimeter.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Measurement of AC signal parameter (peak-peak, rms value, period & frequency) using CRO and AFO.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
CIVIL		
S. No	**Component Name**	**No. of Components**
1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, coupling, unions, elbows, plugs and other fittings	15 sets
2	Carpentry Vice (fitted to work bench)	15 nos
3	Standard wood working tools	15 sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools a. Rotary Hammer b. Demolition Hammer c. Circular Saw d. Planer e. Hand Drilling Machine f. Jigsaw	 2 nos 2 nos 2 nos 2 nos 2 nos 2 nos
MECHANICAL		
1	Arc welding transformer with cables and holders	5 nos
2	Welding booth with exhaust facility	5 nos

3	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 nos
5	Centre Lathe	2 nos
6	Power Tool: Angle Grinder	2 nos
7	Study purpose items: Refrigerator and Air Conditioner	One each
ELECTRICAL		
1	Assorted electrical components for house wiring	10 sets
2	Electrical measuring instruments	10 sets
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4	Megger (250V/500V)	1 no.
5	Power Tools a. Range Finder b. Digital Live-wire detector	 2 nos 2 nos
ELECTRONICS		
1	Soldering guns	10 nos
2	Assorted electronic components for making circuits	50 nos
3	Small PCBs	10 nos
4	Multimeters	10 nos
5	Regulated of power supply, CRO	1 no. each

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Prepare different carpentry joints. [K3]
- Prepare pipe connections with different joints for domestic applications. [K3]
- Make the models using sheet metal works. [K3]
- Carry out the basic machining operations. [K3]
- Prepare joints using welding equipment's. [K3]
- Demonstrate on gas welding, refrigeration and air conditioning processes. [K3]
- Carry out basic home electrical works and appliances. [K3]
- Measure the electrical quantities. [K3]
- Elaborate on the components, gates, soldering practices. [K3]

20HS201	**ADVANCED TECHNICAL COMMUNICATION**	**L**	**T**	**P**	**C**
		3	0	0	3

OBJECTIVES:

- This course is designed for Engineering and Technology curriculum enabling the students to learn, acquire and apply updated elements of English communication.
- The course is aimed at providing effective skills for procuring communication skills for business and advanced technology.
- Students will benefit by learning the four skills – Listening, Speaking, Reading and Writing – to meet the global requirements for their career and higher studies.

PRE-REQUISITE: NIL

UNIT-I TECHNICAL WRITING **9**

Listening: Listening to audio-visuals on personal Interviews, Speeches from Company CEOs, TV Debates. **Speaking**: Wishing, Greeting, Enquiring Hobbies. **Reading**: Editorials, Letter to the Editor Columns, Technical Papers. **Writing**: Analytical writings, Emphasis Techniques, Letter Writing – Business Correspondence, Abstract Writing, Common Errors, Footnotes, Compound words, Preparation of Agenda

UNIT-II BUSINESS ENGLISH AND LANGUAGE DEVELOPMENT **9**

Listening: Listening to Audio-Visual documentary, TV Programs of Celebrities Forum. **Speaking**: Self-Expression, Introducing the fellow students, Talking about celebrities, leaders

Reading: Company Correspondence, Business Correspondence, Technical Text for Vocabulary

Writing: Bibliography, Sentence Completion, Cloze exercises, Verbal Analogy, Letter – Business enquiry orders, payments, Minutes Preparation.

UNIT - III VISUAL BASED LANGUAGE DEVELOPMENT **9**

Listening: Visuals on Group Discussion-Understanding the nuances of GD – Approach – Content – Methodology. **Speaking**: Discussing main points on burning issues, Social issues – Expressing ideas and suggestions. **Reading**: Etiquettes of Non-Verbal Communication. **Writing**: List of common expressions for specified situations – Sentence linkers – Formal Expressions – Suggestions – Reported Speech - Letter to the Editor on Common Issues – Writing the Points in Indirect Form – Check Lists – Numerical Expressions

UNIT - IV EMPLOYABILITY CORRESPONDENCE **9**

Listening: Listening to Visuals of Technical Paper presentation – Technical and HR interviews

Speaking: Peer-to-Peer Interview – Mock Interview – Telephone Conversations. **Reading**: Comparative Analyses – Instructions on Public Spots – Time Management concepts – Email Correspondence. **Writing**: Compare and Contrast – Cause and Effect – Purpose and Function – Job Application Letter – Drafting Resume / CV,– Inferring the graphical / Pictorial representations – Bar chart – Pie chart, Instruction – common and technical instructions for a process or a component.

UNIT - V TECHNICAL REPORT WRITING **9**

Listening: Key note speeches – Annual Reports of institutions / companies. **Speaking**: Answering to the Mock Panel Interview – Sharing of interview experiences – presenting a Technical Paper. **Reading**: Annual Reports – Company Reports – Newspaper reports – Comprehension passages. **Writing**: Homophones – Abbreviations and Acronyms – SI Units – Report Writing with recommendations – Inferring the Graph – Flow Chart – Tables – Technical Papers

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Listen, Understand and create technical correspondence at advanced level
- Respond or answer to the contextual questions, interview questions, form instructions, draft reports
- Speak and analyze social issues, come out with effective ideas for discussion, understand the passages for meaning and vocabulary
- Assess error free technical writings, create legible and coherent technical papers, derive ideas of the given texts in a precise form
- Remember the updated elements of communication skills, nuances of non-verbal communication, business communication
- Create technical instructions, process instructions, self-appraisals, Resumes, reports on various situations

TEXT BOOKS:

1. Board of editors. “Fluency in English A Course book for Engineering and Technology”. Orient Blackswan, Hyderabad: 2016
2. Raman, Meenakshi and Sharma, Sangeetha “Technical Communication Principles and Practice”.Oxford University Press: New Delhi,2014.

REFERENCES:

1. Booth-L. Diana, “Project Work”, Oxford University Press, Oxford: 2014
2. Grussendorf, Marion, “English for Presentations”, Oxford University Press, Oxford: 2007
3. Means, L. Thomas and Elaine Langlois, “English & Communication For Colleges”. Cengage Learning, USA: 2007
4. Board of Editor, “Advanced Technical Communication”, Great Mind Publication, Chennai : 2019

20BS201	LAPLACE TRANSFORM AND ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To make the student familiar with topics such as Multiple Integrals, Vector Calculus, Analytic Functions, Complex Integration and Laplace Transform.
- To learn the concept of basic Vector Calculus which can be widely used for Modeling the various laws of Physics.
- To understand the various methods of Complex Analysis and Laplace Transform can be used for efficiently solving the problems that occur in various branches of Engineering disciplines.

PRE-REQUISITE: NIL

UNIT - I LAPLACE TRANSFORM **12**

Existence Conditions – Transforms of Elementary Functions – Transform of Unit Step Function and Unit Impulse Function – Basic Properties – Shifting Theorems -Transforms of Derivatives and Integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of Periodic Functions – Application to Solution of Linear Second Order Ordinary Differential Equations with Constant Coefficients.

UNIT-II MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in Polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of Variables in Double and Triple integrals.

UNIT-III VECTOR CALCULUS **12**

Gradient and Directional Derivative – Divergence and Curl - Vector Identities – Irrotational and Solenoidal Vector fields – Line Integral over a Plane curve – Surface Integral - Area of a Curved Surface - Volume Integral – Green's, Gauss divergence and Stoke's theorems – Verification and Application in evaluating Line, Surface and Volume Integrals.

UNIT - IV ANALYTIC FUNCTIONS **12**

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions w = z+c, cz, 1/z , z2 -Bilinear transformation.

UNIT - V COMPLEX INTEGRATION **12**

Line integral – Cauchy's Integral Theorem – Cauchy's Integral Formula – Taylor's and Laurent's Series – Singularities – Residues – Residue Theorem – Application of Residue Theorem for Evaluation of Real Integrals – Use of Circular Contour.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Determine the Laplace transform of standard functions using properties. [K3]
- Apply Laplace transform and inverse transform to solve the initial value problems. [K3]
- Solve the multiple integrals and apply the concept to find areas, volumes. [K3]
- Determine the line, surface and volume integrals using Green's, Gauss and Stokes theorems. [K3]
- Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves. [K3]
- Determine the Contour Integrals using Cauchy's Integral and Residue theorems. [K3]

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan.,"Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition2018.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, NewDelhi, 2006.
2. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9th Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics II",Narosa Publications, New Delhi, 5thEdition, 2016.
5. Sastry, S.S. "Engineering Mathematics", Vol.I& II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.

20BS204	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the essential principles of semiconductor device and Electron transport properties.
- To inculcate proficiency in magnetic & optical properties of materials and their fruitful applications.
- To develop knowledge on Nano devices.

PRE-REQUISITE: NIL

UNIT - I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory – Derivation of electrical conductivity – Thermal conductivity– Wiedemann-Franz law – Success and failures – electrons in metals – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

UNIT - II SEMICONDUCTOR PHYSICS 9

Properties of semiconductor – Energy band diagram – direct and indirect band gap semiconductors – Intrinsic Semiconductors – Carrier concentration derivation – electrical conductivity, Energy band gap determination – variation of Fermi level with temperature – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors (qualitative) – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices.

UNIT - III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment – atomic magnetic moments - magnetic permeability and susceptibility – Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory of ferromagnetism - M versus H behaviour – Hard and soft magnetic materials – Ferrites and its applications – Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

UNIT - IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes – Absorption, emission and scattering of light in metals, insulators and semiconductors (concepts only) - photocurrent in a p-n diode – Photo voltaic effect – solar cell and its types – LCD – LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT - V NANO DEVICES 9

Quantum structures, Quantum confinement – Density of states in quantum well, quantum wire and quantum dot structure (qualitative) – Band gap of nanomaterials – Size dependence of fermi energy – Coulomb blockade effect –Quantum computation–Introduction– Single electron phenomena and Single Electron Transistor (SET) – Quantum dot laser – Carbon nanotubes: types, Properties and Applications.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Differentiate classical, quantum electron theories and energy band theory. [K3]
- Demonstrate the semiconductors and Hall effect devices. [K3]
- Explain magnetic properties of materials. [K3]
- Classify optical materials for Opto – electronic applications. [K3]
- Clarify the basic operations of p-n junction devices like solar cell, LED etc. [K3]
- Discuss different quantum structures, size effect and carbon nanotubes. [K3]

TEXT BOOKS:

1. B.K.Pandey and S.Chaturvedi, “Engineering Physics”, Cengage learning, 2013.
2. V.Rajendran, “Engineering Physics”, Mc Graw-Hill Education, 2011
3. Charles Kittel, “Introduction to solid state Physics”, John Wiley & sons, 8^{th} edition, 2015.

REFERENCES:

1. G.W. Hanson, “Fundamentals of nano electronics”, Pearson Education, 2009
2. B. Rogers, Adams and S. Pennathur, “Nanotechnology: Understanding Small Systems”, CRC Press, 2019
3. N. Garcia and A. Damask, “Physics for Computer Science Students”, Springer Verlag, 2012

20GE201	**ENGINEERING GRAPHICS**	**L**	**T**	**P**	**C**
		2	0	2	3

OBJECTIVES:

- To develop graphic skills for communication of concepts, ideas and design of engineering products.
- To expose national standards related to technical drawings.

PRE-REQUISITE: NIL

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT-I PROJECTION OF POINTS AND LINES **6+6**

Orthographic projection – Principles - Principal planes - Projection of points in all quadrants - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

UNIT-II PROJECTION OF PLANE SURFACES **6+6**

Projection of planes (Polygonal and Circular surfaces) inclined to both the principal planes by rotating object method.

UNIT - III PROJECTION OF SOLIDS **6+6**

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

UNIT - IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **6+6**

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

UNIT - V ISOMETRIC PROJECTION AND FREEHAND SKETCHING **6+6**

Principles of Isometric Projection – Isometric scale – Isometric projections of simple solids - truncated Prisms and Pyramids.

Visualization concepts and Free Hand sketching: Principles – Representation of Three-Dimensional objects – Layout of views - Freehand sketching of multiple views from pictorial views of objects

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Familiarize with the fundamentals and standards of Engineering graphics. [K2]
- Draw the orthographic projections of points, lines and planes. [K3]
- Draw the projections of simple solids like prisms, pyramids, cylinder and cone. [K3]
- Draw the projections of sectional views of solids and develop its lateral surfaces. [K3]
- Draw the isometric projection of simple objects, truncated prism and pyramids. [K3]
- Draw the free hand sketching of simple objects. [K3]

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 30th Edition, 2017.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2018.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education, 3rd Edition, 2012.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001: Technical drawings - General principles of presentation.
4. IS 11669 – 1986 :General principles of dimensioning on technical drawings.
5. *SP 46 (2003)*: Engineering Drawing Practice for Colleges.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

SPECIAL POINTS APPLICABLE TO EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

20GE205	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Qualitative Treatment only)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamental laws, theorems of electrical circuits and also to analyze them.
- To study the basic principles of electrical machines and their performances.
- To study the different energy sources and their utilizations.
- To study the fundamentals of electronic circuits.
- To understand the principles and operations of operational amplifiers.

PRE-REQUISITE: NIL

UNIT - I ELECTRICAL CIRCUITS ANALYSIS 9

Ohms Law, Kirchhoff‘s Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, -star delta conversion.

UNIT - II ELECTRICAL MACHINES 9

DC and AC Rotating Machines: Types, Construction, principle, Emf and torque equation, Basics of Stepper Motor- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation.

UNIT - III UTILIZATION OF ELECTRICAL POWER 9

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator -Electric circuit, construction and working principle. Protection-need for earthing. Energy Tariff calculation for domestic loads.

UNIT - IV ELECTRONIC CIRCUITS 9

Semi conductors, Types -PN Junction-VI Characteristics of Diode, zener diode, BJT-operations of PNP and NPN transistors- Transistors configurations –Common Base,Common Emitter &Common Collector configurations- Amplifiers.

UNIT - V OPERATIONAL AMPLIFIERS AND DIGITAL ELECTRONICS 9

Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC, Number Systems, Complements-1’s and 2’s Complements- Basic Digital Logic gates, Universal gates-NAND and NOR Implementation.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the essentials of electric circuits and analysis. [K2]
- Analyze Electrical circuits and apply various network theorems to solve loop currents and branch voltages. [K3]
- Discuss the basic operation of electric machines and transformers. [K2]
- Explain the renewable sources and common domestic loads. [K2]
- Discuss the basics of semiconductor devices and applications. [K2]
- Discuss about applications of Op-amps and basics of digital circuits. [K2]

TEXT BOOKS:

1. D.P. Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, Mc Graw Hill, 2019, Fourth Edition.
2. M.S. Sukhija and T.K. Nagsarkar, “Basic Electrical and Electronic Engineering”, Oxford, 2019.

REFRENCES:

1. S.B. Lal Seksena and Kaustuv Dasgupta, “Fundaments of Electrical Engineering”, Cambridge, 2017
2. B.L Theraja, “Fundamentals of Electrical Engineering and Electronics”. Chand & Co, 2018.
3. S.K.Sahdev, “Basic of Electrical Engineering”, Pearson, 2019.
4. John Bird, “Electrical and Electronic Principles and Technology”, Sixth Edition, Elsevier, 2017.
5. Mittle,Mittal, “Basic Electrical Engineering”, 2nd Edition, Tata McGraw-Hill Edition, 2017.
6. C.L.Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy”, New Age international pvt.ltd.,Revised 4th Edition 2018

20CS201	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic C programming constructs
- To learn about usage of arrays and strings
- To understand the concepts of functions, pointes, structures and unions
- To expose to file handling operations in C

PRE-REQUISITE: NIL

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.

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.

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

UNIT - IV STRUCTURES AND UNIONS 9

Structure – Nested structures, Pointer and Structures, Array of structures, Example Program – using structures and pointers, typedef, Self referential structures, Union, Dynamic memory allocation, Illustrative programs – allocating block of memory, sum of n numbers using malloc, calloc.

UNIT - V FILE PROCESSING 9

Files – File operations, 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.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Use basic constructs of C programming to develop simple programs. [K3]
- Apply one dimensional and two dimensional arrays for implementing matri operations and string operations. [K3]
- Make use of function concept for solving simple mathematical problems. [K3]
- Develop programs to implement pointer arithmetic and arrays with pointers. [K3]
- illustrate simple programs for structures and unions and design real time applicatio programs [K4]
- Analyze file operations and develop programs to implement various file acces

procedures. [K3]

TEXT BOOKS:

1. Balagurusamy, E, “Programming in ANSI C”, Eighth Edition, Tata Mcgraw-Hill,2019.
2. Yashavant Kanetkar, “Let Us C”, BPB Publications, 17th Edition,2020.
3. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education,2015

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Education India, 2015.
2. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd.,2011
3. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press,2013.
4. Byron Gottfried, "Schaum’s outlines- Programming with C", McGraw-Hill Education, Fourth edition, 2018.
5. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition,2016.

20HS2L1	**COMMUNICATION SKILLS LABORATORY**	**L**	**T**	**P**	**C**
		0	0	2	1

OBJECTIVES:

- This course is framed for imparting practical approach in learning and enhancing communication skill to develop in students.
- Students will be able to identify appropriate expressions in speaking and writing.
- They will also be able to understand the style and perfection of language in reading and listening various contexts of engineering and technology.
- The course will benefit to the students to gain confidence for every day communication, aptitude test and interviews.

PRE-REQUISITE: NIL

UNIT-I LISTENING **6**

Listen and takes notes of Lecture, Listen and Write appropriate word, Talks on Engineering and Technology, Developing effective listening skills, barriers to effective listening

UNIT-II SPEAKING **6**

Self-Introduction, Role play of Celebrities, Sharing memorable incidents

UNIT - III READING **6**

Reading Online Blogs, Reading Advertisement in Online, Newspaper archives reading

UNIT - IV WRITING **6**

Process Description, Narrating experiences, Creating Email blogs, Review Writing – Books, Movies, and Journals

UNIT - V SUMMARIZED ACTIVITIES **6**

Reading – cloze exercises, Identifying redundant words, Jargon words, Foreign words, Technical terms. **Writing** – Error free sentences, Sequential paragraphs, Essay writing on various levels – basic, middle, and advanced. **Speaking** – Face to face conversation on specific topics, interviewing celebrities, getting acquaintance with new people, sharing information with persons from abroad.

TOTAL: 30 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Express ideas and concepts on par global communication (AD)
- Involve inter-personal communication with flair and error-free verbatim(AD)
- Face interviews confidently and respond in proper language ability(AD)
- Participate in group discussion and share innovative ideas in technical environments(AD)
- Adapt multi-national exposure on employment(AD)
- Master all-round competency in delivering apt communication for employability (AD)

TEXT BOOKS:

1. E. Suresh Kumar et al. “Communication for Professional Success”. Orient Blackswan: Hyderabad, 2015

REFERENCES:

1. Butterfield, “Jeff Soft Skills of Everyone”, Cengage Learning: New Delhi, 2015
2. “Interact English Lab Manual for Undergraduate Students”, Orient BlackSwan: Hyderabad, 2016.
3. Raman, Meenakshi and Sangeetha Sharma. “Professional Communication”. Oxford University Press: Oxford, 2014.
4. S. Hariharanetal. “Soft Skills”. MJP Publishers: Chennai, 2010

20CS2L1	**C PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	0	4	2

OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

PRE-REQUISITE: NIL

LIST OF PROGRAMS

1. Programs using I/O statements, expressions and decision-making constructs.
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
    - 5 if it is a perfect cube.
    - 4 if it is a multiple of 4 and divisible by 6.
    - 3 if it is a prime number.

    Sort the numbers based on the weight in the increasing order as shown below <10,its weight>,<36,its weight><89,its weight>
5. Matrix addition and subtraction
6. Matrix multiplication and transpose of a matrix
7. Program using string with and without using string functions: string copy and Reverse the String.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. 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.
10. Program using recursion – factorial and Fibonacci series
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
14. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
15. **Mini project (Any one project: Maximum 4 per Team)**
    - Railway reservation system
    - Library Management System
    - University Result Publication System
    - Hospital Management System
    - Student Automation System
    - Payroll System
    - Banking System
    - Inventory System

PLATFORM NEEDED: Turbo C++ Compiler

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop simple programs using decision making and looping statements. [K3]
- Utilize array concepts to perform matrix addition, subtraction and multiplication. [K3]
- Utilize string operations and develop programs to show string copy and reverse. [K3]
- Develop programs using user defined functions, built-in functions and recursion. [K3]
- Design applications using sequential and random access files. [K3]
- Design simple real time projects using the concepts of structures and union. [K3]

20BS303 DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To understand the basic concepts of Logic, Combinatorics and Graph Theory.
- To make the student familiarize the Applications of Algebraic Structures.
- To understand the concepts and significance of Lattices and Boolean algebra which are widely used in Computer Science and Engineering.

PRE-REQUISITE: NIL

UNIT–I LOGIC AND PROOFS 12

Propositional logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers – Rules of Inference - Introduction to Proofs – Proof methods and strategy.

UNIT–II COMBINATORICS 12

Mathematical Induction – Strong Induction and Well ordering – The basics of Counting -The Pigeon hole Principle – Permutations and Combinations – Recurrence Relations – Solving Linear Recurrence Relations – Generating Functions – Inclusion and Exclusion Principle and its Applications.

UNIT–III REPRESENTATION OF STANDARD GRAPHS 12

Graphs and Graph Models – Graph Terminology and special types of Graphs – Matrix Representation ofGraphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT–IV ALGEBRAIC STRUCTURES 12

Algebraic Systems – Semi Groups and Monoids - Groups – Subgroups – Homomorphism's – Normal Subgroup and Cosets – Lagrange's Theorem – Definitions and Examples of Rings and Fields.

UNIT–V LATTICES AND BOOLEAN ALGEBRA 12

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply the Basic Formula to Formulate the Normal Forms and Predicate Calculus. [K3]
- Solve Combinatorial Problems using the Basic Counting Techniques. [K3]
- Solve Recurrence Relations using Generating Functions. [K3]
- Utilize the concepts of Graph Theory in the Computer Science and Technologies Field. [K3]
- Apply the concepts and Properties of Algebraic Structures such as Groups, Rings and Fields. [K3]
- Determine the Partial Ordering, Lattices as Posets and Boolean Algebra using Logical Relation. [K3]

TEXT BOOKS:

1. Tremblay.J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing company Limited, New Delhi, 30th Reprint,2008.
2. Veerarajan .T, "Discrete Mathematics with graph theory and combinatorics", Tata McGraw –Hill companies, New Delhi, 4th Reprint,2008.

REFERENCES:

1. Grimaldi. R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education Asia, Delhi, 5th Edition, 2007.
2. Rosen.K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Publishing company Limited, New Delhi, 7th Edition, 2011.
3. Koshy.T. "Discrete Mathematics with Applications", Elsevier Publications,2011.
4. Venkatraman.M.K.,Sridharan.V., Chandrasekaran.C., "Discrete Mathematics", National Publishing company, 1st Edition,2001.
5. Tamilarasi. A and Natarajan A.M., "Discrete Mathematics and its Application", Khanna Publishers, 3rd Edition, 2006.

20CS301	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To design and analyze combinational circuits
- To design and analyze synchronous and asynchronous sequential circuits
- To understand Memory and Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

PRE-REQUISITE: NIL

UNIT – I BOOLEAN ALGEBRA AND LOGIC GATES 12

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT – II COMBINATIONAL LOGIC 12

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits-Decoder-Comparator-Multiplexer.

UNIT – III SYNCHRONOUS SEQUENTIAL LOGIC 12

Sequential Circuits - Storage Elements: Latches, Flip-Flops-Characteristic table-Excitation table-Characteristic equation-Conversion of one flip-flop into another - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits- D flip flop-JK flip flop-JK flip flop from D flip flop.

UNIT – IV ASYNCHRONOUS SEQUENTIAL LOGIC 12

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT – V MEMORY AND PROGRAMMABLE LOGIC 12

RAM– Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic-An overview of sequential programmable devices.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply Arithmetic operations in any number system and various techniques to simplify the Boolean function. [K3]
- Build combinational circuits that perform arithmetic operations. [K3]
- Design and Analyze Synchronous sequential circuits such as counters and registers. [K4]
- Design and simulate various combinational and sequential circuits using HDL. [K3]
- Analyze Asynchronous sequential circuits to find out the impact of Hazards and Races. [K4]
- Model memory arrays for any Boolean function with the help of PLA, PAL and PROM. [K3]

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, — “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2018.
2. Dr. P. Leach and A.P. Malvino, “Digital Principles and Applications”, Tata McGraw Hill, 2011.

REFERENCES:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2012.
2. John F. Wakerly, Digital Design Principles and Practices, 5th Edition, Pearson Education, 2018.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, CENGAGE Learning, 2013.
4. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill, 2017.

20CS302	**DATA STRUCTURES AND ALGORITHMS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To understand the concepts of ADTs
- To understand the basics of algorithm analysis
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms and their analysis.

PRE-REQUISITE:

Course code : 20CS201
Course Name: Programming in C

UNIT - I INTRODUCTION TO DATA STRUCTURES AND ALGORITHM ANALYSIS **10**

Introduction: Data Structures, Notion of an algorithm, Algorithm Efficiency and Analysis Framework, Asymptotic Notations and their properties. Linear Data Structures: 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). Implementation of algorithmic problems.

UNIT - II LINEAR DATA STRUCTURES – STACKS, QUEUES **8**

Stack ADT – Operations – Applications– Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue – Applications of Queues.

UNIT - III NON LINEAR DATA STRUCTURES – TREES **9**

Tree ADT – Tree Traversals – Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

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 – Applications of graphs.

UNIT - V SEARCHING, SORTING AND HASHING TECHNIQUES **9**

Divide and Conquer Methodology: Comparison of Searching Techniques: Linear Search – Binary Search, Mathematical analysis of Binary Search. Sorting – Merge Sort, Quick Sort, Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the concept of asymptotic notations and algorithmic efficiency with properties. [K2]
- Describe abstract data types and implement various algorithmic problems using arrays and linked list. [K2]
- Apply the different linear data structures like stack and queue to various computing

problems. [K3]

- Build different types of trees and graphs and apply various operations and their applications. [K3]
- Analyze different sorting and searching techniques based on time and space complexity of the algorithms designed using divide and conquer methods. [K4]
- Develop suitable hashing algorithm for indexing data items into specific locations in a hash table considering collision resolution techniques. [K3]

TEXT BOOKS:

1. Mark Allen Weiss, — Data Structures and Algorithm Analysis in C, 2nd Edition Reprint, Pearson Education, 2002.
2. ReemaThareja, — Data Structures Using C, Second Edition, Oxford University Press, 2011.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein – Introduction to Algorithms, MIT Press, Third Edition, 2009.

REFERENCES:

1. Stephen G. Kochan, —Programming in C, 3rd edition, Pearson Education, 2005.
2. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

20EC304 ANALOG AND DIGITAL COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- Understand analog & Digital Communication Techniques.
- Learn Data & Pulse modulation Techniques. .
- Be familiarized with source & Error Control Coding.
- Gain Knowledge on multi-user radio communication

PRE-REQUISITE: NIL

UNIT - I ANALOG COMMUNICATION **9**

Introduction to Communication Systems - Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).

UNIT - II PULSE AND DATA COMMUNICATION **9**

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Data communication Hardware - serial and parallel interfaces.

UNIT - III DIGITAL COMMUNICATION **9**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK – QPSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT - IV SOURCE AND ERROR CONTROL CODES **9**

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, Error Control Coding, linear block codes, cyclic codes - ARQ Techniques.

UNIT - V MULTI-USER RADIO COMMUNICATION **9**

Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Handover Techniques - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

Case Study: GSM module - Design using Arduino/Rasberry pi

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply different analog modulation schemes in time and frequency domain. [K3]
- Illustrate the principle of pulse modulation techniques. [K3]
- Illustrate the principle of data communication techniques. [K3]
- Make use of performance metric of different digital Modulation schemes. [K3]
- Make use of various error control coding techniques to identify/correct errors. [K3]
- Outline the concepts of Mobile & Satellite Communications. [K2]

TEXT BOOKS:

1. Wayne Tomasi —Advanced Electronic Communication Systems, 6th Edition, Pearson Education, 2009.
2. Simon Haykin, —Communication Systems‖, 4th Edition, John Wiley & Sons, 2004.

REFERENCES:

1. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, Pearson Education 2014.
3. H.Taub, D L Schilling and G Saha, —Principles of Communication, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, —Modern Analog and Digital Communication Systems, 3rd Edition, Oxford University Press, 2007.
5. Blake, —Electronic Communication Systems‖, Thomson Delmar Publications, 2002.
6. Martin S.Roden, —Analog and Digital Communication System‖, 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, —Digital Communication Fundamentals and Applications 2nd Edition Pearson Education 2007.

20HS301	UNIVERSAL HUMAN VALUES	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

PRE-REQUISITE: NIL

UNIT-I INTRODUCTION TO VALUE EDUCATION 9

Value Education – Definition - Concept and Need for Value Education - The Evolution of Value Education: Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education- fulfilling human aspirations.

Practice sessions: To discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT- II HARMONY IN THE HUMAN BEING 9

Human being vs Value education - I' and Body synchronization - Understanding Myself as Co-existence of the Self and the Body - Realization - Self, Body needs - Scanning of Karma -Self and Body- Understanding Sanyam and Health.

Practice sessions: To discuss the role others have played in making material goods available to self. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III HARMONY IN THE FAMILY, SOCIETY AND NATURE 9

Family as a basic unit of Human Interaction-Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love – Harmony in society : Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal- Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

Practice sessions: To discuss on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education. Gratitude as a universal value in relationship. Discuss with scenarios. Elicit examples from students' lives

UNIT- IV : SOCIAL ETHICS 9

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

Practice sessions: To discuss human being as cause of imbalance in nature, pollution, depletion of resources and role of technology

UNIT-V PROFESSIONAL ETHICS 9

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies, Production System and Management Models.

Practice sessions: To discuss the conduct as an engineer or scientist.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the significance of value inputs in a classroom and summarize human aspirations. [AD]
- Distinguish between Values & Skills to ensure happiness and prosperity. [AD]
- Identify the synchronization between Thyself & the Body to ensure competency of an individual. [AD]
- Generalize the role of a human being in ensuring harmony in society and nature. [AD]
- Distinguish between ethical and unethical practices and analyze harmonious social environment. [AD]
- Assess the importance of value based life and evaluate the role of professional ethics. [AD]

TEXT BOOKS:

1. R.R. Gaur, R. Asthana, G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd revised edition, Excel Books, New Delhi, Reprint 2019.
2. A N Tripathy, Human Values, New Age International Publishers, New Delhi, 2003.

REFERENCES:

1. E G Seebauer& Robert L.Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
2. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd, Reprint 2011.
3. Mike Martin and Roland Schinzinger “Ethics in Engineering” McGraw Hill, New York, 4th edition, Reprint 2017.
4. Charles E. Harries, Michael S. Protchard and Michael J. Rabins, “Engineering Ethics-concepts and Cases”, Thomson Learning, 2000.
5. S.K. Chakraborty and Dabangshu Chakraborty, “Human Values and Ethics: Achieving Holistic Excellence”, ICFAI University Press, 2006.

20CS3L1	**DIGITAL SYSTEMS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

OBJECTIVES:

- To understand the various basic logic gates
- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits
- To understand and code with HDL programming

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions.
3. Design and implementation of code converters.
4. Design and implement Half/Full Adder and Subtractor.
5. Design and implement combinational circuits using MSI devices.
   a. Parity generator /checker
   b. Magnitude Comparator
   c. Multiplexers
6. Design and implement shift-registers.
7. Design and implement synchronous counters.
8. Design and implement asynchronous counters.
9. Coding combinational circuits using HDL.
10. Coding sequential circuits using HDL.
11. Design and implementation of a simple real time digital system (Mini Project).

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS HARDWARE:

1. Digital trainer kits -30
2. Digital ICs required for the experiments in sufficient numbers

SOFTWARE: HDL simulator.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply Boolean simplification techniques to construct combinational logic circuits. [K3]
- Build combinational logic circuits to perform arithmetic operations. [K3]
- Construct combinational circuits using MSI devices. [K3]
- Construct Sequential circuits like registers and counters. [K3]
- Develop combinational and sequential circuits using HDL. [K3]
- Develop a simple real time application using Digital system. [K3]

20CS3L2 DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

LIST OF EXPERIMENTS

1. Implementation of List and Stack Using Array.
2. Implementation of List and Stack Using Linked list.
3. Implementation of Queue Using Linked List.
4. Perform polynomial addition using list.
5. Perform Infix to postfix conversion using stack.
6. Implementation of Binary tree.
7. Implementation of Binary Search tree.
8. Implementation of AVL Tree.
9. Implementation of Heaps using Priority Queues.
10. Implementation of Graph Traversals Using Breadth First Search.
11. Implementation of Graph Traversals Using Depth First Search.
12. Applications of Graph.
13. Case study problem for sorting and searching.
14. Case study problem using linked list.

TOTAL: 60 PERIODS

SOFTWARE: Sublime editor / Turbo C

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop the array implementation of stack, Queue and List ADTs. [K3]
- Develop the Linked list implementation of list, Stack and Queue ADTs. [K3]
- Construct Binary trees, Binary search Trees and AVL tree and its operations. [K3]
- Develop various graph traversal algorithms like BFS and DFS. [K3]
- Analyze the performance of various searching, sorting and hashing algorithms. [K4]
- Illustrate any real world problem by implement various techniques of Data structures. [K4]

20CS3L3 OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

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

LIST OF EXPERIMENTS

1. 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). Compute the bill amount using the following tariff.

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

First 100 units	Rs. 1.00 per unit
101-200 units	Rs. 2.50 per unit
201 -500 units	Rs. 4.00 per unit
> 501 units	Rs. 6.00 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

First 100 units	Rs. 2.00 per unit
101-200 units	Rs. 4.50 per unit
201 -500 units	Rs. 6.00 per unit
> 501 units	Rs. 7.00 per unit

2. 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.

3. 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.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

5. 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

6. 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.

7. Write a Java program to implement user defined exception handling.

8. 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.

9. 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.

10. Write a java program to find the maximum value from the given type of elements using a generic function.

11. Design a calculator using event-driven programming paradigm of Java with the following options.
    a) Decimal manipulations
    b) Scientific manipulations

12. Develop a mini project for any application using Java concepts.

TOTAL: 60 PERIODS

SOFTWARE: JDK8.0 / Net beans 11

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop and implement Java programs for simple applications that make use of classes, packages. [K3]
- Develop and implement Java programs with inheritance and interfaces. [K3]
- Develop simple java programs for files usage and exceptions handling. [K3]
- Develop simple java programs by implementing multithread concepts and generics. [K3]
- Develop interactive java application using AWT and Swing. [K3]
- Illustrate any real world problem by implement various OOPs concepts. [K4]

20BS403 PROBABILITY, STATISTICS AND QUEUEING THEORY

L	T	P	C
3	1	0	4

OBJECTIVES:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the concept of queueing models and significance of advanced queueing models apply in engineering.

PRE-REQUISITE: NIL

UNIT–I PROBABILITY AND RANDOM VARIABLES 12

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

UNIT –II TWO – DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression –Transformation of random variables –Central limit theorem (for independent and identically distributed random variables).

UNIT –III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markovchain – Chapman Kolmogorov equations - Limiting distributions.

UNIT– IV QUEUEING MODELS 12

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula – Queues with finite waiting rooms–Queues with impatient customers: Balking and reneging.

UNIT–V ADVANCED QUEUEING MODELS 12

Finite source models - M/G/1queue–Pollaczek Khinchin formula-M / D / 1 and M / E_K/ 1 as special cases– Series queues–Open Jackson networks.

TOTAL:60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Build the parameters of statistical distributions using basic probability theory concepts. [K3]
- Calculate the statistical measures for One and Two dimensional random variables. [K3]
- Apply the concepts of correlation and regression for two dimensional random variables. [K3]
- Apply the concept of random processes in engineering disciplines. [K3]
- Solve queueing models using finite and infinite server model. [K3]
- Solve advanced queueing models using open network. [K3]

TEXTBOOKS:

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, Indian Reprint, 1st Edition, 2010.
2. Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 1st Edition, 2002.

REFERENCES:

1. Gross.D.,Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student, 4th Edition, 2013.
2. Yates.R.D.andGoodman.D.J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.
3. Taha.H.A., "Operation Research", Pearson India Education Services, Delhi, 9th Edition, 2016.
4. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw Hill, NewDelhi, 2006.
5. Gupta.S.C.,Kapoor.V.K,, "Fundamental of Mathematical Statistics", Sultanchand& Sons Educational Publishers, NewDelhi, Reprint 2013.

20CS401 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of a computer system and operations.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.
- To understand the memory hierarchies and different ways of communication with I/O devices.

PRE-REQUISITE:

Course code: 20CS301
Course Name: Digital Principles and System Design

UNIT- I FUNDAMENTALS OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts- Bus structures – Performance Metrics – Instructions: Language of the Computer – Operations, Operands – Instruction Set Architecture- Instruction representation- RISC and CISC Architectures – Amdahl's Law – Logical operations – decision making – MIPS Addressing.

UNIT- II ARITHMETIC FOR COMPUTERS 9

ALU design -Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism.

UNIT - III PROCESSOR AND CONTROL UNIT 9

Components of the Processor - Hardwired control – Micro programmed control – Nano programming-A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined data path and control – Hazards – Structural, Data and Control Hazards –Exception handling. Building blocks of Raspberry-pi.

UNIT - IV PARALLELISIM 9

Parallel processing challenges – Instruction Level Parallelism - Exploitation of more ILP – Hardware and Software Approaches – Dynamic Scheduling – Speculation – Compiler Approaches – Multiple Issue Processors - ILP and Thread Level Parallelism-Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT - V MEMORY & I/O SYSTEMS 9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory- Memory management techniques – Associative memories - TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.Case Study: Design of Memory Systems using Raspberry Pi.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the computer organization components, instructions and addressing modes. [K2]
- Compute the arithmetic operations such as Addition, Subtraction, Multiplication and Division. [K3]
- Discuss the basics of MIPS implementation and pipelining. [K2]
- Illustrate the basic concepts of parallelism, multi-core processor, GPU & Clusters. [K2]
- Describe the memory technologies & I/O systems. [K2]
- Generalize the memory systems using Raspberry-pi. [K3]

TEXT BOOKS:

3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Morgan Kaufmann / Elsevier, 2014.
4. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, Computer Organization and Embedded Systems, 6th Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, 5th Edition, 2012.
2. John P. Hayes, Computer Architecture and Organization, 3rd Edition, Tata McGraw Hill, 2012.
3. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
4. Learning Computer Architecture using Raspberry pi – EbenUpton, Jeffrey Duntemann 2016 (1st Edition).

20CS402 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to depict a database system using ER diagrams.
- To study relational database and to write SQL queries to store/retrieve data to/from database.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures for real time applications.
- To understand working procedures of query processing and query optimization techniques.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To study concepts of advanced databases.

PRE-REQUISITE:

Course Code: 20CS302
Course Name: Data Structures and Algorithms

UNIT - I DATABASE FUNDAMENTALS 8

Purpose of Database System – Views of data – Database System Architecture – Introduction to Data Models – Network model – Hierarchical Model – Introduction to Relational Model – Constraints – keys – Entity Relationship Model – Entity Sets – Attributes - Extended E-R features – ER reduction to Relational Schemas.

UNIT - II RELATIONAL AND ADVNACED DATABASE 10

Structure of Relational Database – Relational Query Language – Relational Algebra – SQL Fundamentals – Basic Queries – Set Operations – Aggregate Functions – Clauses – Subqueries – Correlated Subqueries – Joins – Views – Authorization – Advanced SQL – Triggers – Cursors – Procedure – Functions – Embedded SQL – Dynamic SQL – Types of advanced Databases – Distributed Database and Object Oriented Database Architectures - XML Databases: XML Hierarchical Model, DTD, XML Schema, X-Query - Introduction to NoSQL.

UNIT - III DATABASE DESIGN 9

Need for Database Design – Functional Dependencies – Closure of Functional Dependencies – Attribute Closure – Dependency Preservation – Decomposition – Canonical Cover – First Normal Form – Second Normal Form – Third Normal Form – Boyce Code Normal Form – Multivalued Dependencies - Fourth Normal Form – Join Dependencies – Fifth Normal Form.

UNIT - IV TRANSACTIONS 9

Transaction Concepts – ACID properties – Transaction States – Serializability – Conflict Serializability – View Serializability – Concurrency Control – Lock Based Protocols – Deadlocks – Time Based Protocols – Stamp Based Protocols – Validation Based Protocols – Recovery System – Failure Classifications – Storage – Recovery and Atomicity – Recovery Algorithms.

UNIT - V STORAGE AND QUERY PROCESSING 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Compare File Processing System with Database and summarize the basic concepts of Database, various Data Models and Database System Architecture. [K2]
- Identify Entities, Attributes and their Relationships to prepare ER diagram for real time applications. [K3]
- Transform an information model into a relational database schema and use DDL, DML, DQL, DCL, TCL and advanced concepts of SQL to implement the schema. [K3]
- Develop simple database using XML and relate advanced databases with relational model. [K3]
- Construct a database by identifying dependencies and optimize it with suitable normal forms to reduce redundancy. [K3]
- Compare real time applications with respect to transaction, concurrency control, and data object locking protocols and select appropriate storage and recovery techniques. [K4]
- Identify the purpose of query processing and query optimization techniques and also demonstrate the query evaluation for given query. [K3]

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts‖, Sixth Edition, Tata McGraw Hill, 2011.
2. RamezElmasri, Shamkant B. Navathe, —Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems‖, 8th Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, —Database Management Systems‖, 4th Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011O G Palanna, “Engineering Chemistry”, McGraw Hill Education (India) PVT, LTD, Chennai, 2017.

20CS403	DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To choose appropriate sequential algorithm design techniques for solving problems.
- To understand different parallel architectures and models of computation.
- To apply parallel algorithms for basic problems.
- To analyze the various classes of parallel algorithms.

PRE-REQUISITE:

Course Code: 20CS302
Course Name: Data Structures and Algorithms

UNIT - I GREEDY TECHNIQUES 9

General Method – Knapsack Problem – Job Sequencing with Deadlines - Minimum Cost Spanning Trees – Prim's Algorithm, Kuruskal's Algorithm – Optimal Merge Pattern - Single Source Shortest Paths.

UNIT - II DYNAMIC PROGRAMMING TECHNIQUES 9

General Method – Multistage Graph – All pair shortest path – Optimal Binary Search Tree- 0/1 Knapsack Problem -Travelling Salesman Problem - Flow Shop Scheduling.

UNIT - III BACKTRACKING AND BRANCH & BOUND TECHNIQUES 9

Backtracking Techniques: General Method – The 8 Queen's problem – Sum of Subset – Hamiltonian Cycles – Knapsack Problems
Branch & Bound Techniques: Least Cost Search – 0/1 Knapsack Problem -Travelling Salesman Problem - Assignment problem.

UNIT - IV PARALLEL ALGORITHMS 9

Introduction to parallel Algorithms – Computational Model – Fundamentals Techniques and Models: Prefix Computation – List Ranking – Selection – Merging – Sorting – Graph Problems.

UNIT - V SIMD AND MIMD ALGORITHMS 9

2D Mesh SIMD Model – Parallel Algorithms for Reduction – Prefix Computation – Selection - Odd-Even Merge Sorting – UMA Multiprocessor Model - Matrix Multiplication on Multiprocessors and Multicomputer.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply greedy techniques to solve various optimization problems like Knapsack problem and minimum cost spanning tree. [K3]
- Make use of dynamic programming approach to solve various optimization problems like multistage graph and travelling salesman problems. [K3]
- Solve and analyze the performance of problems by Backtracking and Branch & Bound design techniques. [K4]
- Explain the fundamental techniques and models of parallel algorithms. [K2]
- Apply SIMD parallel algorithms in computation problems like selection and sorting. [K3]
- Utilize multiprocessors and multicomputer models to solve matrix multiplication. [K3]

TEXT BOOKS:

1. Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, University press, 2nd edition, 2011.
2. Michael J. Quinn, “Parallel Computing: Theory & Practice”, Tata McGraw Hill Edition, 2nd edition, 2017.

REFERENCES:

1. AnanyLevitin, —Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.
2. AnanthGrame, George Karpis, Vipin Kumar and Anshul Gupta, “Introduction to Parallel Computing”, 2nd Edition, Addison Wesley, 2003.
3. S.G.Akl, “The Design and Analysis of Parallel Algorithms”, PHI, 1989.

20HS401 ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
2	0	0	2

OBJECTIVES:

- To study the scope and significance of environment
- To understand the interrelationship between living organism and environment
- To get a conceptual knowledge on various types of pollution and its effects
- To gain knowledge on various natural resources and its significances
- To provide knowledge on solid wastes, disposal methods and natural disasters and its management
- To learn social issues such as human welfare, sustainability related to population

PRE-REQUISITE: NIL

UNIT - I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 6

Environment – definition, importance, public awareness

Ecosystem – concept, structure and function– producers, consumers and decomposers - characteristic features, structure and function of the forest ecosystem and grassland ecosystem

Biodiversity– definition, types - genetic, species and ecosystem diversity – values - consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India. Assignment on Conservation of biodiversity.

UNIT - II ENVIRONMENTAL POLLUTION 6

Definition, causes, effects and control measures of (i) Air pollution (ii) Water pollution (iii) Soil pollution (iv) Marine pollution – role of an individual in prevention of pollution – pollution case studies - Climate change - global warming, acid rain, ozone layer depletion.

UNIT - III NATURAL RESOURCES 6

Forest resources: Uses, over-exploitation, deforestation, case studies

Water resources: Surface water and ground water - uses, over-utilization, conflicts over water, Conservation of water - rain water harvesting, dams-benefits and problems

Mineral resources: uses, over exploitation, environmental effects of extracting mineral resources, case studies.

UNIT - IV SOLID WASTE AND DISASTER MANAGEMENT 6

Solid waste management: Introduction, types, effects on human beings and disposal management.

Disaster management: Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters, case studies– roles and responsibilities of Government and community.

UNIT - V HUMAN POPULATION AND SOCIAL ISSUES 6

Population growth, population explosion – family welfare programme – women and child welfare – human rights – value education – sustainable development – resettlement and rehabilitation – waste land reclamation – role of information technology in environment and human health. Debate on women and child welfare.

TOTAL: 30 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the environment, ecosystem and their significances. [K2]
- Identify the threats to biodiversity. [K2]
- Describe the sources, effects, control methods of environmental pollution. [K2]
- Explain the knowledge on various natural resources and its effect on environment due to over utilization. [K2]
- Describe the disposal techniques of solid wastes and Record the consequences of natural disasters. [K2]
- Outline the social issues such as welfare, sustainability etc., and to relate with population growth. [K2]

TEXT BOOKS:

1. AnubhaKaushik and Kaushik C.P., Environmental Science and Engineering, New AgeInternational (P) Ltd, Sixth Edition, 2018.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.

REFERENCES:

1. ErachBharucha, “Text book of Environmental Studies”, Universities Press (I) PVT LTD, Hyderabad, 2015.
2. G. Tyler Miller and Scott E.Spoolman, “Environmental Science”, Cengage Learning India PVT, LTD, Delhi, 2014.
3. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd edition, Pearson Education, 2004.

20CS404	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- 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 study various operating systems like Distributed OS, Real-Time OS and basic concepts of virtualization

PRE-REQUISITE: NIL

UNIT-I OPERATING SYSTEM OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System, Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Processes - Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication.

LAB COMPONENT 6

1. Basic Linux Commands and Overview
2. Write Shell Script to experiment with system calls like fork, grep, pipe, open, create read, write, etc.

UNIT-II PROCESS MANAGEMENT AND CONCURRENCY CONTROL 9

CPU Scheduling - Scheduling criteria, Scheduling algorithms; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Semaphores, Classic problems of synchronization, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

LAB COMPONENT 6

1. Implementation of FCFS, SJF, Round Robin, Priority Scheduling Algorithms and analyzing their performance
2. Implement semaphore for solving producer-consumer problem using threads.
3. Simulate situations for testing Deadlock avoidance algorithm.

UNIT - III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory.

LAB COMPONENT 6

1. Implementation Of FIFO, LRU, Optimal Page Replacement Algorithms

UNIT - IV MASS STORAGE AND FILE SYSTEMS 9

Mass Storage system – Disk Structure, Disk Scheduling and Management; File-System- File concept, Access methods, File Sharing and Protection, Allocation Methods, Free Space Management; Directory- Structure, organization, implementation.

LAB COMPONENT **6**

1. Implementation of Directory organizations like – single, two-level, hierarchy

2. Implementation of Allocation methods used for files like – sequential, indexed, linked

UNIT - V ADVANCED OPERATING SYSTEMS AND VIRTUALIZATION 9

Basics of Network Operating System, Server Operating System, Real Time Operating System and Distributed operating systems - Virtual machines- supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another.

LAB COMPONENT **6**

1. Case Study to Learn Virtualization platforms – VM Ware, etc.

2. Installation of Raspbian OS in Raspberry pi

3. Simple C programs to execute OS services using Raspberry pi.

TOTAL: 75 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply the basic functions of Operating System and Process communications. [K3]
- Analyze the performance of CPU scheduling algorithms specifically FCFS, SJF, Priority and Round Robin. [K4]
- Apply various process synchronization methods and deadlock avoidance algorithm for a given scenario. [K3]
- Develop memory management schemes using paging and segmentation. [K3]
- Demonstrate various file allocation methods and directory structures. [K3]
- Classify different operating systems based on application requirements. [K3]
- Make use of virtualization platform to build virtual machines. [K3]

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, — Operating System Concepts, 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.

REFERENCES:

1. RamazElmasri, A. Gil Carrick, David Levine, — Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
2. AchyutS.Godbole, AtulKahate, — Operating Systems‖, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, Pearson Publications, 2014.

20CS4L1 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To write and debug Database commands.
- To implement advanced query in Database tool.
- To use functions and procedures for implementing simple logics in Database.
- To design real time applications using front end tool and Database.
- To implement Database connectivity for real time application.

LIST OF PROGRAMS

13. Data Definition and Data Manipulation Language Commands.
14. Data Control and Transaction Control Language Commands.
15. Aggregate Functions and Set Operations.
16. Nested Subqueries and Join Queries.
17. Views, Indexes and Synonyms.
18. Study of PL/SQL programs
19. PL/SQL - procedures
20. PL/SQL - Functions
21. PL/SQL - Triggers
22. PL/SQL - Cursor
23. Front end application development – Create Forms, Menu and Reports.
24. Implementation of Database Connectivity

PLATFORM NEEDED: Oracle/Mysql/Visual Basics/Netbeans IDE

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop simple Database using DDL, DML and TCL commands. [K3]
- Construct a Relational Database for real time application through Database constraints. [K3]
- Make use of subqueries and join queries to derive and execute complex queries. [K3]
- Develop PL/SQL programs to implement simple logics using Stored Procedure, Functions, Triggers and Cursor. [K3]
- Develop a frontend application to display forms, menu and reports. [K3]
- Model real time applications with Database Connectivity. [K3]

20HS4L2 PROFESSIONAL COMMUNICATION LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVES:

- This course is framed for imparting practical approach in learning and enhancing communication skill among engineering students.
- Students will be able to identify appropriate expressions in speaking and writing.
- Students will also be able to understand this style and perfection of language in reading and listening various contexts of engineering and technology.
- The course will benefit to the students to gain confidence for every day communication, technical presentation, aptitude test and interviews.

UNIT -I LISTENING **6**

Listen And Take Notes of Lecture, Talks on Engineering and Technology, Developing effectiv listening skills, Barriers to Effective listening, Listening Self-Introduction Videos.

UNIT -II SPEAKING **6**

Self-Introduction, Introduce oneself to the audience, Sharing memorable incidents, Individua presentation practice, Introduction to Group Discussion, GD strategies- activities to improve G skills.

UNIT -III READING **6**

Reading Online Blogs, Reading Advertisement in Online, Newspaper archives to readinç Reading FAQ's related to job Interview, General awareness of current affairs.

UNIT -IV WRITING **6**

Process Description, Narrating experience, Creating Email blogs, Review Writing – Book Movies And Journals, Job Application Letter, Resume Writing.

UNIT -V SUMMARIZING ACTIVITIES **6**

Reading -cloze exercise, Identifying redundant words, Jargon words, Foreign words, Technic terms Writing- Error free sentence, Essay writing on various levels – basic, middle an advanced, Preparing job application letter and Resume Speaking -Face to face conversation o specific topics, Answering Interview Questions, Panel Interview, Participating in Grou Discussion, Technical Presentation.

TOTAL: 30 PERIOD

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Listen and respond global English appropriately
- Participate in group discussion towards placement drive
- Make effective presentations of technical topics
- Communicate with effective technological skills
- Read and write the context cohesively and coherently and organized ideas logically workplace situations
- Attend job interviews and be successful in them

TEXT BOOKS:

1. E.Sureshkumar et al. Communication for Professional Success. Orient Blackswar Hyderbad, 2015.

REFERENCES:

1. Butterfield, Jeff Soft Skills of Everyone, Cengage Learning: New Delhi,2015.
2. Interact English Lab Manual For Undergraduate Students, Orient BlackSwan: Hyderbad, 2016.
3. Raman, Meenakshi and Sangeetha Sharma. Professional Communication. Oxford university press: Oxford,2014.
4. Hariharaneta. Soft Skills. MJP Publishers : Chennai,2010.

20CS501	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the concept of layering and functions of each layers of the protocol suits
- To be familiar with the components required to build different types of networks
- To learn concepts related to network addressing and routing
- To familiarize the functions and protocols of the layer of Transport layer
- To understand the working of various application layer protocols

PRE-REQUISITE: NIL

UNIT – I INTRODUCTION TO NETWORKS 8

Network Introduction: Evolution of Computer Networks, Classification of computer Networks LAN, WAN, MAN, Software Defined Networks (SDN), Network Topology: BUS, STAR, RING, MESH, OSI Layered Architecture, TCP/IP Protocol Suite.

UNIT – II MEDIA ACCESS & INTER NETWORKING 12

Medium Access Control Techniques: Random, Round Robin, Reservation: ALOHA Pure and Slotted, CSMA/CD-CSMA/CA- Ethernet-Token Ring-Token Bus-ARQ 3 Types, Data Link Layer design issues: Error Detection Codes, Parity Check, Checksum Error Correction Codes, Hamming codes, IEEE Standards: Bluetooth (802.15), Basic Internetworking: IP -CIDR-ARP - DHCP -ICMP.

UNIT – III NETWORK DEVICES AND NETWORK LAYER 8

Network Devices: Router, Switch, HUB, Bridge, Routing: Static Routing, Introduction to dynamic Routing, Categories of Routing – RIP v1 and RIP v2-OSPF-DSDV,IPV6 Addressing-IPV6 Protocol.

UNIT – IV TRANSPORT LAYER 9

Overview of Transport layer: UDP - Reliable byte stream (TCP), Connection Management: Flow control – Retransmission – TCP Congestion control, Congestion avoidance: DECbit - RED.

UNIT – V APPLICATION LAYER 8

Traditional applications: SSH – HTTP – FTP –DNS – SNMP- Telnet

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the organization of computer networks with the concept of layered approach. [K2]
- Classify various Media Access Control Protocols techniques. [K3]
- Apply the error detection and error correction methods for bit streams. [K3]
- Utilize various types of routing techniques to forward packets. [K3]
- Describe the mechanisms involved in transport layer. [K2]
- Classify different application layer protocols. [K3]

TEXT BOOK:

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

2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

REFERENCES

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

20CS503	THEORY OF COMPUTATION	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To know the relation between regular language, context free language and corresponding recognizers.

PRE-REQUISITE:

Course code: 20BS303

Course Name: Discrete Mathematics

UNIT – I FINITE AUTOMATA 12

Introduction - Basic mathematical notation and techniques – Basic definitions: Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Language acceptance – Design of FA - Equivalence of NFA and DFA - Finite Automata withh epsilon transitions - Equivalence of NFA's with and without epsilon transitions.

UNIT – II REGULAR EXPRESSIONS AND LANGUAGES 12

Regular Languages - Regular Expression - Equivalence of finite Automaton and regular expressions: Finite Automata into Regular Expression – Regular Expression into Finite Automata - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

UNIT – III CONTEXT FREE GRAMMAR AND LANGUAGES 12

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages – Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG: Elimination of Null productions - Unit productions - Useless symbols – Normal Forms of CFG: Chomsky Normal Form (CNF) – Greiback Normal Form (GNF) – Problems related to CNF and GNF.

UNIT – IV PUSHDOWN AUTOMATA 12

Definition of the Pushdown Automata (PDA) – Instantaneous descriptions of PDA – Languages of a Pushdown Automata – Design of PDA for language sets - Equivalence of Pushdown Automata and CFG - Deterministic Pushdown Automata.

UNIT – V TURING MACHINE 12

Definition and representation of Turing machine – Language acceptance by Turing Machine - Computable languages and functions – Programming techniques for Turing machine construction – Recursive and Recursive enumerable languages - Properties of recursive and recursive enumerable languages - A language that is not Recursively Enumerable (RE) - Post's Correspondence Problem.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Construct finite automata for different regular expressions and languages. [K3]
- Develop context free grammar for the given languages. [K3]
- Transfer the context free grammar into its various normal forms. [K3]
- Develop Pushdown automata for the given languages. [K3]
- Construct Turing machine model for solving simple computational problems. [K3]
- Illustrate recursive and recursive enumerable languages. [K3]

TEXT BOOKS:

4. J.E. Hopcroft, R. Motwani and J.D. Ullman, “Introduction to Automata Theory, Languages and Computations”, 3rd Edition, Pearson Education, 2013.
5. J. Martin, “Introduction to Languages and the Theory of computation”, 4th Edition, Tata Mc Graw Hill, 2011.

REFERENCES:

1. Michael Sipser, “Introduction to the Theory of Computation”, Third Edition, Cengage Learning, 2012.
2. H.S Behera, Janmenjoy Nayak and Hadibandhu Pattnayak, "Formal Languages and Automata Theory", Vikas Publishing House Pvt. Ltd, 2014.
3. Thomas A. Sudkamp,” An Introduction to the Theory of Computer Science, Languages and Machines”, Third Edition, Pearson Education, 2007.
4. Peter Linz, " An introduction to formal languages and Automata", 6th edition, Jones & Bartlett Learning, 2016.

20MC501	CONSTITUTION OF INDIA	L	T	P	C
		1	0	0	0

OBJECTIVES:

- To enable the student to understand the importance of the constitution
- To understand the structure of executive, legislature, and judiciary
- To understand the philosophy of fundamental rights, duties and Emergency Provisions.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court.
- To understand the central and state relation financial and administrative.

PRE-REQUISITE: NIL

UNIT – I INTRODUCTION 3

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features.

UNIT – II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 3

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

UNIT – III ORGANS OF GOVERNANCE 3

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions.

UNIT – IV EMERGENCY PROVISIONS 3

Emergency Provisions - National Emergency, President Rule, Financial Emergency

UNIT – V LOCAL ADMINISTRATION 3

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

TOTAL: 15 periods

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain history and philosophy of Indian Constitution. [K2]
- Explain the premises informing the twin themes of liberty and freedom from a civil rights perspective. [K2]
- Explain the powers and functions of Indian government. [K2]
- Explain the emergency rules of Indian Constitution. [K2]
- Explain the structure and functions of local administration. [K2]

TEXT BOOKS:

1. Rajesh Kumar, Universal's Guide to the Constitution of India. Universal Law Publications, 2016.
2. D.C. Gupta, Indian Government and Politics, Vikas Pub,2018.

REFERENCES:

1. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes, Universal Law Publication
2. J.C. Johari, Indian Government and Politics, Shoban Lal & Co, 2012.
3. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press, 2012.

20CS504	SOFTWARE ENGINEERING	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To design with static and dynamic UML diagrams.
- To learn various testing and project management.

PRE-REQUISITE: NIL

UNIT – I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Process Models – Introduction to Agility - Agile Process - Extreme programming - XP Process.

LAB COMPONENT 6

3. Write down the problem statement for a suggested system of sample projects.

UNIT - II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management - Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

LAB COMPONENT 6

4. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system
5. Develop Data Flow Diagram (DFD) model (level-0, level-1) of the project

UNIT - III SOFTWARE DESIGN AND UML MODEL 9

Design Engineering: Design process and design quality, design concepts, the design model. Creating a Architectural Design: Architectural styles, Architectural Design, Architectural Mapping using Data Flow. Conceptual model of UML: basic structural modeling, use case diagram, class diagrams, sequence diagrams, collaboration diagrams, state chart diagram, activity diagram, component diagrams, deployment diagram

LAB COMPONENT 12

2. Identify use cases to develop the Use Case model and model the class diagram.
3. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
4. Draw relevant State Chart and Activity Diagrams for the same system.
5. Implement the system as per the detailed design

UNIT - IV SOFTWARE TESTING 9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging.

LAB COMPONENT **6**

1. Test the software system for all the scenarios identified as per the use case diagram

UNIT - V SOFTWARE PROJECT MANAGEMENT **9**

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model –Risk Management – Identification, Projection -RMMM Plan.

TOTAL: 75 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply the software process models and Identify the problem statement for a suggested system of project. [K3]
- Build the SRS and DFD using software requirements for classical analysis. [K3]
- Examine the identified objects and functionality of the system using USE CASE and CLASS model. [K4]
- Demonstrate the code from objects interaction and implementation models for the system. [K3]
- Illustrate the developed code using testing strategies. [K3]
- Calculate the software project effort and cost. [K3]

TEXT BOOKS:

3. Roger S. Pressman, — Software Engineering – A Practitioner's Approach, Eighth Edition, Mc Graw-Hill International Edition, 2015
4. Ian Sommerville, — Software Engineering, 10th Edition, Pearson Education Asia, 2016.
5. Craig Larman, — Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.

REFERENCES:

1. Rajib Mall, — Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited, 2009.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999.
3. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.

20EC512 EMBEDDED SYSTEM DESIGN AND IoT

L	T	P	C
3	0	2	4

OBJECTIVES:

- To educate concepts of microcontroller design.
- To learn the architecture of ARM processor and peripherals.
- To learn Smart Objects and IOT Architectures
- To learn about various IOT-related protocols
- To develop IOT infrastructure for popular applications

PRE-REQUISITE: NIL

UNIT – I INTRODUCTION TO 8051 MICROCONTROLLER 9

Introduction to Microcontrollers - Architecture of 8051 - Pin Description - Instruction set - Addressing Modes - Assembly language programming - Software Development tools: IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging.

LAB COMPONENT 6

1. Arithmetic Operations of 8051 Microcontroller
2. Interfacing ADC and DAC using 8051.

UNIT - II ARM PROCESSOR AND PERIPHERALS 9

Introduction to embedded systems – built in features for embedded target architecture – selection of embedded processor – ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART.

LAB COMPONENT 6

1. Study of ARM evaluation system
2. Interfacing LED and PWM.
3. Interfacing real time clock and serial port.

UNIT - III INTRODUCTION TO IoT 9

Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOT WF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -– Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

LAB COMPONENT 12

1. Familiarization of Rasperry Pi/Arduino kit and perform necessary software installation.
2. To interface LED with Rasperry Pi/Arduino to turn ON LED for 1second after every 2 Seconds.
3. To interface motor with Rasperry Pi/Arduino.

UNIT - IV IoT PROTOCOLS 9

IOT Access Technologies: Physical Layer, MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoraWAN – Network Layer: Constrained Nodes and Constrained Networks – IP versions, Optimizing IP for IOT: From 6LoWPAN to 6 Lo.

LAB COMPONENT 6

1. To interface sensor with Rasperry Pi/Arduino to print temperature readings.
2. To interface Bluetooth with Rasperry Pi to send sensor data to smartphone using Bluetooth.

UNIT - V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

IoT Levels and Deployment templates, IoT Application : Home Automation, Smart Cities, Environment Parking, Energy, Retail, Logistics, Agriculture, Industry, Health and Life style.

LAB COMPONENT 6

1. To interface WiFi module with Rasperry Pi.
2. To interface camera/IR Sensor with Rasperry Pi.
3. To study of upload temperature data to Thingspeak Cloud using Rasperry Pi.

TOTAL: 75 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Use the 8051 Microcontroller to write Assembly Language Programs. [K3]
- Illustrate the ARM Processors Architecture, and Instruction Set for programming the LPC 2148. [K3]
- Apply the concept of ARM Processor for interfacing peripherals to control a system. [K3]
- Illustrate the concept of Internet of Things with the support of IoT Architectural Model. [K3]
- Demonstrate IoT with the support of Raspberry Pi/Arduino. [K3]
- Classify different IoT Protocols for its implementation in the real world scenario. [K3]
- Utilize the IoT concepts for solving the Industrial Applications. [K3]

TEXT BOOKS:

1. Marilyn Wolf, “Computers as Components: Principles of Embedded Computing System Design”, Morgan Kaufmann Publisher, Third Edition, 2012.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, — IOT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things‖, Cisco Press, 2017

REFERENCES:

1. LylaB.Das, Embedded Systems:An Integrated Approach‖ Pearson Education, 2013.
2. M. Senthilkumar, M.Saravanan, S.Jeevananthan, Microprocessors and Microcontrollers-Oxford Universityu Press 2013.
3. Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015Pearson Education, 2007.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things – Key applications and Protocols, Wiley, 2012 .
5. Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence‖, Elsevier, 2014.

20CS5L1	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- 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 TCP dump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route 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. Write a program to implement RPC (Remote Procedure Call)
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of error correction code (like CRC).
10. Performance evaluation of Routing protocols using Simulation tool.
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer**.**
    a) Link State routing
    b) Flooding
    c) Distance vector

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

1. Windows 7 or higher
2. C / C++ / Java / Python / Equivalent Compiler
3. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Demonstrate the different Network Commands. [K3]
- Develop Simple Socket Programming. [K3]
- Develop the code for Data Link Layer Protocol Simulation. [K3]
- Examine Congestion Control Algorithm using Network Simulator. [K3]
- Develop the code for Transport Layer Protocol Simulation. [K3]
- Illustrate the performance of various network Routing Protocols. [K4]

20CS602 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand OSI security architecture and classical encryption techniques.
- To understand the Symmetric cryptography techniques.
- To understand the public key cryptography Systems.
- To understand the various message authentication functions.
- To understand the different level of security and services.

PRE-REQUISITE:

Course Code : 20CS501
Course Name : Computer Networks

UNIT – I INTRODUCTION 10

Security trends - Legal, 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.

UNIT – II SYMMETRIC CRYPTOGRAPHY 8

Mathematics Of Symmetric Key Cryptography: Algebraic structures - Modular arithmetic-Euclid‘s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields-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 - RC4 – Key distribution.

UNIT – III PUBLIC KEY CRYPTOGRAPHY 9

Mathematics Of Asymmetric Key Cryptography: Primes – Primality Testing – Factorization – Euler‘s totient function, 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 arithmetic-Elliptic curve cryptography.

UNIT – IV MESSAGE AUTHENTICATION AND INTEGRITY 9

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

UNIT – V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – Malware, Ransomware – Viruses – Firewalls.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 7th Edition, 2017.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2nd Edition 2017.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
4. Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000
5. Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
6. Douglas R Simson “Cryptography – Theory and practice”, First Edition, CRC Press, 1995.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the fundamental theory of cryptography and OSI security architecture in networks.[K3]
- Apply the classical encryption techniques for network security. [K3]
- Illustrate the different cryptographic operations of symmetric cryptographic algorithms
- Illustrate the different cryptographic operations of public key cryptography [K3]
- Apply the various security mechanisms to build different Authentication services.
- Explain the various Security practices and System security standards. [K2]

20CS603	COMPILER DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

PRE-REQUISITE:

Course Code : 20CS503
Course Name : Theory of Computation

UNIT – I INTRODUCTION TO COMPILERS 9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA

UNIT – II SYNTAX ANALYSIS 12

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR(0) Item - Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT – III INTERMEDIATE CODE GENERATION 8

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT – IV RUN-TIME ENVIRONMENT AND CODE GENERATION 8

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

UNIT – V CODE OPTIMIZATION 8

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks-Global Data Flow Analysis - Efficient Data Flow Algorithm

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Construct lexical analyzer for a sample language. [K3]
- Apply different parsing algorithms to develop the parsers for a given grammar. [K3]
- Describe the syntax-directed translation and run-time environment. [K2]
- Develop code optimization techniques for source program. [K3]
- Build a simple code generator for source program. [K3]
- Develop a scanner and a parser using LEX and YACC tools. [K3]

TEXT BOOK:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles,Techniques and Tools, Second Edition, Pearson Education, 2013.
2. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.

REFERENCES

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Allen I. Holub, Compiler Design in C, Prentice-Hall Software Series, 1993.

20CS604	MACHINE LEARNING	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the need for machine learning for various problem solving.
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning.
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving.

PRE-REQUISITE: NIL

UNIT - I SUPERVISED LEARNING: REGRESSION **9**

Paradigms of Machine Learning - Examples- Types of Learning - Types of supervised learning - Introduction to Regression - Linear regression - Geometrical Interpretation - Iterative solution: Gradient descent - Performance metrics of machine learning - Python libraries suitable for Machine Learning.

LAB COMPONENT

1. Installing Anaconda-Jupiter Notebook-Learn Python ML Packages.
2. Implement data loading methods - understanding data with statistics, visualization - Data Preprocessing - Data Labeling. **6**

UNIT - II SUPERVISED LEARNING: CLASSIFICATION **9**

K-Nearest Neighbour Classification - Distance metric and Cross-Validation - Computational efficiency of KNN - Introduction to Decision Trees - Entropy and Information Gain - Naive Bayes classifier - Perceptron and its learning algorithm - Support Vector Machine.

LAB COMPONENT

3. Logistic Regression Implementation: Implement the standard Logistic Regression model generally used for classifying data into binary classes such as pass/fail, win/lose, alive/dead or healthy/sick.
4. Decision Tree Implementation: Implement the standard Decision Tree Class used for classifying data into various classes using a tree-like model of decisions and their possible consequences. **6**

UNIT - III UNSUPERVISED LEARNING **9**

K-means Clustering - LLyod's Algorithms - Convergence and Initialization - Covariance Matrix and Eigen direction - PCA

LAB COMPONENT

5. Tumor Prediction: Detect Brain tumor images from the given data set.
6. Dimensionality Reduction: Analyze PCA for the appropriate data set. **6**

UNIT - IV RECOMMENDER SYSTEMS **9**

Recommender Systems - Introduction - Non-Personalized Recommender Systems - Content-Based Recommender Systems - Recommender System Evaluation.

LAB COMPONENT

7. Movie/Book/Any Product recommendation by using content based filtering. **6**

UNIT - V CASE STUDIES **9**

Text Classification: Build a classifier model using Naive Bayes algorithm to predict the topic of an article present in a newspaper. **Twitter Sentiment Analysis:** Analyse the tweets posted on twitter to predict the sentiment of the tweet i.e. positive, negative or neutral.

LAB COMPONENT

8. Mini Project **6**

TOTAL: 75 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify the category of the learning problem, and measure its performance like recall, precision etc. [K3]
- Apply the classification algorithms like K-NN, Decision Tree, Naive Bayes, Logistic Regression to label the data set. [K3]
- Apply unsupervised algorithms namely K-means and PCA to cluster the given data set. [K3]
- Apply Content-based recommender systems and Collaborative Filtering to implement recommender systems. [K3]
- Identify any societal problem and examine by applying acquired knowledge of machine learning in order to develop a mini project [K4]
- Combine all the modules of mini project through effective team work after efficient testing, and compile a detailed report. [K4]

TEXT BOOKS:

1. Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, “Mathematics for Machine Learning”, Cambridge University Press, 2020.
2. Gopal sakarkar, gaurav patil and prateek dutta, “Machine Learning Algorithms using Python Programming”, Nova Science Publishers, Newyork, 2021.

REFERENCES:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2013.
2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, CRC Press, 2009.
3. Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
4. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 2004.

20CS605	WEB TECHNOLOGY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To be familiar with web pages design using HTML, XML, Style Sheets.
- To be exposed to creation of user interfaces using Java Frames & Applets.
- To be able to create dynamic web pages using server side scripting.
- To learn to write server side applications.
- To be familiar with PHP & AJAX programming

PRE-REQUISITE: NIL

UNIT – I WEBSITE BASICS, HTML 5, CSS 9

Web Essentials: Clients, Servers and Communication – The Internet – HTML5 – Tables – Lists – Image – HTML5 control elements –Drag and Drop – Audio – Video controls - CSS – Inline, embedded and external style sheets

LAB COMPONENT 6

1. Create Simple website with 5 pages (Home, About, Gallery, Course, Contact). Gallery and contact page with contact us form is must.
2. Create a web page with the following using HTML
   i) To embed an image map in a web page ii) To fix the hot spots iii) Show all the related information when the hot spots are clicked.
3. Create a web page with all types of Cascading style sheets.

UNIT - II CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to JavaScript, Regular Expressions - Exception Handling - Validation-Built-in objects-Event Handling-DHTML with JavaScript.

LAB COMPONENT 6

1. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
2. Client Side Scripts for Validating Web Form Controls using DHTML

UNIT - III JAVA, JAVA SERVLET, JSP 9

Applet : Graphics programming- Frame — Components- layout management, Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions – Database Connectivity: JDBC program example – JSP:Creating HTML forms by embedding JSP code.

LAB COMPONENT 6

1. Write programs in Java to create applets incorporating the following features Create a color palette with matrix of buttons Set background and foreground of th control text area by selecting a color from color palette. In order to select Foregroun or background use check box control as radio buttons To set background images
2. Write programs in Java using Servlets: To invoke servlets from HTML forms T invoke servlets from Applets.
3. Write programs in Java to create three-tier applications using JSP and Databases fo conducting on-line examination for displaying student mark list. Assume that studer information is available in database which has been stored in a database server.

UNIT - IV PHP and XML 9

An introduction to PHP- Built-in functions-Form Validation- Regular Expressions - File

handling – Cookies - Connecting to Database.
XML: Basic XML- Document Type Definition- XML Parsers and Validation, XSL and XSLT Transformation.

LAB COMPONENT **6**

1. Programs using XML – Schema – XSLT/XSL
2. Programs using PHP for real time applications

UNIT - V AJAX AND WEB SERVICES **9**

AJAX: Ajax Client Server Architecture-XML Http Request Object, Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL) - Consuming a web service.

LAB COMPONENT **6**

1. Programs using AJAX .
2. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base

TOTAL: 75 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Use HTML / CSS tag to create static and dynamic web pages. [K3]
- Apply the Java script to design a simple application and form validation. [K3]
- Explain the Java Servlet architecture and database connectivity. [K2]
- Build an applications using server side script languages. [K3]
- Develop web related applications using PHP and XML. [K3]
- Develop an interactive web service using AJAX. [K3]

TEXT BOOKS:

1. Deitel and Deitel and Nieto, — Internet and World Wide Web - How to Program,Prentice Hall, 5th Edition, 2011.

REFERENCES:

1. Stephen Wynkoop and John Burke —Running a Perfect Website, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, —Web Technologies A Computer Science Perspective, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.
5. UttamK.Roy, —Web Technologies, Oxford University Press, 2011.

20CS6L1	MOBILE APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Write a mobile application that creates alarm clock
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project)

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent
HARDWARE**:** Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop mobile applications using GUI and Layouts. [K3]
- Develop mobile applications using Event Listener. [K3]
- Develop mobile applications using Databases. [K3]
- Develop mobile applications using Notification Manager [K3]
- Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS. [K3]
- Create own mobile app for simple needs. [K6]

20CS701	DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of Data Analytics.
- To learn the data preprocessing techniques
- To Handle missing data in the real world data sets by choosing appropriate methods
- To apply the classification and clustering algorithms
- To apply the intelligent Data Analysis Techniques
- To gain knowledge on Hadoop related tools

PRE-REQUISITE:
Course Code: 20CS604
Course Name: Machine Learning

UNIT - I INTRODUCTION 9

Knowledge domains of Data Analysis, Understanding structured and unstructured data, data analytic tools, applications of data analytics, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.

UNIT - II DATA PREPROCESSING 9

Data Preprocessing : Data Cleaning – Data Integration - Data Reduction – Data Transformation Handling Missing Data: Introduction to Missing data, Traditional methods for dealing with missing data, Maximum Likelihood Estimation – Basics, Missing data handling, improving the accuracy of analysis

UNIT - III CLASSIFICATION AND CLUSTERING 9

Statistical Methods: Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics.

UNIT - IV INTELLIGENT DATA ANALYSIS 9

Analysis of Time Series : Linear and Non Linear Systems Analysis, Neural Networks : Fundamentals – Back Propagation Neural Network – Fuzzy Logic : Basics of Fuzzy Sets and Fuzzy Logic - Genetic Algorithms.

UNIT - V HADOOP FRAMEWORKS 9

HADOOP – HDFS concepts, Algorithms using MapReduce, Introduction to NoSQL,Cassandra, Pig, Hive.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the basic concepts of Data Analytics. [K2]
- Describe the Data Analysis preprocessing Techniques. [K2]
- Explain about how missing data will be handled during preprocessing
- Apply the Classification and Clustering algorithms for real time applications. [K3]
- Apply intelligent analytics techniques like neural networks, fuzzy and genetic algorithms for real time analytics applications. [K3]
- Explain the Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics. [K2]

TEXT BOOKS:

1. John Wiley & Sons, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services (Editor),2015
2. Craig K. Enders, “Applied Missing Data Analysis”, The Guilford Press, 2010.
3. Michael Berthold, David J. Hand, —Intelligent Data Analysis, Springer, Second Edition, 2007.

REFERENCES:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley, 2012
2. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.

20CS702	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION **9**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT - II PROBLEM SOLVING METHODS **8**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT - III KNOWLEDGE REPRESENTATION **9**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT - IV SOFTWARE AGENTS **9**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems

UNIT - V APPLICATIONS **9**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the concept of intelligent agent and various problem solving approaches. [K3]
- Determine the appropriate search algorithms for any AI problem. [K3]
- Discuss the suitable agent strategy to solve a given problem. [K3]
- Illustrate first order and predicate logic for a given problem. [K3]
- Explain software agents components to solve a problem. [K3]
- Summarize the different applications that use Artificial Intelligence. [K3]

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2011.
2. I. Bratko, Prolog: Programming forArtificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFRENCES:

1. M. TimJones, ArtificialIntelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J.Nilsson, The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish,Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, Multi Agent Systems, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

20CS7L1	DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To implement numerical and statistical analysis on various data sources
- To apply data pre-processing techniques
- To implement linear regression technique on numeric data for prediction
- To execute classification and clustering algorithms on different datasets
- To implement and evaluate the performance of KNN algorithm on different datasets

PRE-REQUISITE: NIL

1. Write a Program to perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.
2. Implement a program for statistical operations such as Mean, Median, Mode and Standard deviation.
3. Write a Program to Read and Write operations on different types of Files (csv, xls, txt etc).
4. Implement data pre-processing operations
    a. Handling Missing data
    b. Min-Max normalization
5. Write a Program to implement Principal Component Analysis for House dataset.
6. Implement simple linear regression program to predict the future values and analyze the goodness of fit.
7. Write a Program to implement Simple Naïve Bayes classification algorithm for predicting the weather forecast.
8. Write a Program to implement K-Means clustering operation and visualize for iris dataset.
9. Write a Program to diagnose any disease using KNN classification and plot the results.
10. Create the following visualization plots for the movie recommendations system
    a. Bar, Pie, Box and scatter plot.
    b. Find the outliers using plot.
11. Mini Project

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Software Require

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Build numerical and statistical analysis on various data sources. [K3]
- Apply data preprocessing and dimensionality reduction methods on raw data [K3]
- Apply the different regression technique on given dataset. [K3]
- Apply the classification and clustering algorithms on different datasets. [K3]
- Apply appropriate visualization techniques for presenting the data. [K3]
- Solve the real world data analysis problems. [K4]

20CS7L2	MINI PROJECT	L	T	P	C
		0	0	4	2

OBJECTIVES:

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The student in a group of 3 to 4, works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The first and second review will be evaluated by a thee member internal committee. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on third review's oral presentation and the submission of project report, before the internal examiners which was constituted by the Head of the Department.

TOTAL:60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify a problem and its applicability along with suitable domain. [K3]
- Analyze and formulate project modules and identified constraints based on environmental and societal impact. [K4]
- Select efficient tools and methods for designing and implementing project modules. [K4]
- Propose an effective solution for the problem identified with the help of developed methodology and tools. [K6]
- Summarize all the modules through effective integration and testing. [K5]
- Illustrate the completed task and compile the project report. [K4]

20CS8L1	PROJECT WORK	L	T	P	C
		0	0	20	0

OBJECTIVES:

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify a domain and problem by applying required domain knowledge. [K3]
- Analyze and categorize executable project modules including real time project constraints based on environmental and societal impact. [K4]
- Examine efficient tools and methods for designing and implementing project modules. [K4]
- Develop effective solution for the problem identified with the help of proposed methodology and tools. [K6]
- Assess all the modules through effective integration, optimization and testing. [K5]
- Elaborate the completed task and compile the project report. [K4]

20CSV11	CLOUD COMPUTING TECHNIQUES	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment.

PRE-REQUISITE: NIL

UNIT - I CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE 6

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.

LAB COMPONENT: 6

1. Install Virtualbox /VMware / Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.

UNIT - II VIRTUALIZATION BASICS 6

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

LAB COMPONENT: 6

1. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs

UNIT - III VIRTUALIZATION INFRASTRUCTURE AND DOCKER 6

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

LAB COMPONENT: 6

1. Find a procedure to transfer the files from one virtual machine to another virtual machine.
2. Creating and Executing Your First Container Using Docker.

UNIT - IV CLOUD DEPLOYMENT ENVIRONMENT 6

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

LAB COMPONENT: 6

1. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
2. Use the GAE launcher to launch the web applications.

UNIT - V CLOUD SECURITY 6

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architectureand Practice.

LAB COMPONENT: 6

1. Install Hadoop single node cluster and run simple applications like word count.
2. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the cloud architecture, cloud deployment & service models and challenges of cloud design. [K2]
- Apply the concept of virtualization and its types. [K3]
- Experiment with virtualization of hardware resources. [K3]
- Use Docker in cloud environment. [K3]
- Develop and deploy services on the cloud and set up a cloud environment. [K3]
- Explain security challenges in the cloud environment. [K2]

TEXT BOOKS:

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

REFERENCES:

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

20CSV21 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

PRE-REQUISITE:

Course Code : 20CS402
Course Name : Database Management Systems

UNIT - I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP

UNIT - II DATA MINING - INTRODUCTION 9

Introduction– Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns. Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT - III FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT - IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines —Clustering Techniques – Cluster Analysis- Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis

UNIT - V DATA MINING TOOLS 9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Data mining tools: WEKA, Hadoop, Spark, R tool – Learning algorithms, Clustering algorithms, Association–rule learners.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss data warehouse system and business analysis with OLAP tools. [K2]
- Describe various pre-processing and visualization techniques for data analysis. [K2]
- Apply frequent pattern and association rule mining techniques. [K3]
- Select and apply an appropriate classification algorithm for labelled data. [K3]
- Apply various clustering techniques for unlabeled data. [K3]
- Apply learning and clustering algorithms using data mining tools. [K3]

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2. Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 5th Reprint 2016.

REFERENCES:

1. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
3. Daniel T.Larose, “Data Mining Methods and Models”, Wiley-Interscience, 2006.

20CSV31	CLOUD SERVICE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

PRE-REQUISITE : NIL

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 Life Cycle, 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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the fundamentals of cloud service management. [K2]
- Describe the cloud service strategies like cloud policy, risk management and change management etc., [K2]
- Explain the life cycle and benchmarks of cloud services. [K2]
- Illustrate deployment and migration of cloud services. [K2]
- Discuss the economic based cloud services. [K2]
- Explain the strong theoretical foundation leading to cloud service governance & measuring the value of cloud-based services. [K2]

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications
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

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.

20CSV41	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

1. To learn the fundamentals of software defined networks.
2. To understand the separation of the data plane and the control plane.
3. To study about the SDN Programming.
4. To study about the various applications of SDN

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION TO SOFTWARE DEFINED NETWORK 9

SDN Origins and Evolution – Introduction – Why SDN? - Centralized and Distributed Control and Data Planes - The Genesis of SDN

UNIT - II OPEN FLOW AND SDN CONTROLLERS 9

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

UNIT - III DATA CENTERS 9

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT - IV SDN PROGRAMMING 9

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

UNIT - V SDN FRAMEWORK 9

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the key benefits of SDN by separation of Data and Control Planes. [K2]
- Discuss the open flow specification and different controllers of SDN. [K2]
- Describe various Data centers and SDN solutions for the Data Center networks. [K2]
- Develop various applications of SDN using current languages and tools. [K3]
- Explain the various concepts of Network function virtualization in SDN programming. [K2]
- Explain different framework and controller used in SDN. [K2]

TEXT BOOKS:

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehens Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, O'Reilly Mec 2013

REFERENCES:

1. Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, SDN and Open Flow for Beginnersǁ, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

20ADV51 Storage Technologies 3 0 0 3

OBJECTIVES:

- 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

PRE-REQUISITE: NIL

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 5

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.

UNIT- III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 13

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel 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.

UNI - IV BACKUP, ARCHIVE AND REPLICATION 12

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 6

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

OUTCOMES:
On Completion of the course, the students should be able to:

- Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment. [K2]
- Illustrate the usage of advanced intelligent storage systems and RAID. [K3]
- Identify various storage networking architectures – SAN. [K3]
- Apply storage subsystems and Virtualization. [K3]
- Examine the different role in providing disaster recovery and remote replication technologies. [K3]
- Infer the security needs and security measures to be employed in information storage Management. [K4]

TEXT BOOKS

1. EMC Corporation, Information Storage and Management, Wiley, India
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017

REFERENCES:

1. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Second Edition, Wiley, 2009

20ITV63	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations
- To learn different techniques of recommender system

PRE-REQUISITE:NIL

UNIT - I INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The User s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT - II MODELING AND RETRIEVAL EVALUATION 9

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT - III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT - IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT - V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the IR components and Web Search Engine Framework. [K2]
- Discuss various information retrieval models. [K2]
- Apply appropriate method of classification or clustering. [K3]
- Explain the Web Search Engine architecture and ranking functions. [K2]
- Discuss Web Link Analysis algorithms and advanced search. [K2]
- Illustrate recommendation techniques and develop content-based Recommender Systems. [K3]

TEXT BOOKS:

1. Ricardo BaezaYates and Berthier RibeiroNeto, Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, Recommender Systems Handbook, First Edition, 2011.

REFERENCES:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

20SCV71	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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

PRE-REQUISITE: NIL

UNIT - I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Nonrepudiation, 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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the fundamental concepts of cloud security. [K2]
- Illustrate the various cloud security design for cloud. [K3]
- Apply data protection strategies for cloud. [K3]
- Identify the cloud requirements, storage and network access control options. [K3]
- Explain the different types of architectural and design considerations for security in the cloud. [K2]
- Explain the various risks, audit and monitoring mechanisms in the cloud. [K2]

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 Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

20ITV81 REINFORCEMENT LEARNING TECHNIQUES

L	T	P	C
3	0	0	3

Objectives :

- To introduce the fundamentals of Reinforcement Learning
- To illustrate model-based prediction and control using dynamic programming
- To illustrate model-free prediction and control
- To introduce planning and learning with tabular methods
- To explain approximation of a value function

PRE-REQUISITE: NIL

UNIT I INTRODUCTION **9**

Introduction to Reinforcement learning, examples - Elements of reinforcement learning - Limitations and Scope- An extended example - multi-armed bandits - k-armed bandit problem - action-value methods - the 10-armed testbed - incremental implementation - tracking a nonstationary problem - optimistic initial values - upper-confidence-bound action selection - associative search

UNIT II MARKOV DECISION PROCESS AND MODEL-BASED PREDICTION AND CONTROL **9**

Finite Markov Decision Process - The Agent–Environment Interface - Goals and Rewards - Returns and Episodes - Unified Notation for Episodic and Continuing Tasks - Policies and Value Functions - Optimal Policies and Optimal Value Functions - Optimality and Approximation - Dynamic Programming - Policy Evaluation (Prediction) - Policy Improvement - Policy Iteration - Value Iteration - Generalized Policy Iteration - Efficiency of Dynamic Programming - Asynchronous Dynamic Programming

UNIT III MODEL-FREE PREDICTION AND CONTROL **9**

Model-free learning - Model-free prediction - Monte Carlo methods - Monte Carlo Prediction - Monte Carlo Estimation of Action Values - Temporal-Difference Learning - TD Prediction - Advantages of TD Prediction Methods - Optimality of TD(0) - n-step Bootstrapping - n-step TD Prediction - n-step Sarsa - Model-free control - Monte Carlo Control - Monte Carlo Control without Exploring Starts - Off policy learning - Importance sampling - Off-policy Monte Carlo Control - Sarsa: On-policy TD Control - Q-learning: Off-policy TD control

UNIT IV PLANNING AND LEARNING WITH TABULAR METHODS **9**

Models and planning - Dyna: Integrated Planning, Acting and Learning - When the model is wrong - Prioritized Sweeping - Real-time Dynamic Programming - Monte Carlo Tree Search

UNIT V VALUE FUNCTION APPROXIMATION **9**

On-policy Prediction with Approximation - Value Function Approximation - The Prediction Objective (VE) - Stochastic-gradient and Semi-gradient Methods - Linear Methods - Least-Squares TD.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain basic concepts of reinforcement learning. [K2]
- Perform model-based prediction and control using dynamic programming. [K3]
- Apply model-free prediction and control. [K3]
- Comprehend the use of tabular methods. [K2]
- Explain how a value function can be approximated. [K2]
- Apply Stochastic-gradient and Semi-gradient Methods for value function approximation. [K3]

TEXT BOOKS :

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An introduction, 2nd edition, The MIT Press, 2015.
2. Martijn van Otterlo, Marco Wiering, Reinforcement Learning: State-of-the-Art, Springer Verlag Berlin Heidelberg, 2012.
3. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd edition, Pearson, 2015.

REFERENCES:

1. Good fellow, Y. Bengio, A. Courville, Deep Learning, MIT Press Ltd., 2016.
2. Reinforcement Learning with MATLAB, Math Works Inc., 2020.

20CSV12	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

.**PRE-REQUISITE:**

Course Code **:**20CS501

Course Name :Computer Networks

UNIT - I INTRODUCTION **9**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT - II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT - III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS **9**

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT - IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES **9**

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT - V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS **9**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the semantic web concepts and applications of social network analysis. [K2]
- Discuss about modeling and knowledge representation using ontology of social network. [K2]

- Illustrate the extraction and mining communities in web social networks. [K2]
- Illustrate the various methods for predicting human behaviour in social communities. [K2]
- Describe the privacy issues in trust network analysis. [K2]
- Make use of visualization techniques for social network applications [K3]

TEXT BOOKS:

1. Peter Mika, Social Networks and the Semantic Webll, First Edition, Springer 2007.
2. BorkoFurht, Handbook of Social Network Technologies and Applicationsll, 1st Edition, Springer, 2010.

REFERENCES:

1. GuandongXu ,Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web, Springer, 2009.

20ITV22	CYBER PHYSICAL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the nature of continuous and discrete systems
- To develop synchronous and asynchronous model of processes
- To specify both safety and liveness requirements in temporal logic
- To debug the correctness of the protocol using model checking
- To develop and analyze model of timed and hybrid systems
- To understand zero behaviors and its hybrid automata

PRE-REQUISITE: NIL

UNIT I INTRODUCTION 9

Introduction-key features of cyber physical systems- Continuous dynamics: Newtonian mechanics- actor models-properties of systems-feedback control-Discrete dynamics: Discrete systems- Finite state machines

UNIT II SYNCHRONOUS AND ASYNCHRONOUS MODEL 9

Synchronous model: Reactive components-properties of components-composing components- synchronous design, Asynchronous model- asynchronous processes-asynchronous design primitives- coordination protocols.

UNIT III SAFETY AND LIVENESS REQUIREMENT 9

Safety specifications- verifying invariants- Enumerative search- Temporal logic- Model checking- reachability analysis- proving liveness

UNIT IV TIMED MODEL AND REAL-TIME SCHEDULING 9

Timed processes- Timing based protocols: Timing-Based Distributed Coordination-Audio Control Protocol- Timed automata: Model of Timed Automata-Region Equivalence-Matrix-Based Representation for Symbolic Analysis, Real-time scheduling.

UNIT V HYBRID SYSTEMS 9

Classes of Hybrid Systems-Hybrid dynamic models: Hybrid Processes-Process Composition-Zeno Behaviors-Stability- designing hybrid systems- linear hybrid automata

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Ability to understand knowledge, opportunities, challenges and Logical Foundations of Cyber Physical Systems. [K2]
- Ability to develop model for synchronous, asynchronous, continuous and discrete systems. [K2]
- Ability to identify safety specifications and critical properties of Cyber Physical Systems. [K2]
- Ability to design and analyze the stability of hybrid systems. [K2]
- Ability to apply automata for timed systems. [K2]
- Ability to understand Zeno Behaviors. [K2]

TEXT BOOKS

1. Rajeev Alur, Principles of cyber-physical systems, The MIT press, 2015
2. E. A. Lee and S. A. Seshia, Introduction to Embedded Systems - A Cyber-Physical Systems Approach, Lulu.com, Second Edition, 2015.

REFERENCE:

1.Sang C.Suh , U.JohnTanik and John N.Carbone , Applied Cyber-Physical systems, Springer,2014

20SCV32	DIGITAL AND MOBILE FORENSICS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- 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.

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION TO DIGITAL FORENSICS **6**

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.

Lab Component: **6**

1. Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.

UNIT - II DIGITAL CRIME AND INVESTIGATION **6**

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence.

Lab Component: **6**

1. Data extraction from call logs using Sleuth Kit.

UNIT - III DIGITAL FORENSIC READINESS **6**

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.

Lab Component: **6**

1. Data extraction from SMS and contacts using Sleuth Kit.

UNIT - IV iOS FORENSICS **6**

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud.

Lab Component: **6**

1. Install Mobile Verification Toolkit or MVT and decrypt encrypted iOS backups.
2. Process and parse records from the iOS system.

UNIT-V ANDROID FORENSICS **6**

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.

Lab Component: **6**

1. Extract installed applications from Android devices.
2. Extract diagnostic information from Android devices through the adb protocol.
3. Generate a unified chronological timeline of extracted records.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain various digital forensics process. [K2]
- Discuss various digital crime and investigation methods. [K2]
- Illustrate the digital forensic readiness and challenges in digital forensic. [K2]
- Identify and extract digital evidence from iOS devices. [K2]
- Discuss the basics of Android forensics. [K2]
- Apply needed tools in Android devices. [K3]

TEXT BOOKS:

1. Andre Arnes, “Digital Forensics”, Wiley, 2018.
2. Chuck Easttom, “An In-depth Guide to Mobile Device Forensics”, First Edition, CRC Press, 2022.

REFERENCE:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

20ITV42	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

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

PRE-REQUISITE: Nil

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain emerging abstract models for Block chain Technology. [K2]
- Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain. [K3]
- Explain the function of Block chain as a method of securing distributed ledgers, how consensus on their contents is achieved. [K2]
- Apply hyper ledger Fabric and Ethereum platform to implement the Block chain Application. [K3]
- Describe emerging abstract models for Block chain Technology. [K2]
- Apply block chain concepts in supply chain management. [K3]

TEXT BOOKS :

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 University
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
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

20SCV52	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applicatic
- 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

PRE-REQUISITE:NIL

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, SessionManagement-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 ApplicationTesting, 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, etc.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the fundamental concept of Web application security. [K2]
- Discuss Microsoft security development lifecycle, security process and software assurance maturity model. [K2]
- Illustrate API security using session cookies, token based authentication and encryption. [K3]
- Describe various vulnerability assessments tools in web application. [K2]
- Illustrate different type of penetration tests to identify security weaknesses in web application. [K3]
- Explain various hacking techniques and tools in web application. [K2]

TEXT BOOKS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for ModernWeb Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, TheMcGraw-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 TerronWilliams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

20CSV62 ENGINEERING SECURE SOFTWARE SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- 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.

PRE-REQUISITE:NIL

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: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify various vulnerabilities related to memory attacks and low level attacks. [K2]
- Apply security principles in software development and secure design. [K3]
- Discuss the risk factors in software systems and risk assessment techniques. [K2]
- Apply various testing techniques related to software security in the testing phase of software development. [K3]
- Discuss the web application security, bypassing Firewalls and tools for penetration testing. [K2]
- Illustrate secure project management and its framework. [K3]

TEXT BOOKS:

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, “Developing Secure Software”

20SCV82	MALWARE ANALYSIS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To introduce the fundamentals of malware, types and its effects
- To enable to identify and analyse various malware types by static analysis
- To enable to identify and analyse various malware types by dynamic analysis
- To deal with detection, analysis, understanding, controlling, and eradication of malware

PRE-REQUISITE:NIL

UNIT - I INTRODUCTION AND BASIC ANALYSIS **6**

Goals of Malware Analysis, AV Scanning, Hashing, Finding Strings, Packing and Obfuscation, PE file format, Static, Linked Libraries and Functions, Static Analysis tools, Virtual Machines and their usage in malware analysis, Sandboxing, Basic dynamic analysis, Malware execution, Process Monitoring, Viewing processes, Registry snapshots.

Lab Component: **6**

1. Experimentation on Initial Infection Vectors and Malware Discovery
2. Implementation on Sandboxing Malware and Gathering Information From Runtime Analysis

UNIT - II ADVANCED STATIC ANALYSIS **6**

The Stack, Conditionals, Branching, Rep Instructions, Disassembly, Global and local variables, Arithmetic operations, Loops, Function Call Conventions, C Main Method and Offsets. Portable Executable File Format, The PE File Headers and Sections, IDA Pro, Function analysis, Graphing, The Structure of a Virtual Machine, Analyzing Windows programs, Anti-static analysis techniques, obfuscation, packing, metamorphism, polymorphism.

Lab Component: **6**

1. Implementation on Portable Executable (PE32) File Format
2. Implementation on Executable Metadata and Executable Packers

UNIT - III ADVANCED DYNAMIC ANALYSIS **6**

Live malware analysis, dead malware analysis, analyzing traces of malware, system calls, api calls, registries, network activities. Anti-dynamic analysis techniques, VM detection techniques, Evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching

Lab Component: **6**

1. Experimentation on Malware Self - Defense, Compression, and Obfuscation Techniques
2. Experimentation on Malware behaviour analysis

UNIT - IV MALWARE FUNCTIONALITY **6**

Down loaders and Launchers, Backdoors, Credential Stealers, Persistence Mechanisms, Handles, Mutexes, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Lab Component: **6**

1. Experimentation on analyzing Malicious Microsoft Office and Adobe PDF Documents
2. Experimentation on Mobile malware analysis
3. Experimentation on Packing and Unpacking of malware

UNIT - V ANDROID MALWARE ANALYSIS 6

Android Malware Analysis: Android architecture, App development cycle, APKTool, APKInspector, Dex2Jar, JD-GUI, Static and Dynamic Analysis, Case studies.

Lab Component: 6

1. Experimentation on Rootkit AntiForensics and Covert Channels
2. Experimentation on Modern Rootkit Analysis
3. Experimentation on Malware traffic analysis

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the various concepts of malware analysis and their technologies used. [K2]
- Apply the skills necessary to carry out independent analysis of modern malware samples using static analysis techniques. [K3]
- Apply the knowledge to carry out malware analysis of using dynamic analysis techniques. [K3]
- Implement experimentation on Malware behaviour analysis. [K3]
- Explain the methods and techniques used by professional malware analysts. [K2]
- Illustrate the concept of Android malware analysis their architecture, and App development. [K3]

TEXT BOOKS:

1. Michael Sikorski and Andrew Honig, “Practical Malware Analysis” by No Starch Press, 2012,ISBN: 9781593272906
2. Bill Blunden, “The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System”, Second Edition,Jones & Bartlett Publishers, 2009.

REFERENCES:

1. Jamie Butler and Greg Hoglund, “Rootkits: Subverting the Windows Kernel” by 2005, Addison-Wesley Professional.
2. Bruce Dang, Alexandre Gazet, Elias Bachaalany, SébastienJosse, "Practical Reverse Engineering: x86, x64, ARM, Windows Kernel, Reversing Tools, and Obfuscation", 2014.
3. Victor Marak, "Windows Malware Analysis Essentials" Packt Publishing, O’Reilly, 2015.
4. Ken Dunham, Shane Hartman, Manu Quintans, Jose Andre Morales, Tim Strazzere, "Android Malware and Analysis",CRC Press, Taylor & Francis Group, 2015.
5. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015.

20ITV13	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

Objectives :

- 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 and ling in programming languages
- To develop programs in non-procedural programming paradigms.

PRE-REQUISITE: NIL

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,DATATYPES, AND BASIC STATEMENTS **9**

Names–variables–binding–type checking –scope–scope rules–life time 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

UNIT III UB PROGRAMS AND IMPLEMENTATIONS **9**

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simplesubprograms–stackanddynamiclocalvariables–nestedsubprograms–blocks–dynamicscoping

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

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the syntax ,semantics and parsing of programming languages. [K2]
- Use data, data types, and basic statements of programming languages. [K3]
- Identify the issues of subprograms and apply the relevant concepts to subprograms implementation. [K3]
- Demonstrate the basic concepts of object-oriented programming and concurrency using semaphores and monitors. [K3]

- Illustrate the mechanism of threads and exception handling. [K3]
- Compare features and applications of functional and logic programming language. [K4]

TEXT BOOKS :

1. Robert W. Sebesta, “Concepts of Programming Languages”, Twelfth Edition (Global Edition), Pearson, 2022.

2. Scott,“ProgrammingLanguagePragmatics”,FourthEdition,Elsevier,2018.

REFERENCES:

1. R.KentDybvig,“TheSchemeprogramminglanguage”,FourthEdition,PrenticeHall,2011.
2. Jeffrey D. Ullman,“ Elements of ML programming”, Second Edition, Pearson, 1997
3. W.F.Clocksin and C.S.Mellish, “Programming in Prolog: Using the ISO Standard” Fifth Edition, Springer,2003.

20CSV23	UI AND UX DESIGN	L	T	P	C
		2	0	2	3

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

PRE-REQUISITE: NIL

UNIT – I FOUNDATIONS OF DESIGN 6

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

Lab Component: 6

1. Designing a Responsive layout for an societal application
2. Brainstorming feature for proposed product
3. Defining the Look and Feel of the new Project

UNIT – II FOUNDATIONS OF UI DESIGN 6

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.

Lab Component: 6

1. Exploring various UI Interaction Patterns
2. Developing an interface with proper UI Style Guides

UNIT – III FOUNDATIONS OF UX DESIGN 6

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 Goal.

LabComponent: 6

1. Exploring various open source collaborative interface Platform
2. Hands on Design Thinking Process for a new product

UNIT – IV WIREFRAMING, PROTOTYPING AND TESTING 6

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.

Lab Component: 6

1. Developing Wireflow diagram for application using open source software.
2. Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)

UNIT – V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 6

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods – Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams – Flow Mapping - Information Architecture.

Lab Component: 6

1. Conduct end-to-end user research - User research, creating personas, Ideation

process (User stories, Scenarios), Flow diagrams, Flow Mapping

2. Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Differentiate divergent and convergent thinking and explain brainstorming and game storming. [K2]
- Discuss the fundamental needs of UI design. [K2]
- Illustrate methods and tools to the process of UX design for research. [K2]
- Explain the sketching principles, responsive design and wire framing. [K2]
- Discuss the design of UI and UX prototyping and testing with suitable tools. [K2]
- Identifying and writing problem statements, appropriate research methods and creating scenarios. [K2]

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.

20CSV31	CLOUD SERVICE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

PRE-REQUISITE : NIL

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 Life Cycle, 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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the fundamentals of cloud service management. [K2]
- Describe the cloud service strategies like cloud policy, risk management and change management. [K2]
- Explain the life cycle and benchmarks of cloud services. [K2]
- Illustrate deployment and migration of cloud services. [K2]
- Discuss the economic based cloud services. [K2]

- Explain the strong theoretical foundation leading to cloud service governance & measuring the value of cloud-based services. [K2]

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications
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

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.

20ITV43	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		3	0	0	3

Objectives :

- 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

PRE-REQUISITE: NIL

UNIT I FOUNDATIONS OF SOFTWARE TESTING 9

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

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the basic concepts of software testing and the need for software testing. [K2]
- Explain test planning and different activities involved in test planning. [K2]
- Identify the test objectives and apply different method of test strategies. [K3]
- Apply advanced testing concepts like Fail-Over testing, usability testing, security testing etc. [K3]
- Describe the Testing methods for web and mobile applications. [K2]
- Use automatic software testing tools like Selenium web driver for automating web-based application testing. [K3]

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.

20CSV61	COMPUTER VISION	L	T	P	C
		3	0	0	3

Objectives :

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

PRE-REQUISITE: NIL

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 rangefinding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos

UNIT V IMAGE-BASED RENDERING AND RECOGNITION 9

View interpolation Layered depth images - Light fields and Lumi graphs - 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

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain basic knowledge, theories and methods in image processing and computer vision. [K2]
- Implement basic and some advanced image processing techniques in Open CV. [K3]
- Apply 2D feature-based based image alignment, segmentation and motion estimations. [K3]
- Apply 3D image reconstruction techniques. [K3]
- Explain the innovative image processing concepts. [K2]
- Develop innovative image processing and computer vision applications. [K3]

TEXT BOOKS :

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

REFERENCES:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

20ITV73	DEVOPS	L	T	P	C
		2	0	2	4

Objectives :

- 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/ ContinuousDeployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve realworld problems

PRE-REQUISITE: NIL

UNIT I INTRODUCTION TO DEVOPS **6**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

Lab Component: **6**

1. Install Jenkins in Cloud
2. Install Ansible and configure ansible roles and to write playbook

UNIT II COMPILE AND BUILD USING MAVEN & GRADLE **6**

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.

Lab Component: **6**

1. Build a simple application using Gradle

UNIT III CONTINUOUS INTEGRATION USING JENKINS **6**

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

Lab Component: **6**

1. Create CI pipeline using Jenkins
2. Create a CD pipeline in Jenkins and deploy in Cloud

UNIT IV CONFIGURATION MANAGEMENT USING ANSIBLE **6**

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

Lab Component: **6**

1. Create an Ansible playbook for a simple web application infrastructure

UNIT V BUILDING DEVOPS PIPELINES USING AZURE **6**

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file.

Lab Component: **6**

1.Create Maven Build pipeline in Azure
2.Run regression tests using Maven Build pipeline in Azure

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Illustrate different actions performed through Version control tools like Git. [K3]
- Implement Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle. [K3]
- Illustrate Automated Continuous Deployment. [K3]
- Implement configuration management using Ansible. [K3]
- Illustrate leveraging Cloud-based DevOps tools using Azure DevOps. [K3]
- Implement the Devop pipeline using Azure. [K3]

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
2. Jeff Geerling, “Ansible for DevOps: Server and configuration management for
3. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
4. Mariot Tsitoara, “Ansible Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019

20ITV81	REINFORCEMENT LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

Objectives :

- To introduce the fundamentals of Reinforcement Learning
- To illustrate model-based prediction and control using dynamic programming
- To illustrate model-free prediction and control
- To introduce planning and learning with tabular methods
- To explain approximation of a value function

PRE-REQUISITE: NIL

UNIT I INTRODUCTION **9**

Introduction to Reinforcement learning, examples - Elements of reinforcement learning - Limitations and Scope- An extended example - multi-armed bandits - k-armed bandit problem - action-value methods - the 10-armed testbed - incremental implementation - tracking a nonstationary problem - optimistic initial values - upper-confidence-bound action selection - associative search

UNIT II MARKOV DECISION PROCESS AND MODEL-BASED PREDICTION AND CONTROL **9**

Finite Markov Decision Process - The Agent–Environment Interface - Goals and Rewards - Returns and Episodes - Unified Notation for Episodic and Continuing Tasks - Policies and Value Functions - Optimal Policies and Optimal Value Functions - Optimality and Approximation - Dynamic Programming - Policy Evaluation (Prediction) - Policy Improvement - Policy Iteration - Value Iteration - Generalized Policy Iteration - Efficiency of Dynamic Programming - Asynchronous Dynamic Programming

UNIT III MODEL-FREE PREDICTION AND CONTROL **9**

Model-free learning - Model-free prediction - Monte Carlo methods - Monte Carlo Prediction - Monte Carlo Estimation of Action Values - Temporal-Difference Learning - TD Prediction - Advantages of TD Prediction Methods - Optimality of TD(0) - n-step Bootstrapping - n-step TD Prediction - n-step Sarsa - Model-free control - Monte Carlo Control - Monte Carlo Control without Exploring Starts - Off policy learning - Importance sampling - Off-policy Monte Carlo Control - Sarsa: On-policy TD Control - Q-learning: Off-policy TD control

UNIT IV PLANNING AND LEARNING WITH TABULAR METHODS **9**

Models and planning - Dyna: Integrated Planning, Acting and Learning - When the model is wrong - Prioritized Sweeping - Real-time Dynamic Programming - Monte Carlo Tree Search

UNIT V VALUE FUNCTION APPROXIMATION **9**

On-policy Prediction with Approximation - Value Function Approximation - The Prediction Objective (VE) - Stochastic-gradient and Semi-gradient Methods - Linear Methods - Least-Squares TD.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain basic concepts of reinforcement learning. [K2]
- Perform model-based prediction and control using dynamic programming. [K3]
- Apply model-free prediction and control. [K3]
- Comprehend the use of tabular methods. [K3]
- Explain how a value function can be approximated. [K2]
- Apply Stochastic-gradient and Semi-gradient Methods for value function approximation. [K3]

TEXT BOOKS :

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An introduction, 2nd edition, The MIT Press, 2015.
2. Martijn van Otterlo, Marco Wiering, Reinforcement Learning: State-of-the-Art, Springer Verlag Berlin Heidelberg, 2012.
3. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd edition, Pearson, 2015.

REFERENCES:

1. Good fellow, Y. Bengio, A. Courville, Deep Learning, MIT Press Ltd., 2016.
2. Reinforcement Learning with MATLAB, Math Works Inc., 2020.

20CSV74	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Provide iterative, incremental development process leads to faster delivery of more
  useful software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques and Analyze the essence of agile development methods.
- To understand the benefits and pitfalls of working in an Agile team and Develop prototyping in the software process..
- To understand Agile development and testing.

PRE REQUISITE: NIL

UNIT - I FUNDAMENTALS OF AGILE 9

The Genesis of Agile – Introduction and background – Agile Manifesto and Principles – Overview of Scrum – Extreme Programming – Feature Driven development – Lean Software Development – Agile project management – Design and development practices in Agile projects - Continuous Integration – Refactoring - Pair Programming - Simple Design - AgileTools.

UNIT - II AGILE SCRUM FRAMEWORK 9

Introduction to Scrum – Project phases – Agile Estimation – Planning game –Product backlog – Sprint backlog - Iteration planning – User story definition –Characteristics and content of user stories – Acceptance tests and Verifying stories – Project velocity – Burndown chart – Sprint planning and retrospective – Daily scrum – Scrum roles — Product Owner - Scrum Master - Scrum Team - Scrum case study - Tools for Agile project management.

UNIT - III AGILE REQUIREMENTS ENGINEERING ANDTESTING 9

Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment – Concurrency in Agile Requirements Generation – The Agile lifecycle and its impact on testing –Test Driven Development (TDD) – acceptance tests and scenarios – Planning and managing testing cycle – Exploratory testing - Risk based testing - Regression tests - Test Automation – Tools to support the Agile tester.

UNIT - IV AGILE SOFTWARE DESIGN AND DEVELOPMENT 9

Agile design practices- Role of design Principles including Single Responsibility Principle- Open Closed Principle- Liskov Substitution Principle – Interface Segregation Principles- Dependency Inversion Principle in Agile Design - Need and significance of Refactoring- Refactoring Techniques- Continuous Integration - Automated build tools - Version control.

UNIT - V QUALITY ASSURANCE AND INDUSTRYTRENDS 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Agile Approach in Global Software Development. Agile applicability-Agile in Distributed teams – Business benefits –Challenges in Agile – Risks and Mitigation.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain agile principles and software development techniques to develop high-quality software. [K2]
- Demonstrate the scrum framework for software development. [K3]
- Discover requirements elicitation and requirements management in an Agile environment. [K3]
- Demonstrate the success of software development through agile development and testing techniques. [K3]
- Determine the role of design principles in agile software design development. [K3]
- Explain various agile metrics for quality assurance. [K3]

TEXT BOOKS:

1. Hazza and Dubinsky, Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009
2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2008.
3. Robert C.Martin, Agile Software Development, Principles, Patterns and Practices, Prentice Hall, 2002.

REFERENCES:

1. Lisa Crispin, Janet Gregory, "AgileTesting: A Practical Guide for Testers and AgileTeams", Addison Wesley, 2008
2. Kevin C. Desouza, Agile Information Systems: Conceptualization, Construction, and Management, Butterworth Heinemann, 2007
3. Alistair Cockburn, Agile Software Development: The Cooperative Game", Addison Wesley, 2006.
4. Mike Cohn Publisher, "User Stories Applied: For Agile Software", Addison Wesley, 2004
5. Craig Larman, Agile and Iterative Development: A Manager's Guide, Addison Wesley, 2004.

20CSV84 VIRTUAL REALITY AND AUGMENTED REALITY L T P C
3 0 0 3

OBJECTIVES:

- To learn rapidly evolving and commercially viable field of computer science.
- To become familiar with geometric modeling and computer graphics.
- To learn various types of Hardware and Software in virtual Reality systems

PRE-REQUISITE:NIL

UNIT - I INTRODUCTION TO VIRTUAL REALITY 9

Virtual Reality and Virtual Environment: Introduction-Computer graphics-Real time computer graphics-Flight Simulation-Virtual environment requirement-benefits of virtual reality-Historical development of VR-Scientific Landmark.

UNIT - II AUGMENTED REALITY 9

Taxonomy-technology and features of augmented reality-difference between AR and VR-Challenges with AR-AR systems and functionality-Augmented reality method-visualization techniques for augmented reality-enhancing interactivity in AR environments-evaluating AR systems.

UNIT - III COMPUTER GRAPHICS AND GEOMETRIC MODELING 9

Introduction-The Virtual world space-positioning the virtual observer-The perspective projection-Human vision-Stereo perspective projection- Colour theory-Geometrical Transformations-Introduction-frames of reference-Modeling transformations-scaling the VE-Collision detection.

UNIT - IV DEVELOPMENT TOOLS AND FRAMEWORK 9

Human factors-Hardware-Software-The somatic senses-Sensor hardware-Head coupled displays-Acoustic hardware-Integrated VR systems-Modeling virtual world-Physical simulation.

UNIT - V AUGMENTED AND VIRTUAL REALITY APPLICATION 9

Virtual Reality Applications: Introduction – Engineering – Entertainment-Education- The Future: Introduction – Virtual environments – modes of interaction. Case study on Oculus Rift - Head mounted display.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the Virtual Reality and Environment, Virtual Reality Requirements and benefits. [K2]
- Illustrate the visualization techniques for augmented reality. [K3]
- Discuss the concept of Computer Graphics And Geometric Modeling. [K3]
- Use various types of Hardware and software in virtual Reality systems. [K3]
- Apply Development Tools And Framework for Virtual Reality. [K3]
- Analyze and Design a system or process to meet given specifications with Realistic Engineering Constraints. [K4]

TEXT BOOKS:

1. Jernej Barbic-Mirabelle D'Cruz Marc Erich Latoschik, Melslater Patrick Bourdot Edition 2017.
2. Timothy Jung M.claudia tom Diek Philip A.Rauschnabel 2019

REFERENCES:

1. Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology, Wiley 2016
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan A. Kaufmann, 2013
3. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications,
4. Foundations of Effective Design, Morgan Kaufmann, 2009.
5. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007

		L	T	P	C
20ADV14	DATA AND INFORMATION SECURITY	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To equip the students' knowledge on digital signature, email security and web security

UNIT-I INTRODUCTION **9**

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT- II SECURITY INVESTIGATION **9**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT- III DIGITAL SIGNATURE AND AUTHENTICATION **9**

Digital Signature and Authentication Schemes: Digital Signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview- Requirements Protocols - Applications - Kerberos -X.509 Directory Services

UNI-IV E-MAIL AND IP SECURITY **9**

E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.

UNIT-V WEB SECURITY **9**

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure Communication- Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.

TOTAL:45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Understand the basics of data and information security. [K2]
- Understand the legal, ethical and professional issues in information security. [K2]
- Understand the various authentication schemes to simulate different applications. [K2]
- Understand the various protocols and application. [K2]
- Understand various security practices and system security standards. [K2]
- Understand the Web security protocols for E-Commerce applications. [K2]

TEXTBOOKS

1. Fundamentals and Applications of Renewable Energy | Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN- 10 : 9390385636
2. Renewable Energy Sources and Emerging Technologies, by Kothari, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2011), ISBN-10 : 8120344707

REFERENCES:

1. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, U.K., 2012.
2. Rai.G.D., “Non-Conventional Energy Sources”, Khanna Publishers, New Delhi, 2014.
3. Sukhatme.S.P., “Solar Energy: Principles of Thermal Collection and Storage”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
4. Tiwari G.N., “Solar Energy – Fundamentals Design, Modelling and applications”, Alpha Science Intl Ltd, 2015.
5. Twidell, J.W. & Weir A., “Renewable Energy Resources”, EFNSpon Ltd., UK, 2015

20ITV24	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

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.

PRE-REQUISITE: NIL

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Understand the basics of quantum computing. [K2]
- Understand the background of Quantum Mechanics. [K2]
- Analyze the computation models. [K2]
- Model the circuits using quantum computation. Environments and frameworks. [K2]
- Understand the quantum operations such as noise and error–correction. [K2]
- Implement the Quantum operations [K3]

TEXT BOOKS :

1. Parag K Lala, Mc Graw Hill Education, “Quantum Computing, A Beginners Introduction”, First edition (1 November 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 (8 September 2020), “Quantum Computing for 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.

		L	T	P	C
20ITV42	**CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES**	**3**	**0**	**0**	**3**

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

PRE-REQUISITE: NIL

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Understand emerging abstract models for Blockchain Technology [K2]
- Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain. [K2]
- Understand the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved [K2]
- Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application. [K2]
- Understand emerging abstract models for Block chain Technology [K2]
- Apply block chain concepts in supply chain management [K3]

TEXT BOOKS :

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 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
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

20ITV64	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

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

PRE-REQUISITE: NIL

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 PRINCIPLE **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

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

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Outline and examine the basic concepts of 3D printing technology [K2]
- Outline 3D printing workflow` [K2]
- Explain and categories the concepts and working principles of 3D printing using inkjet technique [K2]
- Explain and categories the working principles of 3D printing using laser technique. [K2]
- Explain various method for designing and modeling for industrial applications [K2]
- Explain the future trends in 3D design [K3]

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

20SCV54	CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand various types of cyber-attacks and cyber-crimes
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION 9

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats - Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc.

UNIT - II CYBER FORENSICS 9

Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT -III CYBER CRIME: MOBILE AND WIRELESS DEVICES 9

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones

UNIT -IV PRIVACY ISSUES 9

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains - medical, financial, etc

UNIT - V CYBERCRIME 9

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify the fundamental concepts of cyber security and the layers of cyber security based on real time scenarios. [K3]
- Illustrate the process of digital forensics, analysis and challenges in computer forensics. [K4]
- Analyze the security challenges and prevention measures for the security attacks on mobile and wireless devices. [K4]

- Discuss the concepts of privacy Attacks, Data linking and profiling. [K2]
- Explain the privacy policies and their specifications in various domains. [K2]
- Infer the category of the cyber security attacks and analyze its security measures. [K4]

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2013
2. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press, 2016
2. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber security, CRC Press T&F Group, 2013.

20ADV15	BUSINESS INTELLIGENCE SYSTEM	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for analytics.
- To apply analytics for different functions of a business

PRE-REQUISITE: NIL

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 Modeling–Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS 9

HumanResources–PlanningandRecruitment–TrainingandDevelopment-Supplychainnetwork - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR &Supply Chain

UNIT V MARKETING& SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behavior– selling Process – Sales Planning – Analytics applications in Marketing and Sales

TOTAL:45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the fundamental concepts of analytics life cycle modeling and evaluation. [K2]
- Apply business analytics and business intelligence tools as a business process to support evidence-based decision-making. [K3]
- Illustrate business analytics using data mining techniques to meet the needs of a business forecasting. [K3]
- Discuss the concepts of human resources and Supply chain network. [K2]
- Summarize the process involved in Marketing and Sales. [K2]
- Analyze, Investigate and evaluate key concepts of Business Intelligence and Analytics techniques that assess complex datasets in field of HR, Supply chain, Marketing and Sales. [K4]

REFERENCES:

1. R. EvansJames, Business Analytics, 2017
2. RNPrasad, Seema Acharya, Fundamentals of Business Analytics, 2016

3. PhilipKotler and KevinKeller, Marketing Management, 15thedition,PHI,2016
4. VSPRAO, Human Resource Management, 3rdEdition, ExcelBooks,2010.
5. MahadevanB,“OperationsManagement-TheoryandPractice”,3rdEdition,PearsonEducation, 2018.

20ADV25	DATA COMMUNICATION AND COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI Model
- To introduce UDP and TCP Models.

UNIT-I DATA COMMUNICATIONS 9

Components–Direction of Dataflow– Networks– Components and Categories–Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN Physical layer: Transmission modes, Multiplexing,Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT- II DATA LINK LAYER 9

Introduction, Framing, and Error– Detection and Correction– Parity– LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. 111Medium Access sub layer: ALOHA, CSMA/CD, LAN –Ethernet IEEE802.3, IEEE802.5– IEEE802.11,Randomaccess,Controlledaccess,Channelization

UNIT- III NETWORK LAYER 9

Logical Addressing, Inter networking,Tunneling, Address mapping, ICMP,IGMP,Forwarding,Uni-Cast Routing Protocols, Multi cast Routing Protocols.

UNI-IV TRANSPORT LAYER 9

Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS,
Integrated Services, Differentiated Services, QoS in Switched Networks.

UNIT-V APPLICATION LAYER 9

Domain namespace, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP.

TOTAL:45PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the basic layers and its functions in computer networks. [K2]
- Evaluate the performance of a network. [K3]
- Describe Concepts of the basics of how data flows from one node to another. [K2]
- Analyze and design routing algorithms. [K3]
- Design protocols for various functions in the network. [K3]
- Explain about the working of various application layer protocols. [K2]

TEXTBOOKS

1. Data Communications and Networking, BehrouzA. Forouzan, Fourth EditionTMH,2006.
2. ComputerNetworks,AndrewSTanenbaum,4th Edition.Pearson Education, PHI

REFERENCES

1. Data communications and Computer Networks, P.C .Gupta, PHI.
2. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, PearsonEducation.
3. Understanding communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning.
4. Computer Networking: A Top-Down Approach Featuring the Internet. James F.Kurose & Keith W. Ross, 3 rd Edition, Pearson Education.
5. Data and Computer Communication, William Stallings, Sixth Edition, Pearson Education, 2000.

20ADV34	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		2	0	2	3

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 generative models for suitable applications.

UNIT-I INTRODUCTION **6**

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

Lab Component: **6**

1. Implement simple vector addition in TensorFlow.
2. Implement a regression model in Keras.

UNIT -II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS **6**

Training Algorithms for Pattern Association-Auto associative Memory Network-Hetero associative Memory Network-Bidirectional Associative Memory (BAM)-Iterative Auto associative Memory Networks-Fixed Weight Competitive Nets(MAXNET, Hamming Network)-Kohonen Self-Organizing Feature Maps.

Lab Component: **6**

1. Implement a perceptron in TensorFlow/Keras Environment.
2. Implement a Feed-Forward Network in TensorFlow/Keras.

UNIT -III THIRD-GENERATION NEURAL NETWORKS **6**

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 – Efficient Convolution Algorithms

Lab Component: **6**

1. Implement an Image Classifier using CNN in TensorFlow/Keras

UNIT -IV DEEP FEED FORWARD NETWORKS **6**

A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout.

Lab Component: **6**

1. Implement character and Digit Recognition using ANN

UNIT V RECURRENT NEURAL NETWORKS **6**

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing.

Lab Component: **6**

1. Perform Sentiment Analysis using RNN
2. Recommendation system from sales data using Deep Learning

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the scope of the neural network and explain the basic models of Artificial Neural Network. [K2]
- Illustrate the different types of associative memory networks. [K3]
- Apply conventional neural network model and its algorithms. [K3]
- Use deep learning components to build and train deep neural networks for various tasks. [K3]
- Apply Recurrent Neural Network and its variants for text analysis. [K3]
- Utilize the applications of neural networks and deep learning for image compression and Natural Language Processing. [K3]

TEXT BOOKS:

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Francois Chollet, “Deep Learning with Python”, Second Edition, Manning Publications, 2021.

REFERENCES:

1. Introduction to Neural Networks Using Matlab 6.0 - S. N. Sivanandam, S. N Deepa 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.S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.
7. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
8. James A Freeman, David M S Kapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003

20ADV45 **ROBOTIC PROCESS AUTOMATION**

L	T	P	C
3	0	0	3

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.

PRE-REQUISITE: NIL

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

UNI - 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 work flows, 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

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the robotic process automation and its applications. [K2]
- Illustrate control flows and work flows for the target process. [K3]
- Demonstrate recording, web scraping and process mining by automation. [K2]
- Determine exception handling in automation processes. [K3]
- Describe Code management and maintenance in automation. [K2]
- Illustrate the Orchestrator for controlling of automated bots. [K3]

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

20ADV55	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

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

UNI-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

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain existing and emerging deep learning architectures for text and speech processing. [K2]
- Apply deep learning techniques for NLP tasks, [K3]
- Describe the language modeling and machine translation. [K2]
- Explain coreference and coherence for text processing. [K2]
- Build question-answering systems, chatbots and dialogue systems. [K3]
- Apply deep learning models for building speech recognition and text-to-speech systems. [K3]

TEXTBOOKS

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.

		L	T	P
20ITV65	FUZZY LOGIC AND APPLICATIONS	3	0	0

OBJECTIVES :

- To impact knowledge on fuzzy logic principles
- To understand models of ANN
- To explain the concepts of fuzzy sets are introduced and their role in applications of semantic interpreters, control systems and reasoning system
- To use the fuzzy logic and neural network for application related to design and manufacture.

PRE-REQUISITE: NIL

UNIT I INTRODUCTION TO FUZZY LOGIC PRINCIPLES 9

Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – Fuzzy relational equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference – Predicate Logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.

UNIT II ADVANCED FUZZY LOGIC APPLICATIONS 9

Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multi objective decision making – fuzzy classification – means clustering – fuzzy pattern recognition – image processing applications – systactic recognition – fuzzy optimization

UNIT III INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9

Fundamentals of neural networks – model of an artificial neuron – neural network architectures – Learning methods – Taxonomy of Neural network architectures – Standard back propagation algorithms – selection of various parameters – variations Applications of back propagation algorithms.

UNIT IV OTHER ANN ARCHITECTURES 9

Associative memory – exponential BAM – Associative memory for real coded pattern pairs – Applications adaptive reasonance theory – introduction – ART 1 – ART2 –Applications – neural networks based on competition – kohenen self organizing maps –learning vector quantization – counter propagation networks – industrial applications.

UNIT V RECENT ADVANCES 9

Fundamentals of genetic algorithms – genetic modeling – hybrid systems – integration of fuzzy logic, neural networks and genetic algorithms – non-traditional optimization techniques like ant colony optimization – Particle swarm optimization and artificial immune systems – applications in design and manufacturing.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain basic knowledge of the fuzzy sets, operations and their properties. [K2]
- Explain the fundamental concepts of Fuzzy functions and Fuzzy logic. [K2]
- Apply the concepts of Fuzzy sets in image processing, pattern reorganization and decision making. [K3]
- Describe the fundamental of neural network and architecture. [K2]
- Illustrate the advanced neural network and architecture. [K3]
- Apply non-traditional optimization techniques in design and manufacturing applications. [K3]

TEXT BOOKS :

1.S.Rajasekaran.G.A.Vijayalakshmi Pai “Neural Networks, fuzzy logic and genetic algorithms”, prentice hall of India private limited, 2003

2. Timothy J.Ross, “Fuzzy logic with engineering applications”, McGraw Hill, 995

3. Zurada J.M. “Introduction to artificial neural systems”, Jaico publishing house,

REFERENCES:

1. Klir.G, Yuan B.B. “Fuzzy sets and fuzzy logic prentice Hall of India private limited,1997.
2. Laurance Fausett, “Fundamentals of neural networks”, Prentice hall, 1992
3. Gen, M. and R. Cheng “Genetic algorithm and engineering design”, john wiley 1997

20ADV75	ETHICS AND AI	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
- Study about AI standards and Regulations
- Study about social and ethical issues of Robot Ethics
- Study about AI and Ethics- challenges and opportunities

UNIT-I INTRODUCTION **9**

DefinitionofmoralityandethicsinAI-Impactonsociety-Impactonhumanpsychology-Impactonthelegalsystem-Impactontheenvironmentand the planet-Impact on trust

UNIT- II ETHICAL INITIATIVES IN AI **9**

International ethical initiatives-Ethical harms and concerns-Case study: health care robots, Autonomous Vehicles, Warfare and weaponization

UNIT- III AI STANDARDS AND REGULATION **9**

ModelProcessforAddressingEthicalConcernsDuringSystemDesign-TransparencyofAutonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - OntologicalStandardforEthicallyDrivenRoboticsandAutomationSystems

UNI-IV ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS **9**

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility-Roboethics Taxonomy.

UNIT-V AI AND ETHICS- CHALLENGES AND OPPORTUNITIES **9**

Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain about morality and ethics in AI. [K2]
- Describe the knowledge of real time application ethics, issues and its challenges. [K3]
- Illutrate the ethical harms and ethical initiatives in AI. [K3]
- Describe about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems. [K3]
- Explain the concepts of Roboethics and Morality with professional responsibilities. [K2]
- Discuss about the societal issues in AI with National and International Strategies on AI. [K2]

TEXTBOOKS

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

REFERENCES:

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

20ADV85	HEALTH CARE ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the health data formats, health care policy and standards
- Learn the significance and need of data analysis and data visualization
- Understand the health data management frameworks
- Learn the use of machine learning and deep learning algorithms in healthcare
- Apply healthcare analytics for critical care applications

UNIT-I INTRODUCTIONINTRODUCTION TO HEALTHCARE ANALYSIS **9**

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT- II ANALYTICS ON MACHINE LEARNING **9**

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT- III HEALTH CARE MANAGEMENT **9**

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare

UNI-IV HEALTHCARE AND DEEP LEARNING **9**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System

UNIT-V CASE STUDIES **9**

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis

TOTAL:45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Use machine learning and deep learning algorithms for health data analysis. [K2]
- Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications. [K3]
- Apply the data management techniques for healthcare data. [K2]
- Demonstrate health data analytics for real time applications. [K2]
- Understand emergency care system using health data analysis. [K2]
- Apply health care analytics in Healthcare and Emerging Technologies. [K3]

TEXT BOOKS:

1. ChandanK.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015.

2. Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018.

REFERENCES:

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

20HS5A1	MANAGEMENT CONCEPTS & ORGANIZATIONAL BEHAVIOR	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization with a perspective to diagnose and effectively handle human behavior**.**

PRE-REQUISITE:NIL

UNIT-I INTRODUCTION TO MANAGEMENT 9

Origin - Definition of management -Nature & Characteristics of management - Scope of management - Importance of Management - Difference between administration & management- Levels of management -Functions of Management - Principles of management - Management by objectives - Management by exception .

UNIT-II PLANNING AND ORGANIZING 9

Definitions of planning -Nature of planning - Importance of planning - Limitations of planning - Process / steps of planning -Elements of planning - Decision making - Characteristics of decision making - Process / steps of decision making-Nature of Organisation-Principles of Organisation - Advantages of Organisation - Process / steps of Organisation - Formal & Informal Organisation - Organisational Structure (Types) - Organisation chart - delegation - Process / steps of delegation - Centralisation - De-Centralisation

UNIT - III CO-ORDINATION AND CONTROLLING 9

Definition of Co-ordination - characteristics of Co-ordination - Benefits of Co-ordination - Problems in Coordination -Techniques of Co-ordination - Defintion of controlling - characteristics of control function – Control process –Communication - Characteristics of Communication - Process of Communication - Formal &Informal Communication - Upward & Downward Communication - Sideward Communication – Written Communication -Barriers in Communication - Measures to overcome communication barriers

UNIT - IV INDIVIDUAL BEHAVIOUR 9

Meaning of Organizational behavior, contributing disciplines, importance of organizational behavior,

Perception and Learning - Personality and Individual Differences - Motivation theories and Job Performance - Values, Attitudes and Beliefs - Communication Types-Process - Barriers - Making Communication Effective.

UNIT - V GROUP BEHAVIOUR 9

Groups and Teams: Definition, Difference between groups and teams, Stages of Group Development, Group Cohesiveness, Types of teams, Group Dynamics - Leadership - Styles - Approaches - Power and Politics .

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

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

- Explain Management principles into management practices and Managers manage business in global context with different strategies and to determine the effective ways of controlling, and decision making. [K2]
- Understand and explain all the managerial functions. [K2]
- Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization and management of individual behavior in the organization. [K3]
- Analyze the complexities associated with management of the group behavior in the organization. [K3]
- Demonstrate how the organizational behavior can integrate in understanding the

motivation (why) behind behavior of people in the organization. [K3]

- Managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management and the degree to which one can make an individual to think beyond self. [K3]

REFERENCES:

1. Stephen P. Robins, Organizational Behavior, Pearson Education, Edition 16, 2022.
2. Steven L. Mc Shane, Mary Ann Von Glinow, et al. Organizational Behavior, Edition 9, 2022
3. PC Tripathi, PN Reddy, AshishBajpai, Principles of Management, Tata McGrawHill,

20HS5A2	INDUSTRIAL MARKETING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the basics of Industrial Marketing.
- To know about the Management of Industrial Marketing
- To understand the methods of Strategic Planning and Implementation process.
- To learn the process of Logistics, Marketing Control and Channel Optimization
- To understand the techniques of Pricing and Sales Force Planning

PRE-REQUISITE:NIL

UNIT-I Basics of Industrial Marketing 9

Introduction to Industrial Marketing- Industrial versus Consumer Marketing- Economics of Industrial Demand Classification of Industrial Customers- Unique Characteristics of Organizational Procurement-Purchasing in Government Units

UNIT-II Management of Industrial Marketing 9

Industrial Buying Behaviour in Indian context- Conceptualization of Buying Behavior-Stages in Buying Uncertainty Management in Industrial Marketing- Purchasing Agents in Industrial Buying-Negotiation in Industrial Marketing

UNIT - III Strategic Planning and Implementation 9

Process of Strategic Planning-Macro and Micro Variables Used to Segment Industrial Marketing- Managing the Development of Strategic Planning- Understanding Strategy Formulation and Strategy Implementation Industrial Marketing Strategy Components - Industrial Marketing Research for New Product Development Industrial Marketing Strategy in India

UNIT - IV Logistics, Marketing Control and Channel Optimization 9

Marketing Logistics- Physical Distribution and Customer Services- Marketing Control Channel Participants-Channel Functions and Dual Channels-Choosing the Right Distributor- Distribution and Manufacturers' Representatives

UNIT - V Pricing and Sales Force Planning 9

Price: A Crucial Element in Product Strategy- The nature of Derived Demand- Segregation of New Product Cost- Pricing in Industrial Marketing- Segregation of New Product Cost - Industrial Product Pricing in India Development of Industrial Sales Force-Motivation of Sales Force- Effective Use of Sales Compensation

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Compare industrial vs consumer marketing and the classifications of industrial customers. [K3]
- Develop Negotiation and buying techniques for industrial products. [K3]
- Formulate strategic plan and implementation methods. [K3]
- Develop techniques of Logistics, Marketing Control and Channel Optimization [K3]
- Identify Pricing tactics and Sales Force Planning techniques [K3]
- Manage the entire industrial marketing process. [K3]

REFERENCES:

1. Industrial Marketing: A Process of Creating and Maintaining Exchange by krishnamacharyulu
Csg,Lalitha R, Publisher: Jaico Book House,
2. Industrial Marketing by Ghosh, Publisher: Oxford University Press,2019
3. Industrial Marketing 2e by K. K. Havaldar, Publisher: Tata McGraw-Hill Publishing Company limited,2016
4. Industrial Marketing Management by Govindarajan, Vikas Publishing House.2018
5. Industrial Marketing by Phadtare -M. T, Prentice Hall of India Private Limited ,2020

20HS7A2	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand TQM Concepts and importance of customers.
- To know about TQM Principles, understand about employee involvement and supplier partnership.
- To understand six sigma, Traditional tools, New tools, Benchmarking and FMEA.
- To understand Control charts, Taguchi Quality Loss function, QFD, TPM and Performance measures.
- To understand the various elements of Quality Management System and Environment Management System.

PREREQUISITE: NIL

UNIT - I INTRODUCTION 9

Quality – Need, Evolution, Definitions, Dimensions of product and service quality. TQM - Basic concepts, Framework, Contributions of Deming, Juran and Crosby, Barriers. Quality statements, Customer satisfaction, Customer complaints, Customer retention, Costs of quality

UNIT – II TQM PRINCIPLES 9

Strategic quality planning, Quality Councils, Employee involvement, Motivation, Empowerment, Teamwork, Quality circles, Recognition and Reward, Performance appraisal, Continuous process improvement - PDCA cycle, 5S, Kaizen, Supplier partnership, Supplier selection, Supplier Rating.

UNIT – III TQM TOOLS AND TECHNIQUES I 9

Traditional tools of quality, New management tools. Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT, Bench marking, Reason to bench mark, Bench marking process, FMEA - Stages, Types.

UNIT – IV TQM TOOLS AND TECHNIQUES II 9

Control Charts, Process Capability, Quality Function Development (QFD), Taguchi quality loss function, TPM - Concepts, improvement needs, Performance measures.

UNIT - V QUALITY SYSTEMS 9

Need for ISO 9000, ISO 9001-2008 Quality System, Elements, Documentation, Quality Auditing, QS 9000 - ISO 14000, Concepts, Requirements and Benefits, TQM Implementation in manufacturing and service sectors.

TOTAL : 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain basic concepts, TQM framework, Barriers Benefits of TQM and importance of customers [K2]
- Explain the TQM Principles, understand the importance of employee involvement and supplier partnership [K2]
- Explain the basics of Six Sigma, Traditional tools, New tools [K2]
- Explain the process of Benchmarking and FMEA. [K2]
- Explain process capability, QFD, TPM, Taguchi quality loss function and performance measures [K2]

- Explain the Quality system ISO 9000, ISO 14000, Audit, Certification process and implementation of TQM in manufacturing and service sectors [K2]

TEXT BOOKS:

1. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, 5th Edition, 2018.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", Cengage Learning, 8th Edition, 2012.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2nd Edition, 2006.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”, CRC Press, 5th Edition, 2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 1st Edition, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2012.
4. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 1st Edition, 2006.
5. Brue G, "Six Sigma for Managers”, Tata-McGraw Hill, 2nd Edition, 2002.

20HS6A1	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get an adequate knowledge on patent and copyright for their innovative research works.
- To use in their career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations.
- To pave the way to catch up Intellectual Property (IP) as an career option.
    - R & D IP Counsel
    - Government Jobs – Patent Examiner
    - Private Jobs
    - Patent agent and Trademark agent

PRE-REQUISITE: NIL

UNIT - I OVERVIEW OF INTELLECTUAL PROPERTY **9**

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design - Genetic Resources and Traditional Knowledge - Trade Secret - IPR in India: Genesis and development - IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention - 1883, the Berne Convention - 1886, the Universal Copyright Convention - 1952, the WIPO Convention - 1967, the Patent Co-operation Treaty - 1970, the TRIPS Agreement - 1994.

UNIT - II PATENTS **9**

Patents - Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non-Patentable Subject Matter - Registration Procedure - Rights and Duties of Patentee - Assignment and license - Restoration of lapsed Patents - Surrender and Revocation of Patents - Infringement - Remedies & Penalties - Patent office and Appellate Board.

UNIT- III III COPYRIGHTS **9**

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works - cinematograph films and sound recordings - Registration Procedure - Term of protection - Ownership of copyright - Assignment and license of copyright - Infringement - Remedies & Penalties - Related Rights - Distinction between related rights and copyrights.

UNIT - IV TRADEMARKS **9**

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board.

UNIT - V OTHER FORMS OF IP & REGISTRATION PROCESS **9**

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection. Geographical Indication (GI): meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection. IPR registration process through government website-modalities and publications. Plant Variety Protection: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection. Layout Design Protection: meaning – Procedure for registration, effect of registration and term of protection.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the fundamental aspects of Intellectual property Rights which plays a major role in development and management of innovative projects in industries. [K2]
- Describe the patents, patent regime in India and abroad and registration aspects. [K2]
- Describe the copyrights and its related rights and registration aspects. [K2]
- Explain the trademarks and registration aspects. [K2]
- Explain the Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects. [K2]
- Analyze the current trends in IPR and Government steps in fostering IPR. [K4]

TEXT BOOKS:

1. K.V.Nithyananda, “Intellectual Property Rights: Protection and Management”, Cengage Learning India Pvt. Ltd., 2019.
2. P.Neeraj and D.Khusdeep, “Intellectual Property Rights”, PHI Learning Pvt. Ltd., 2014.

REFERENCES:

1. V.K.Ahuja, “Law Relating to Intellectual Property Rights”, Lexis Nexis, Third Edition, 2017.
2. Journal of Intellectual Property Rights (JIPR): NISCAIR
3. Cell for IPR Promotion and Management (http://cipam.gov.in/)
4. World Intellectual Property Organization (https://www.wipo.int/about-ip/en/)
5. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

20HS6B1	PROJECT MANAGEMENT AND ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make them understand the concepts of project management for planning to execution of projects.
- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

PRE-REQUISITE: NIL

UNIT - I PROJECT MANAGEMENT 9

Project management: meaning, scope & importance, role of project manager - Project life-cycle and Project appraisal - project feasibility report- Technical appraisal, Environmental appraisal, Market appraisal and Managerial appraisal.

UNIT - II PROJECT FINANCING 9

Project cost estimation & working capital requirements - sources of funds - capital budgeting - Risk & uncertainty in project evaluation - preparation of projected financial statements viz. Projected balance sheet - projected income statement - projected funds & cash flow statements - Preparation of detailed project report - Project finance.

UNIT - III ENTREPRENEURSHIP 9

Entrepreneurship need and scope - Entrepreneurial competencies and traits - Factors affecting entrepreneurial development - Entrepreneurial motivation (Mc Clellend's Achievement motivation theory) - conceptual model of entrepreneurship - entrepreneur vs. intrapreneur - Classification of entrepreneurs - Entrepreneurial Development Programmes.

UNIT - IV ENTREPRENEURIAL IDEA AND INNOVATION 9

Introduction to Innovation - Entrepreneurial Idea Generation and Identifying Business Opportunities - Management skills for Entrepreneurs and managing for Value Creation - Creating and Sustaining Enterprising Model - Organizational Effectiveness.

UNIT - V SOCIAL ENTREPRENEURSHIP 9

Social Sector Perspectives and Social Entrepreneurship - Social Entrepreneurship Opportunities and Successful Models - Social Innovations and Sustainability - Marketing Management for Social Ventures - Risk Management in Social Enterprises - Legal Framework for Social Ventures.

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Conclude the project characteristics and various stages of a project. [K2]
- Compile the conceptual clarity about project organization and feasibility. [K3]
- Apply the risk management plan and analyze the role of stakeholders. [K3]
- Analyze the social responsibility for an entrepreneurship. [K3]
- Interpret the gain knowledge to overcome the factors affecting small-scale business. [K3]
- Formulate a new small-scale business. [K3]

TEXT BOOKS:

1. Robert D. Hisrich, Michael P. Peters and Dean A. Shepherd, “Entrepreneurship”, McGraw Hill Education, Tenth Edition, 2018.
2. Peter F. Drucker, “Innovation and Entrepreneurship”, Harper Business, 2006.

REFERENCES:

1. Anil K. Gupta, “Grassroots Innovation: Minds on the Margin Are Not Marginal Minds”, Random House, 2016.
2. V.S.P.Rao, “Business, Entrepreneurship and Management”, Vikas Publishing, 2014.
3. Rajeev Roy, “Entrepreneurship”, Oxford University Press, 2011.
4. Roman Pichler, “Agile Product Management with Scrum Creating Products That Customers Love”, Pearson India, 2013.
5. John M. Nicholas and Herman Steyn, “Project Management for Engineering, Business and Technology”, A Butterworth-Heinemann Title, Fourth Edition, 2011

20HS8A1	HUMAN RELATIONS AT WORK	L	T	P	C
		3	0	0	3

OBJECTIVES:

• To create awareness of human relations at work its relationship with self.
• To create awareness about the processes involved in interaction with people at work.
• To understand the importance of psychological and physical health in maintaining human relations at work and progressing in career.

PRE-REQUISITE : NIL

UNIT-I INTRODUCTION TO HUMAN RELATIONS 9

Understanding and Managing Yourself – Human Relations and You – Self-Esteem and Self –Confidence – Self-Motivation and Goal Setting – Emotional Intelligence – Attitudes andHappiness – Values and Ethics – Problem Solving and Creativity.

UNIT-II HUMAN RELATIONS AT WORK 9

Dealing Effectively with People – Communication in the Workplace – Specialized Tactics for Getting Along with Others in the Workplace – Managing Conflict – Becoming an Effective Leader – Motivating Others and Developing Teamwork – Diversity and Cross-Cultural Competence.

UNIT - III STAYING PHYSICALLY HEALTHY 9

Yoga: Ashtanga, Yam and Niyam, Asan – Pranayam – Exercise: Aerobic and anaerobic.

UNIT - IV STAYING PSYCHOLOGICALLY HEALTHY 9

Managing Stress and Personal Problems – Meditation – Cognitive, behavioural and emotional well-being.

UNIT - V DEVELOPING CAREER THRUST 9

Getting Ahead in Your Career – Learning Strategies – Perception – Life Span Changes – Developing Good Work Habits.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Implement the elements of Emotional Intelligence and create a plan for continual improvement. [K3]
- Demonstrate the elements of teamwork such as team development stages, leadership skills, team dynamics, problems solving and decision making approaches, and team building. [K3]
- Employ active listening skills including paraphrasing, questioning, empathetic listening, analytic listening, responding and communicating non-verbally while respecting individual differences. [K3]
- Identify various Yoga Postures. [K3]
- Develop an action plan to increase personal motivation in a personal and or workplace situation. [K3]
- Identify different elements of organizational behavior and change including organizational climate, culture, power, ethics, and organizational development techniques to develop a change model for an aspect of their personal and or professional life. [K3]

TEXT BOOKS:

1. Andrew DuBrin, “Human Relations for Career and Personal Success: Concepts, Applications, and Skills”, Pearson Education, Eleventh Edition, 2016.
2. Swami Vivekananda, “Raja-Yoga or Conquering the Internal Nature”, Vedanta Press, 1998.

REFERENCES:

1. Jerrold S. Greenberg, “Comprehensive Stress Management”, McGraw-Hill Humanities Social, Thirteenth Edition, 2012.
2. Y.Udai, “Yogasan aur pranayama”, N.S. Publications, New Delhi, 2015.
3. Janardan Swami Yogabhyasi Mandal, “Yogic Asanas for Group Training - Part-I”, Nagpur.

20HS8B2	ECONOMICS FOR ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamental economic concepts
- To understand cost estimation concepts
- To understand value engineering
- To understand project appraisal and methods of analysis
- To understand the methods of depreciation

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION TO ECONOMICS 9

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis - V ratio, Elementary economic Analysis – Material selection for product Design selection of a product, Process planning.

UNIT - II COST ESTIMATION AND MACRO ECONOMICS 9

Cost and revenue concepts- Determination of equilibrium price under perfect competition - Banking – Inflation - National Income

UNIT - III VALUE ENGINEERING 9

Make or buy decision, Value engineering – Function, aims, Value engineering procedure: Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT - IV PROJECT APPRAISAL AND ANALYSIS 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram),rate of return method, Examples in all the methods.

UNIT - V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the concept of engineering economics. [K2]
- Comprehend macroeconomic principles [K3]
- Decision making in diverse business set up [K3]
- Explain the Inflation & Price Change [K2]

- Explain Present Worth Analysis [K2]
- Apply the principles of economics through various case studies [K3]

TEXT BOOKS:

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi,2001.

REFERENCES:

1. ChanS.Park,“ContemporaryEngineeringEconomics”, PrenticeHallofIndia,2011.
2. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg.Press,Texas,2010.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, NewYork,2011.

4.ZahidAkhan:EngineeringEconomy,"EngineeringEconomy", DorlingKindersley,2012

20OE401 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI

PRE-REQUISITE:NIL

UNIT-I INTRODUCTION **9**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT-II PROBLEM SOLVING METHODS **9**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT - III KNOWLEDGE REPRESENTATION **9**

First Order Predicate Logic– Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT - IV SOFTWARE AGENTS **9**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT - V APPLICATIONS **9**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the problem solving approaches to AI problems [K2]
- Apply appropriate search algorithms for any AI problems [K3]
- Solve a problem using first order and predicate logic [K3]
- Describe the concepts of software agents [K2]
- Discuss the software agents for solving AI problems [K2]
- Describe the applications for Natural Language Processing [K2]

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. I. Bratko, 'Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press,2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

20OE402	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to depict a database system using ER diagrams
- To study relational database and to write SQL queries to store/retrieve data to/from database
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures for real time applications
- To understand working procedures of query processing and query optimization techniques
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To study concepts of advanced databases

PRE-REQUISITE:NIL

UNIT-I DATABASE FUNDAMENTALS 8

Purpose of Database System – Views of data – Database System Architecture – Introduction to Data Models –Introduction to Relational Model – Constraints – keys – Entity Relationship Model – Entity Sets – Attributes - Extended E-R features – ER reduction to Relational Schemas.

UNIT-II RELATIONAL DATABASE 10

Structure of Relational Database –SQL Fundamentals – Basic Queries – Set Operations – Aggregate Functions – Clauses – Subqueries – Correlated Subqueries – Joins – Views – Authorization – Advanced SQL – Triggers – Cursors – Procedure – Functions – Embedded SQL – Dynamic SQL

UNIT - III 9

Need for Database Design – Functional Dependencies – Closure of Functional Dependencies – Attribute Closure – Dependency Preservation – Decomposition – Canonical Cover – First Normal Form – Second Normal Form – Third Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Fourth Normal Form – Join Dependencies – Fifth Normal Form.

UNIT - IV TRANSACTIONS 9

Transaction Concepts – ACID properties – Transaction States – Serializability – Conflict Serializability – View Serializability – Concurrency Control – Lock Based Protocols – Deadlocks – Time Based Protocols – Stamp Based Protocols – Validation Based Protocols – Recovery System,

UNIT - V STORAGE AND QUERY PROCESSING 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the fundamental elements of relative database management systems. [K2]
- Formulate SQL queries for the given relational tables. [K3]
- Apply normal forms to identify the redundancy in database tables. [K3]
- Explain various protocols in transaction processing. [K2]
- Discuss file organization in database storage system. [K2]
- Apply algorithms for SELECT and JOIN operations. [K3]

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,"Database Management Systems”, Tata McGraw Hill, 2011

20OE403 COMPUTER COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

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.

PRE-REQUISITE:NIL

UNIT-I INTRODUCTION AND PHYSICAL LAYER 9

Networks – Network Types – Classification of computer Networks LAN, WAN, MAN, Network Topology: BUS, STAR, RING, MESH- Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit Switching, Packet Switching.

UNIT-II DATA-LINK & MEDIA ACCESS LAYER 9

Introduction – Link Layer Addressing – Framing, Physical Addressing, Flow control-noisy and noiseless channels, Error Control – Error detection and Error correction codes- Access control ALOHA,CSMA,CSMA/CD,TDMA,FDMA- Ethernet - Wireless LANs -IEEE 802.11, Bluetooth – Connecting Devices.

UNIT - III NETWORK LAYER 9

Network Layer Services – Performance – Logical Addressing- IPV4,IPV6- Network Layer Protocols- IP, ICMP,IGMP – Unicast Routing Algorithms - Distance Vector, Link state algorithms, Multicasting Basics Routing.

UNIT - IV TRANSPORT LAYER 9

Introduction – Transport Layer Protocols-. TCP, UDP – Services – Port Numbers -Flow control-TCP congestion control, Congestion avoidance mechanisms, Quality of service.

UNIT - V APPLICATION LAYER 9

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

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the basic concepts of communication networks [K2]
- Apply the error detection and error correction methods for bit streams [K3]
- Classify various media access control protocols techniques of communication networks [K3]
- Utilize various types of routing techniques to forward packets [K3]
- Illustrate the mechanisms involved in transport layer [K3]
- Classify different application layer protocols [K3]

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition TMH, 2013.
2. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2013

REFERENCES:

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

20OE404 CLOUD INFRASTRUCTURE AND TECHNOLOGIES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

PRE-REQUISITE:NIL

UNIT-I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT-II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT - III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT - IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT - V CASE STUDIES 9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the main concepts, key technologies, strengths and limitations of cloud computing. [K2]
- Describe the key and enabling technologies that help in the development of cloud. [K2]
- Discuss and use the architecture of compute and storage cloud with its service and delivery models. [K2]
- Explain the core issues of cloud computing such as resource management and security. [K2]
- Discuss the Cloud Environment using current cloud technologies. [K2]
- Illustrate the appropriate technologies, algorithms and approaches for implementation and use of cloud. [K3]

TEXT BOOKS:

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, First Edition, John Wiley & Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2017

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)”, O'Reilly, 2009.

20OE405	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide a broad survey of different machine learning approaches and techniques
- To understand the principles and concepts of machine learning
- To understand neural networks concepts
- To learn regression and reinforcement learning
- To develop programming skills that helps to build real world applications based on machine learning

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION **9**

Introduction: Machine learning: What and why? - Types of Machine Learning - Supervised Learning -Unsupervised Learning - The Curse of dimensionality - Over and under fitting - Model selection - Error analysis and validation - Parametric vs. non-parametric models.

UNIT - II CLASSIFICATION **9**

Types of Machine Learning - Supervised Learning - Classification models - Naïve Bayes Classifier – Decision trees - Support Vector Machines - KNN model - Dimensionality reduction - PCA.

UNIT - III CLUSTERING **9**

Clustering approaches - Mean Shift clustering - Clustering data points and features - Bi-clustering - Multi-view clustering - K-Means clustering - K-medians clustering - Expectation Maximization (EM).

UNIT - IV REGRESSION **9**

Linear models for regression - Ridge Regression - Bayesian linear regression - Logistic models for regression - Bayesian logistic Regression- Reinforcement Learning.

UNIT - V ARTIFICIAL NEURAL NETWORKS **9**

Neural networks - Biological motivation for Neural Network - Neural network Representation - Perceptron – Feed forward networks - Multilayer Networks and Back Propagation Algorithms - Hidden layer representation – Application of neural network.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Discuss the principles and concepts of machine learning and different approaches and techniques [K3]
- Illustrate different classification techniques for various data sets [K3]
- Utilize clustering approaches for implementing unsupervised learning on data sets [K3]
- Make use of regression models based on supervised learning for data prediction [K3]
- Build an appropriate neural network for learning features in a given data set [K3]
- Apply neural network for solving real world machine learning problems[K3]

TEXT BOOKS

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Ethem Alpaydin, “Introduction to Machine Learning”, Second Edition, Prentice Hall of India, 2010.

REFERENCES

1. Laurene Fausett, “Fundamentals of Neural Networks, Architectures, Algorithms and Applications”, Pearson Education, 2008.
2. Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997.
3. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.

20OE406	JAVA SCRIPT PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Definition, Evolution and Nature of JavaScript
- To understand the basics of Script Writing
- To Learn Java Script Names, Objects, and Methods
- To Create Dynamic Web Pages
- To understand the method of Adding Interactivity to a Web Page.

PRE-REQUISITE: NIL

UNIT - I JAVA SCRIPT BASICS 9

JAVA Script Basics: An introduction to JavaScript– Advantages & Limitations of Java Script. Syntax, Variables, Variable Naming Rules and JavaScript Data Types, Expressions and Operators, Flow Control

UNIT - II OBJECTS AND ARRAYS 9

Creating objects, Object Attributes, Serializing Object, Object Methods Represent Multiple values in Java Script, JavaScript DOM, Arrays: Creating Arrays, Array elements, Multi dimensional Arrays, Array Methods , Functions and Methods.

UNIT - III ADDING INTERACTIVITY TO A WEB PAGE 9

Controlling Script Flow, Storing Tasks within Functions, Using Conditional Statements for Decision Making, if Statements, if-else Conditional Statements, Using the Date Object, for Conditional Statements, while Conditional Statements, break and continue Statements, with Statements, Creating Functions in JavaScript, Declaring a Function, Designing a Simple Function.

UNIT - IV CLIENT SIDE JAVASCRIPT 9

Embedding Java Script in HTML, Execution of JS Program, Dialog boxes, Error Handling & Exceptions. Event Handling: Types of Events, Event Handlers, Document load Events, Mouse Events, Keyboard Events, Drag and Drop Events, Text Events.

UNIT - V JAVA SCRIPT VALIDATION 9

Working with Forms: Accessing the form element, The form object, Accessibility, Validation, Using form-based navigation, Form widgets in libraries and HTML5. Errors and Exceptions, Form Validation, Validation-Built-in objects-Event Handling, DHTML with JavaScript

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Summarize various java script components like data types, expressions, operators etc. [K2]
- Discuss the various JavaScript elements, methods, properties, functions and objects [K3]
- Apply appropriate user experience and interactive design concepts to custom websites [K3]
- Apply the event handling methods in client side scripting [K3]
- Develop interactive web pages using HTML5 and media tags. [K3]
- Demonstrate HTML5 integration with JavaScript scripting skills in a variety of student designed projects [K3]

TEXT BOOKS:

1. David Flanagan JavaScript: The Definitive Guide, 6th Edition,O'Relly, 2011
2. David Sawyer McFarland JavaScript & jQuery: The Missing Manual 3rd Edition, 2014

REFERENCES:

1. Marijn Haverbeke Eloquent JavaScript 3rd Edition, No Starch Press, 2018
2. Michael Moncur Teach yourself Java Script in 24 Hours SAMS Publication 2007

20OE407	COMPUTER GRAPHICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Gain knowledge about graphics hardware devices and software used.
- To Understand the two dimensional graphics and their transformations.
- To Understand the three dimensional graphics and their transformations.
- Appreciate illumination and color models.
- Be familiar with understand animation techniques.

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION 9

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms.

UNIT - II TWO DIMENSIONAL GRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT - III THREE DIMENSIONAL GRAPHICS 10

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces - B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping.

UNIT - IV ILLUMINATION AND COLOUR MODELS 8

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT - V ANIMATIONS & REALISM 9

Animation Graphics: Design of Animation sequences – animation function – raster animation –key frame systems – motion specification –morphing – tweening. Computer Graphics Realism: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the hardware devices and software used in graphics systems. [K2]
- Apply two dimensional graphics and transformation. [K3]
- Apply three dimensional graphics and transformation. [K3]
- Demonstrate the clipping techniques to graphics. [K3]
- Discuss about basic illumination and colour models. [K3]
- Explain the animation sequences and various methods in graphics realism. [K2]

TEXT BOOKS:

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, StevenK. Feiner and Kurt Akeley, Computer Graphics: Principles and Practice", 3rd Edition, Addison-Wesley Professional, 2013.
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007

REFERENCES:

1. Donald Hearn and M. Pauline Baker, Warren Carithers,"Computer Graphics With Open GL",4th Edition, Pearson Education, 2010.
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
3. Hill F S Jr., "Computer Graphics", Maxwell Macmillan", 1990.
4. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

20OE408	ESSENTIALS OF DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of Data Analytic.
- To Handle missing data in the real world data sets by choosing appropriate methods
- To Learn data analysis methods
- To learn stream computing
- To Understand and apply Data Analysis Techniques
- To gain knowledge on Hadoop related tools

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION 9

Knowledge domains of Data Analysis, Understanding structured and unstructured data, data analytic tools, applications of data analytics.

UNIT – II DATA PREPROCESSING 9

Data Preprocessing : Data Cleaning –Data Integration - Data Reduction – Data Transformation – Handling Missing Data

UNIT – III CLASSIFICATION AND CLUSTERING 9

Mining Various Kinds of Association Rules – Correlation Analysis, Classification: SVM & Kernel Methods Cluster Analysis, Types of Data in Cluster Analysis, K means, Partitioning Methods, Hierarchical Methods, Density Based Methods, Clustering High Dimensional Data - Predictive Analytics.

UNIT - IV MINING DATA STREAMS 9

Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams - Real Time Analytics Platform (RTAP) Applications. Case Study: Stock Market Predictions

UNIT - V DATA ANALYTICS USING R

Introduction to R Programming: data types in R - built-in functions - Data Manipulation: Data Cleaning, functions used in Data Inspection - Data Visualization: graphical functions, various graphs like tableplot, histogram, Boxplot

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the basic concepts of Data Analytic. [K2]
- Describe the Data Analysis preprocessing Techniques. [K2]
- Explain about how missing data will be handled during preprocessing. [K2]
- Apply the Classification and Clustering algorithm for a given data set. [K3]
- Apply the different mining techniques for real time analytics applications. [K3]
- Explain the Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics. [K2]

TEXT BOOKS:

1. John Wiley & Sons-Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services (Editor), 2015
2. Craig K. Enders, “Applied Missing Data Analysis”, The Guilford Press, 2010.
3. Kun Ren, Learning R programming, Packt publishing, 2016

REFERENCES:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, Second Edition, 2007.
2. Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, ,O‘Reilly Media, 2013.
4. Jiawei Han, Micheline Kamber and Jian Pei - Data Mining: Concepts and Techniques”, Third Edition, ISBN 0123814790,