SETHU INSTITUTE OF TECHNOLOGY
(An Autonomous Institution| Accredited with 'A++' Grade by NAAC)

B.TECH INFORMATION TECHNOLOGY

REGULATIONS 2021

CURRICULUM AND SYLLABUS

Chairperson
Board of Studies

Chairperson
Board of Studies
Information Technology
Sethu Institute of Technology
Kariapatti - 626 115

Chairman
Academic Council

CHAIRMAN
ACADEMIC COUNCIL
Sethu Institute of Technology
Pulloor, Kariapatti - 625 115

Institute Vision and Mission

Institute Vision	To promote excellence in technical education and scientific research for the benefit of the Society
Institute Mission	• To provide Quality Technical Education to fulfill the aspiration of the students and to meet the needs of the industry • To provide holistic learning ambience • To impart skills leading to employability and entrepreneurship • To establish effective linkage with industries • To promote Research and Development Activities • To offer Services for the Development of Society through education and technology
Core Values	Quality | Commitment | Innovation | Team Work | Courtesy

Department Vision and Mission

PROGRAMME	**B.Tech. INFORMATION TECHNOLOGY**
Department Vision (IT)	To Promote Excellence in Producing Competent IT Professionals to Serve the Society Through Technology and Research
Department Mission (IT)	• Producing competent professionals in information and communication technologies. • Educating the students with the state of art computing environment and pedagogical innovations • Encouraging entrepreneurship and imparting skills for employability • Establishing collaboration with IT and allied Industries • Promoting research in information and communication technology to improve the quality of human life • Offering beneficial service to the society by imparting knowledge and providing IT solutions
Core Values	Quality | Responsibility | Novelty | Team work |Courtesy

PROGRAMME EDUCATIONAL OBJECTIVES	
PEO 1	Exhibit Proficiency in Analyzing, Designing and Developing IT Based Solutions to cater to the needs of the Industry. **{Technical Competence}**
PEO 2	Provide Professional Expertise to the Industry and Society with Effective Communication and Ethics. **{Professionalism}**
PEO 3	Engage in Lifelong Learning for Professional Development and Research. **{Life-Long Learning}**

PROGRAMME OUTCOMES	
PO1	Apply the knowledge of Mathematics, Basic Science, Computer and communication Fundamentals to solve complex problems in Data Engineering, Networking and Image Processing. **[Engineering Knowledge]**
PO2	Identify, formulate, review research literature and analyze complex problems reaching concrete conclusions using principles of Information Technology, Engineering sciences, mathematics, algorithms and IT constructs. **[Problem Analysis]**
PO3	Design solution for complex information and communication engineering problems and design system components or processes that meet with realistic constraints for public health and safety, cultural, societal and environment considerations. **[Design/Development of Solutions]**
PO4	Conduct investigations of complex Information technology related problems using research based knowledge and research methods including analysis and interpretation of data to provide valid conclusions through synthesis of information.**[Conduct investigations of complex problems]**
PO5	Create, select and apply appropriate techniques, resources and modern IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. **[Modern Tool Usage]**
PO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and consequent responsibilities relevant to professional

	engineering practice and provide IT based solutions. **[The Engineer and Society]**
PO7	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.**[Environment and sustainability]**
PO8	Apply ethical principles and commit to professional ethics and responsibilities through the norms of professional engineering practice .**[Ethics]**
PO9	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary teams for IT based products. **[Individual and Team Work]**
P10	Communicate effectively with the engineering community and the 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.**[Communication]**
P11	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member /or leader in a team, to manage projects in multi-disciplinary environment. **[Project Management and Finance]**
P12	Recognize the need for, and have the preparation and ability to engage in independent and Life-long learning in broadest context of technological change. **[Life-long Learning]**

PROGRAMME SPECIFIC OUTCOMES	
PSO1	Design software solutions using programming skills and computing technologies
PSO2	Design and implement data communication system using various IT components.

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Pulloor, Kariapatti –Taluk. Virudhunagar Dist-626115.
DEPARTMENT OF INFORMATION TECHNOLOGY
Accredited by NBA

REGULATIONS 2021

OVERALL COURSE STRUCTURE

Code	Category	Total No. of Courses	Credits	Percentage
BS	Basic Sciences	10	28	17.3
ES	Engineering Sciences	7	20.5	12.7
HSS	Humanities and Social Sciences	5	9	5.6
PC	Professional Core (Including Lab Courses)	25	59.5	37
PE	Professional Elective	6	18	11.1
OE	Open Elective	4	12	7.1
PW	Project Work, Seminar	3	13	8
MC	Mandatory Courses	10	2	1.2
	TOTAL	**70**	**162**	**100**

COURSE CREDITS – SEMESTERWISE

Branch	I	II	III	IV	V	VI	VII	VIII	TOTAL
IT	**22**	**17**	**22**	**22**	**25**	**23**	**17**	**14**	**162**

Semester I

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN101	English for Technical Communication (Common to ALL Branches except CSBS)	2	0	0	2	HSS
21UMA102	Matrix and Calculus (Common to ALL Branches except CSBS)	3	1	0	4	BS
21UPH103	Engineering Physics (Common to ALL Branches except CSBS)	3	0	0	3	BS
21UCY105	Applied Chemistry (Common to CSE,ECE,EEE,IT,BME,BT,AIDS and CSD)	3	0	0	3	BS
21UCS108	Problem Solving and Python Programming (Common to All Branches Except CSBS)	3	0	0	3	ES
21UME109	Engineering Graphics (Common to All BranchesExcept CSBS,AIDS and CSD)	3	1	0	4	ES
OTHER THEORY COURSES						
NIL						
PRACTICAL						
21UCS110	Problem Solving and Python Programming Laboratory (Common to All Branches Except CSBS)	0	0	2	1	ES
21UCS112	Engineering Fundamentals Laboratory (Common to CSE, ECE,IT, BME,BT)	0	0	2	1	ES
21UGS113	Basic Sciences Laboratory I (Common to All BranchesExcept CSBS)	0	0	2	1	BS
MANDATORY						
21UGM131	Induction Programme (Common to All Branches)	0	3	0	P/F	MC
	TOTAL	**17**	**5**	**6**	**22**	
Total No of Credits - 22						

Semester II

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN201	Communication Skills for Professionals (Integrated Course) (Common to All Branches except CSBS)	1	0	1	1.5	HSS
21UMA203	Differential Equations and Complex Analysis (Common to CSE and IT)	3	1	0	4	BS
21UPH205	Physics for Information Science (Common to CSE, IT,EEE ,AIDS & CSD)	3	0	0	3	BS
OTHER THEORY COURSES						
21UIT204	Digital Principles and System Design (Only for IT)	3	0	0	3	ES
21UIT205	C Programming (Integrated Course) (Only for IT)	3	0	3	4.5	ES
PRACTICAL						
21UGS210	Basic Sciences Laboratory II (Common to All Branches Except CSBS)	0	0	2	1	BS
MANDATORY						
21UGM231	Environmental Science (Common to All Branches)	3	0	0	P/F	MC
	TOTAL	**16**	**1**	**6**	**17**	
Total No of Credits - 17						

Semester III

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA322	Probability, Queueing Theory and Numerical Methods (Common to CSE and IT)	3	1	0	4	BS
21UIT302	Data Structures (Common to CSE,IT,AIDS&CSD)	3	0	0	3	PC
21UCS303	Object Oriented Programming using C++ (Integrated Course) (Common to CSE,IT,CSBS & CSD)	3	0	2	4	PC
21UIT304	Principles of Operating Systems (Common to CSE ,IT,AIDS&CSD)	3	0	0	3	PC
21UCS305	Computer Organization (Common to CSE ,IT,CSBS & AIDS)	3	0	0	3	PC
21UCD306	Database system Design (Common to CSE,IT, AIDS& CSD)	3	0	0	3	PC
PRACTICAL						
21UIT307	Data Structures Laboratory (Common to CSE,IT, AIDS&CSD)	0	0	2	1	PC
21UCD308	Database system Design Laboratory (Common to CSE,IT, AIDS & CSD)	0	0	2	1	PC
MANDATORY						
21UGM331	Biology for Engineers (Common to All except BME and BT)	2	0	0	P/F	MC
	TOTAL	**20**	**1**	**6**	**22**	
Total No of Credits - 22						

Semester IV

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA421	Transforms and Discrete Mathematics (Common to CSE and IT)	3	1	0	4	BS
21UCS402	Computer Networks (Common to CSE, IT & CSD)	3	0	0	3	PC
21UCS403	Algorithm Analysis (Common to CSE, IT,AIDS& CSD)	3	0	0	3	PC
21UIT404	Java Programming (Integrated course) (Offered By Infosys-Springboard) (Common to CSE, IT & CSD)	3	0	2	4	PC
21UIT405	Software Engineering Methodology (Common to CSE &IT)	3	0	0	3	PC
21UIT406	Microprocessor Based System Design (Integrated Course) (Only to IT)	3	0	2	4	ES
PRACTICAL						
21UCS407	Computer Networks Laboratory (Common to CSE, IT & CSD)	0	0	2	1	PC
MANDATORY						
21UGM431	Gender Equality (Common to all)	1	0	0	P/F	MC
		19	**1**	**6**	**22**	
Total No of Credits -22						

Semester V

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UGS531	Reasoning and Aptitude (Common to CSE, ECE, IT, CSBS, AIDS and CSD)	1	0	0	1	BS
21UIT501	Internet and web Technology (Only to IT)	3	0	0	3	PC
21UCS502	Mobile applications design and development (Common to CSE &IT)	3	0	0	3	PC
21UIT503	Mining and analysis of big data (Only to IT)	3	0	0	3	PC
21UIT504	Object Oriented Analysis and Design (Only to IT)	3	0	0	3	PC
PE1	ProfessionalElective–I	3	0	0	3	PE
OE1	Open Elective–I	3	0	0	3	OE
PRACTICAL						
21UGS532	Soft Skills Laboratory (Common to CSE,EEE,IT,AGRI,CSBS,AIDS and CSD)	0	0	2	1	HSS
21UIT506	Internet and web Technology Laboratory (Only to IT)	0	0	2	1	PC
21UIT 507	Creative thinking and Innovation	0	0	2	1	PW
21UIT508	Mining and Analysis of Big Data Laboratory (Only to IT)	0	0	2	1	PC
21UCS509	Mobile applications design and development Laboratory (Common to CSE &IT)	0	0	2	1	PC
MANDATORY						
21UGT140	Heritage of Tamil (Common to all)	1	0	0	1	MC
	TOTAL	**20**	**0**	**10**	**25**	
Total No of Credits –25						

Semester VI

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UIT601	Internet of Things (Only to IT)	3	0	0	3	PC
21UCS603	Artificial Intelligence and Machine learning (Common to CSE &IT)	3	0	0	3	PC
PE-II	ProfessionalElective–II	3	0	0	3	PE
PE-III	ProfessionalElective–III	3	0	0	3	PE
OE-II	OpenElective–II	3	0	0	3	OE
PRACTICAL						
21UIT606	Internet of Things Laboratory (Only to IT)	0	0	3	1.5	PC
21UIT607	Product Development Project	0	0	8	4	PW
21UCS608	Artificial Intelligence and Machine Learning Laboratory (Common to CSE &IT)	0	0	2	1	PC
21UGS633	Interpersonal Skills Development Laboratory (Common to CSE,EEE,IT,AGRI,CSBS, AIDS and CSD)	0	0	3	1.5	HSS
MANDATORY						
21UGM631	Indian Constitution (Common to all Branches)	1	0	0	P/F	MC
	TOTAL	**16**	**0**	**16**	**23**	
Total No of Credits - 23						

Semester VII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UME701	ProjectManagement and Finance (Common to All Branches Except CSBS and AGRI)	3	0	0	3	HSS
21UIT702	Cloud Service Management (Only to IT)	3	0	0	3	PC
PE-IV	Professional Elective–IV	3	0	0	3	PE
PE-V	Professional Elective –V	3	0	0	3	PE
OE-III	Open Elective–III	3	0	0	3	OE
PRACTICAL						
21UIT705	Cloud Service Management Laboratory (Only to IT)	0	0	2	1	PC
R21UGE710	MDP-Phase I* (Common to all Branches)	0	0	6	3	PW
MANDATORY						
21UGM731	Sports and Social Development (Common to all Branches)	-	-	-	P/F	MC
21UGM732	Skill Development	-	-	-	P/F	MC
21UIT735	Internship	-	-	-	1	MC
	TOTAL	**15**	**0**	**2**	**17**	
Total No of Credits - 17						

***Students those who opt for MDP Phase I are exempted from taking Open Elective III**

Semester VIII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
PE-VI	ProfessionalElective–VI(swayam)	3	0	0	3	PE
OE-IV	OpenElective–IV	3	0	0	3	OE
PRACTICAL						
21UIT801	Projectwork	0	0	16	8	PW
21UGE810	MDP-Phase II* (Common to all branches)	0	0	16	8	PW
MANDATORY						
21UGM831	Professional Ethics and Human values (Common to all branches)	2	0	0	P/F	MC
	TOTAL	**8**	**0**	**16**	**14**	
Total No of Credits 14						

***Students those who opt for MDP Phase-I are allowed to take MDP Phase II**

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

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

PROFESSIONAL ELECTIVE COURSES : VERTICALS

Vertical Data Science	**Vertical II Full Stack Development**	**Vertical III Cloud Computing and Data Center Technologies**	**Vertical IV Cyber Security and Data Privacy**	**Vertical V Creative Media and Design**	**Vertical VI Emerging Technologies**	**Vertical VII Artificial Intelligence and Machine Learning**
Exploratory Data Analysis	Full stack web Development	Cloud Computing	Ethical Hacking	Metaverse	Metaverse	Knowledge Engineering
Recommender Systems	App Development	Virtualization	Digital and Mobile Forensics	Multimedia and Animation	Robotic Process Automation	Soft Computing
Neural Networks and Deep Learning	Cloud Essentials	Cloud Essentials	Social Network Security	Video Creation and Editing	Human Computer Interfaces	Neural Networks and Deep Learning
Text and Speech Analysis	UI and UX Design	Data Warehousing	Modern Cryptography	Digital Audio & Video Production Workflow	Cyber Security	Text and Speech Analysis
Business Analytics	Software Testing and Automation	Storage Technologies	Engineering Secure Software Systems	Digital Marketing	Quantum Computing	Optimization Techniques
Image and Video Analytics	Web Application Security	Software Defined Networks	Crypto currency and Block chain Technologies	Visual Effects	Cryptocurrencyan d Block chain Technologies	Game Theory
Computer Vision	DevOps	Stream Processing	Network Security	Digital Audio & Video Design	DevOps	Cognitive Science
Big Data Analytics	Principles of Programming Languages	Security and Privacy in Cloud	Security and Privacy in Cloud	Short Flim Development	3D Printing and Design	Ethics and AI
	CloudComputing					

VERTICAL I - DATASCIENCE

Course Code	Course Title	L	T	P	C
21CSV 101	Exploratory Data Analysis	3	0	0	3
21CSV 102	Recommender Systems	3	0	0	3
21ITV 103	Neural Networks and Deep Learning	3	0	0	3
21CSV 104	Text and Speech Analysis	3	0	0	3
21ITV 105	Business Analytics	3	0	0	3
21ITV 106	Image and Video Analytics	3	0	0	3
21CSV 107	Computer Vision	3	0	0	3
21IT V 108	Big Data Analytics	3	0	0	3

VERTICAL II - FULL STACK DEVELOPMENT

Course Code	Course Title	L	T	P	C
21ITV 201	Full stack web Development	3	0	0	3
21ITV 202	App Development	3	0	0	3
21CSV 303	Cloud Essentials	3	0	0	3
21CSV 204	UI and UX Design	3	0	0	3
21ITV 205	Software Testing and Automation	3	0	0	3
21CSV 206	Web Application Security	3	0	0	3
21ITV207	DevOps	3	0	0	3
21CSV 208	Principles of Programming Languages	3	0	0	3
21CSV 301	Cloud Computing	3	0	0	3

VERTICAL III - CLOUD COMPUTING AND DATACENTER TECHNOLOGIES

Course Code	Course Title	L	T	P	C
21CSV 301	Cloud Computing	3	0	0	3
21CSV 302	Virtualization	3	0	0	3
21CSV 303	Cloud Essentials	3	0	0	3
21ITV 304	DataWarehousing	3	0	0	3
21ITV 305	StorageTechnologies	3	0	0	3
21CSV 306	Software Defined Networks	3	0	0	3
21ITV 307	Stream Processing	3	0	0	3
21ITV 308	Security and Privacy in Cloud	3	0	0	3

VERTICAL IV – CYBER SECURITY AND DATA PRIVACY

Course Code	Course Title	L	T	P	C
21ITV 401	Ethical Hacking	3	0	0	3
21ITV 402	Digital and Mobile Forensics	3	0	0	3
21CSV 403	Social Network Security	3	0	0	3
21CSV 404	Modern Cryptography	3	0	0	3
21ITV 405	Engineering Secure Software Systems	3	0	0	3
21ITV 406	Crypto currency and Block chain Technologies	3	0	0	3
21CSV 407	Network Security	3	0	0	3
21ITV 308	Security and Privacy in Cloud	3	0	0	3

VERTICAL V – CREATIVE MEDIA AND DESIGN

Course Code	Course Title	L	T	P	C
21ITV 501	Metaverse	3	0	0	3
21ITV 502	Multimedia and Animation	3	0	0	3
21ITV 503	Video Creation and Editing	3	0	0	3
21ITV 504	Digital Audio & Video Production Workflow	3	0	0	3
21CSV 505	Digital Marketing	3	0	0	3
21CSV 506	Visual Effects	3	0	0	3
21ITV 507	Digital Audio & Video Design	3	0	0	3
21ITV 508	Short Flim Development	3	0	0	3

VERTICAL VI – EMERGING TECHNOLOGIES

Course Code	Course Title	L	T	P	C
21ITV 501	Metaverse	3	0	0	3
21CSV 602	Robotic Process Automation	3	0	0	3
21ITV603	Human Computer Interfaces	3	0	0	3
21CSV 604	Cybersecurity	3	0	0	3
21CSV 605	Quantum Computing	3	0	0	3
21ITV 406	Crypto currency and Block chain Technologies	3	0	0	3
21ITV207	DevOps	3	0	0	3
21ITV 608	3DPrinting and Design	3	0	0	3

VERTICAL VII – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	Course Title	L	T	P	C
21ITV 701	Knowledge Engineering	3	0	0	3
21CSV 702	Soft Computing	3	0	0	3
21ITV 103	Neural Networks and Deep Learning	3	0	0	3
21CSV 104	Text and Speech Analysis	3	0	0	3
21CSV 705	Optimization Techniques	3	0	0	3
21ITV 706	Game Theory	3	0	0	3
21ITV 707	Cognitive Science	3	0	0	3
21CSV708	Ethics And AI	3	0	0	3

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

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

VERTICALS FOR MINOR DEGREE

(In addition to all the verticals of other programmes)

Vertical I Fintech and Block Chain	**Vertical II Entrepreneurship**	**Vertical III Public Administration**	**Vertical IV Business Data Analytics**	**Vertical V Environment and Sustainability**	**Vertical VI Computer Technology**	**Vertical VII Artificial Intelligence and Data Science**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development	Introduction to Object oriented programming using C++	Fundamentals of Data Science
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Data mining for Business Intelligence	Sustainable Agriculture and Environmental Management	Algorithms and data structures	Foundation of Artificial Intelligence
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials	Java fundamentals	Data Analytics

Introduction to Block chain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability	Agile Software development	Data and Information Security
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology	Database and data analytics	Information Storage and Management
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis	Networking and data Communication	Statistical Machine Learning
-	-	-	-	Integrated Energy Planning for Sustainable Development	Applications development (Full Stack)	Human Computer Interaction
-	-	-	-	Energy Efficiency for Sustainable Development	Machine learning	AI in Speech Processing
-	-	-	-	-	Cyber Security Essentials	-

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL I: FINTECH AND BLOCK CHAIN

Course Code	Course Title	L	T	P	C
21CBVG11	Financial Management	3	0	0	3
21CBVG12	Fundamentals of Investment	3	0	0	3
21CBVG13	Banking, Financial Services and Insurance	3	0	0	3
21CBVG14	Introduction to Block chain and its Applications	3	0	0	3
21CBVG15	Fintech Personal Finance and Payments	3	0	0	3
21CBVG16	Introduction to Fintech	3	0	0	3

VERTICAL II : ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
21MEVG21	Foundations of Entrepreneurship	3	0	0	3
21MEVG22	Team Building & Leadership Management for Business	3	0	0	3
21MEVG23	Creativity & Innovation in Entrepreneurship	3	0	0	3
21MEVG24	Principles of Marketing Management for Business	3	0	0	3
21MEVG25	Human Resource Management for Entrepreneurs	3	0	0	3
21MEVG26	Financing New Business Ventures	3	0	0	3

VERTICAL III :PUBLIC ADMINISTRATION

Course Code	Course Title	L	T	P	C
21EEVG31	Principles of Public Administration	3	0	0	3
21EEVG32	Constitution of India	3	0	0	3
21EEVG33	Public Personnel Administration	3	0	0	3
21EEVG34	Administrative Theories	3	0	0	3
21EEVG35	Indian Administrative System	3	0	0	3
21EEVG36	Public Policy Administration	3	0	0	3

VERTICAL IV : BUSINESS DATA ANALYTICS

CourseCode	Course Title	L	T	P	C
21CSVG41	Statistics for Management	3	0	0	3
21CSVG42	Datamining for Business Intelligence	3	0	0	3
21CSVG43	Human Resource Analytics	3	0	0	3
21CSVG44	Marketing and Social Media Web Analytics	3	0	0	3
21CSVG45	Operation and Supply Chain Analytics	3	0	0	3
21CSVG46	Financial Analytics	3	0	0	3

VERTICAL V :ENVIRONMENT AND SUSTAINABILITY

Course Code	Course Title	L	T	P	C
21CEVG51	Sustainable Infrastructure Development	3	0	0	3
21CEVG52	Sustainable Agriculture and Environmental Management	3	0	0	3
21CEVG53	Sustainable Bio Materials	3	0	0	3
21CEVG54	Materials for Energy Sustainability	3	0	0	3
21CEVG55	Green Technology	3	0	0	3
21CEVG56	Environmental Quality Monitoring and Analysis	3	0	0	3
21CEVG57	Integrated Energy Planning for	3	0	0	3

	Sustainable Development				
21CEVG58	Energy Efficiency for Sustainable Development	3	0	0	3

VERTICAL VI :COMPUTER TECHNOLOGY

Course Code	Course Title	L	T	P	C
21ITVG61	Introduction to Object oriented programming using C++	2	0	2	3
21ITVG62	Algorithms and data structures	3	0	0	3
21ITVG63	Java fundamentals	2	0	2	3
21ITVG64	Agile Software development	3	0	0	3
21ITVG65	Database and data analytics	3	0	0	3
21ITVG66	Networking and data Communication	3	0	0	3
21ITVG67	Applications development (Full Stack) **(Offered By Infosys Springboard)**	2	0	2	3
21ITVG68	Machine learning	3	0	0	3
21ITVG69	Cyber Security Essentials	3	0	0	3

VERTICAL VII :ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Code	Course Title	L	T	P	C
21ADVG71	Fundamentals of Data Science	3	0	0	3
21ADVG72	Foundation of Artificial Intelligence	3	0	0	3
21ADVG73	Data Analytics	3	0	0	3
21ADVG74	Data and Information Security	3	0	0	3
21ADVG75	Information Storage and Management	3	0	0	3
21ADVG76	Statistical Machine Learning	3	0	0	3
21ADVG77	Human Computer Interaction	3	0	0	3
21ADVG78	AI in Speech Processing	3	0	0	3

LIST OF OPEN ELECTIVES

OFFERED BY IT TO OTHER DEPARTMENTS

Course Code	Course Title	L	T	P	C
21UIT971	Animation Technology	3	0	0	3
21UIT972	Basics of Arduino and Raspberry Pi	3	0	0	3
21UIT973	Cyber Forensics and Malware	3	0	0	3
21UIT974	Fundamentals of Database Management Systems	3	0	0	3
21UIT975	Introduction to 3D Animation	3	0	0	3
21UIT976	Learning IT Essentials by Doing	3	0	0	3
21UIT977	Introduction to Logics of Programming	3	0	0	3
21UIT978	Essentials of UI Design	3	0	0	3
21UIT979	Website Designing	3	0	0	3

LIST OF COURSES OFFERED BY IT TO OTHER DEPARTMENTS

Course Code	Course Title	L	T	P	C	Offered Dept
21UIT326	Fundamentals of C Programming (Integrated Course)	2	0	2	3	ECE
21UIT327	Data Structure using C (Integrated Course)	3	0	2	4	EEE
21UIT426	Data structures using object oriented programming (Integrated Course)	3	0	2	4	Bio-Medical
21UIT427	Python Object Oriented Programming	3	0	0	3	AGRI
21UIT428	Python Object Oriented Programming Laboratory	0	0	3	1.5	AGRI
21UIT429	Introduction to Data Structures and Algorithms (Integrated Course)	2	0	2	3	ECE

ONE CREDIT COURSES

Course Code	Course Title	L	T	P	C
21UIT861	IT-Infrastructure Management Service	1	0	0	1
21UIT862	Fundamentals of 3DAnimation	1	0	0	1
21UIT863	Dart Programming	1	0	0	1
21UIT864	Software development using CASE Tool	0	0	2	1
21UIT865	Essentials of Tableau	0	0	2	1
21UIT866	Microsoft Power BI	1	0	0	1
21UIT867	Logics of Programming	0	0	2	1
21UIT868	ChatBot using Dialog flow	0	0	2	1
21UIT869	Kotlin Programming	0	0	2	1
21UIT870	Blender for Beginners	0	0	2	1
21UIT871	Essentials of Emotional Intelligence	1	0	0	1
21UIT872	UI Design	0	0	2	1
21UIT873	Green Computing	1	0	0	1

SEMESTER I

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN101	English for Technical Communication (Common to ALL Branches except CSBS)	2	0	0	2	HSS
21UMA102	Matrix and Calculus (Common to ALL Branchesexcept CSBS)	3	1	0	4	BS
21UPH103	Engineering Physics (Common to ALL Branches except CSBS)	3	0	0	3	BS
21UCY105	Applied Chemistry (Common to CSE,ECE,EEE,IT,BME,BT,AIDS and CSD)	3	0	0	3	BS
21UCS108	Problem Solving and Python Programming (Common to All Branches Except CSBS)	3	0	0	3	ES
21UME109	Engineering Graphics (Common to All BranchesExcept CSBS,AIDS and CSD)	3	1	0	4	ES
OTHER THEORY COURSES						
NIL						
PRACTICAL						
21UCS110	Problem Solving and Python Programming Laboratory (Common to All Branches Except CSBS)	0	0	2	1	ES
21UCS112	Engineering Fundamentals Laboratory (Common to CSE, ECE,IT, B ME,BT)	0	0	2	1	ES
21UGS113	Basic Sciences Laboratory I (Common to All BranchesExcept CSBS)	0	0	2	1	BS
MANDATORY						
21UGM131	Induction Programme (Common to All Branches)	0	3	0	P/F	MC
	TOTAL	**17**	**5**	**6**	**22**	
Total No of Credits - 22						

21UEN101	ENGLISH FOR TECHNICAL COMMUNICATION (Common To All Branches Except CSBS)	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES :

- To enhance the vocabulary of students
- To strengthen the application of functional grammar and basic skills
- To improve the language proficiency of students

UNIT I	PRESENTING ESSENTIALS OF CORRESPONDENCE	6
Listening - Formal and informal conversations and comprehension. **Speaking-** introducing oneself - exchanging personal and social information. **Reading** - Skimming and Scanning. **Writing -** Sentence Formation, Formal Letters (Permission/Requisition).**Grammar**- Parts of Speech. **Vocabulary Development** - Technical Word Formation- Prefix- suffix - Synonyms and Antonyms-Phrases and Clauses.		
UNIT II	**COMMUNICATION SKILLS**	**6**
Listening- Telephonic Conversations**. Speaking** - Pronunciation rules with Stress pattern. **Reading** - comprehension-pre-reading, post-reading- comprehension questions **Writing** - Punctuation rules, paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions, - **Grammar** - Tense. **Vocabulary Development**- Words from other languages in English.		
UNIT III	**CORRESPONDENCE AND VOCATION IMPROVEMENT**	**6**
Listening - Motivational speech by Great Speakers **Speaking** -Narrating daily events.**Reading** - Newspaper reading. **Writing** - Job application letter - Transformation of Information (Transcoding) -**Grammar -** Voice. -**Vocabulary Development** -Same word in different parts of speech		
UNIT IV	**PORTRAYAL AND SUMMATION**	**6**
Listening - Understating the instruction. **Speaking** -Intonation and preparing dialogue on various formal and informal situation**Reading** -Note Making from given text - **Writing** - Creating coherence, Essay writing with proper introduction and conclusion, Giving Instruction (Guidance/Procedure) -**Grammar**- Subject-Verb Agreement (Concord), **VocabularyDevelopment** - One word substitution.		
UNIT V	**CRITICAL THINKING**	**6**
Listening -Listening important messages based on news report. **Speaking-** retelling short		

stories.**Reading-** Organization Profile, news report. **Writing** -Precise writing, Developing Hints - Report Writing (Industrial, Accident). **Grammar** - Spot the Errors in English

TOTAL PERIODS : 30 Periods

COURSE OUTCOMES

After successful completion of this course the students will be able to:

- Apply grammar effectively in writing meaningful sentences and paragraphs – A2
- Exhibit reading skills and comprehension to express the ideas in the given text - A2
- Develop writing skills to present the ideas in various formal situations – A2
- Develop oral fluency to express the ideas in various formal situations – A2
- Prepare Reports for various purpose – A2

TEXT BOOKS

1. KN Shoba, Lourdes JoavaniRayen,"Communicative English", New Delhi, Cambridge University Press, 2017

REFERENCE BOOKS

1. Raman, Meenakshi, SangeethaSharma,"Business Communication", New Delhi, Oxford University Press, 2014.
2. Lakshminarayanan. K.R, "English for Technical Communication", Chennai, Scitech Publications (India) Pvt. Ltd, 2004.
3. Rizvi. Asraf M, "Effective Technical Communication", New Delhi, Tata McGraw-Hill Publishing Company Limited, 2007.

21UMA102	MATRIX AND CALCULUS (Common To All Branches Except CSBS)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To make the students capable of identifying linear equations based problems (Eigen Value) from practical areas and obtain the Eigen value oriented solutions in certain cases.
- To widen the students' knowledge base on linear algebra, growth rate computation and application of integrals.
- Able to integrating various types of functions using various integration methods.
- To familiarize the students with the basic rules of differentiation and use them to find derivatives of products and quotients of functions
- To apply these mathematical concepts (matrix theory, differentiation and integration) in engineering field.

UNIT I	MATRICES	8 + 3
Eigen value and eigen vector of a real matrix - Characteristic equation - Properties - Cayley-Hamilton theorem (excluding Proof) - Orthogonal reduction -(transformation of a symmetric matrix to diagonal form) - Quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation		
UNIT II	**DIFFERENTIAL CALCULUS**	**9 + 3**
Introduction - Definition of derivatives - Limits and Continuity - Differentiation techniques (Product rule, Quotient rule, Chain rule) - Successive differentiation (n^{th} derivatives) - Leibnitz theorem (without proof) - Maclaurin's series - Physical Applications (Newton's law of cooling - Heat flow problems, Rate of decay of radioactive materials - Chemical reactions and solutions, Ohm's law, Kirchoff's law - Simple electric circuit problems)		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**9 + 3**
Partial derivatives - Euler's theorem for homogenous functions - Total derivatives - Differentiation of implicit functions - Jacobian - Taylor's expansion - Maxima and Minima - Method of Lagrangian Multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**8 + 3**
Definitions and concepts of integrals - Methods of integration (Decomposition method, Substitution method, Integration by parts) - Definite integrals - Properties and problems - Reduction formulae - Beta and Gamma functions.		
UNIT V	**MULTIPLE INTEGRALS**	**8 + 3**

Double integration -Cartesian and Polar coordinates - Change of order of integration - Area as a double integral - Change of variables between Cartesian and Polar coordinates - Triple integration in Cartesian coordinates - Volume as triple integral.

SUPPLEMENT TOPIC FOR INTERNAL EVALUATION ONLY - 3

Evocation / Application of Mathematics, Quick Mathematics – Speed Multiplication and Division Applications of Matrices.

TOTAL PERIODS : 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Apply the knowledge of Matrices to solve Engineering problems [Apply]
- Analyze Engineering problems using limits, continuity and derivatives [Analyse]
- Applythe knowledge of differentiation techniques to predict the extreme values of the Engineering problems with constraints [Apply]
- Apply the knowledge of Beta and Gammafunction and their relation to evaluate the Engineering problems involving definite integrals. [Apply]
- Apply the concept of Multiple integralsto compute the graphical representation in Engineering problems [Apply]
- Explain the basic concepts of Matrix, Differentiation and Integration [Understand]

TEXT BOOKS

1. BALI N. P and MANISH GOYAL, "A Text book of Engineering Mathematics", Laxmi Publications (P) Ltd, New Delhi, 8th Edition, (2011).
2. VEERARAJAN.T, "Engineering Mathematics" Tata McGraw Hill Publishing Company, New Delhi, vol 15.
3. GREWAL. B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 42nd Edition, (2012).

REFERENCE BOOKS

1. RAMANA B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
2. GLYN JAMES, "Advanced Engineering Mathematics", Pearson Education, New Delhi, 7th Edition, (2007).
3. JAIN R.K and IYENGAR S.R.K," Advanced Engineering Mathematics",

NarosaPublishing House, New Delhi, 3rd Edition, (2007).

4. BHARATI KRISHNA TIRTHAJI, "Vedic Mathematics - Mental Calculation", MotilalBanarsiDass Publications, New Delhi, 1st Edition, (1965).
5. KREYSZIG. E, "Advanced Engineering Mathematics", John Wiley & Sons, New York, 10th Edition, (2011).
6. P.SIVARAMAKRISHNA DAS, E.RUKMANGADACHARI "Engineering mathematics", volume1, Pearson Edison New Delhi, 2nd Edition, (2013).

21UPH103	ENGINEERING PHYSICS (Common To All Branches Except CSBS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To develop the research interest in crystal physics
- To use the principles of Lasers and its types
- To apply principles of Quantum physics in engineering field
- To develop knowledge on properties of materials

UNIT I	CRYSTAL STRUCTURE	9
Introduction - Classification of solids -Space lattice -Basis-Lattice parameter - Unit cell - Crystal system -Miller indices -d-spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius-Coordination number - Packing factor for SC, BCC, FCC and HCP structures - Applications.		
UNIT II	**SOLID DEFECTS AND HOLOGRAPHY**	**9**
Introduction - Solid defects - Crystal imperfection - Point defects-Line defects-Surface defects-Volume defects Burger vector – Holography - Construction and Reconstruction of hologram - Industrial and Medical Applications		
UNIT III	**PHOTONICS**	**9**
Introduction- Principles of Laser- Characteristics of laser -Spontaneous and stimulated emission - Population inversion - Einstein's A and B coefficients - Pumping methods - Basic components of Laser - Types of lasers - Nd -YAG laser - CO2 laser - Applications.		
UNIT IV	**INTRODUCTION TO QUANTUM MECHANICS**	**9**
Introduction - Black body radiation - Planck's law of radiation- Wien's displacement la Rayleigh Jeans law- Compton Effect - Theory and experimental verification - Matter waves- Schrodinger's wave equation - Time dependent - Time independent equati Particle in 1-D dimensional box		
UNIT V	**PROPERTIES OF SOLIDS**	**9**
Introduction - Elasticity- Stress and Strain - Hooke's law – Three moduli of elasticity –str strain curve – Poisson's ratio –Factors affecting elasticity –Bending moment – Depressio a cantilever –Young's modulus by uniform bending –I- shaped girders.		
TOTAL PERIODS : = 45 Periods		

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Classifythe types of crystals, lasers, elasticity and quantum behavior of solids(U)
- Apply the basic knowledge of crystal, quantum mechanicsand mechanical behavior of solids to solve engineeringproblems(AP)
- Apply the principle of laser to estimate the wavelength of emitted photons (AP)
- Analyze the dual nature of matter using the concepts ofquantum mechanics(AN)
- Analyze the structural and optical properties of crystalsinindustrial and medical applications (AN)
- Analyze the properties of materials forspecificEngineeringApplications (AN)

TEXT BOOKS

1. Dr. Mani.P, "Engineering Physics", Dhanam Publications, Edition ,2018, Chennai.
2. Rajendran.V, "Engineering,Physics", Tata Mc-Graw Hill Publishing Company limited,
   New Delhi, Revised Edition 2018.
3. Palanisami P.K., "Physics For Engineers", Scitech Publications (India), Pvt Ltd., Chennai,2018.

REFERENCE BOOKS

1. Raghuvenshi G.S., "Engineering Physics", PHI Learning Private Limited, New Delhi, Revised Edition 2018.
2. Arul doss .G., "Engineering Physics", PHI Learning Limited, New Delhi, Revised Edition2018.
3. Marikani .A., "Engineering Physics", PHI Learning Private Limited, New Delhi, RevisedEdition 2017.
4. Sankar B.N., and Pillai .S.O., "A Text book of Engineering Physics", New Age International Publishers Private Limited, New Delhi, Revised Edition 2017.
5. Avadhanulu M.N. and Kshirsagar P.G., "A Textbook: of Engineering Physics", S.Chand&Company Ltd., New Delhi, 2018.

21UCY105	APPLIED CHEMISTRY (Common to CSE,ECE,EEE,IT,BME,BT,AIDS and CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To impart the knowledge on Chemical bonding and types.
- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To explain the importance of smart material, green chemistry and energy storage devices

UNIT I	CHEMICAL BONDING	9
Chemical Bonding: Electronic Configuration- Ionic Bond - Covalent Bond - Metallic bond -Aufbau principle, Pauli Exclusion principle, Valence bond theory application and its limitations, Various types of hybridization (sp, sp^2,sp^3) (C_2H_2, C_2H_4, CH_4) -bond strength and bond energy - Hydrogen bonding, Vander Waalsforces.		
UNIT II	**WATER AND ITS TREATMENT TECHNOLOGIES**	**9**
Hardness of water- types- expression of hardness(Problems)- units- estimation of hardness of water by EDTA - boiler troubles (scale and sludge) - Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) - External treatment Ion exchange process - Zeolite process - desalination of brackish water - Reverse Osmosis.		
UNIT III	**SMART MATERIALS**	**9**
Introduction to smart materials and their structure - Organic Light Emitting Diodes - Principles and applications, Liquid crystals – definition and applications.		
UNIT IV	**GREEN CHEMISTRY**	**9**
Introduction to Green Chemistry, the 12 Principles of Green Chemistry, toxicology and Green Chemistry, Environmental Issues, Climate and Green Chemistry, Energy and Green Chemistry, e- waste disposal.		
UNIT V	**ENERGY STORAGE DEVICES**	**9**
Batteries, fuel cells and super capacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery)fuel cells–H_2-O_2fuel cell and application.		
TOTAL PERIODS : = 45 Periods		

COURSE OUTCOMES

At the end of the course, students will be able to :

- Describe the basic concept of chemistry involved in chemical bonding, water treatment methods, smart materials, e-waste management and energy storage devices (Understand-K2)
- Explain the principles and application of organic light emitting diodes, liquid crystals and green chemistry (Understand- K2)
- Apply the knowledge of chemical bonding to identify the types of bonds in molecules (Apply- K3)
- Apply the knowledge of the basic electrochemical cell terminology to select suitable type of energy storage devices for engineering application (Apply-K3)
- Analyze the impurities of water to find its hardness and remove the hardness causing substances (Analyze-K4)
- Write a report on chemical application for Industries (Respond-A2)

TEXT BOOKS

1. Jain P.C.and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P)Ltd., New Delhi, 2010
2. Dr.Sunita Rattan, "A Textbook of Engineering Chemistry" S.K.Kataria&Sons.,New Delhi,2013.
3. Pradeep. T "A textbook of Nanoscience and Nanotechnology", Tata McGraw - Hill education private ltd, 2012.

REFERENCE BOOKS

1. DerekPletcherandFrankC.Walsh,"IndustrialElectrochemistry",ChapmanandHall, New York, 1993.
2. Peter Grundler, " Chemical Sensors – An introduction for Scientists and Engineers", Springer, New York, 2007.

21UCS108	**PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to All Branches Except CSBS)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES :

- To impart the concepts in problem solving for computing
- To familiarize the logical constructs of programming
- To illustrate programming in Python.

UNIT I	**INTRODUCTION**	**9**
Definition and basic organization of computers - classification of computers - Software - Types of software - types of programming paradigms - Translators: compiler and interpreter - Problem solving tools: Algorithms - Flowchart - Pseudo code.		
UNIT II	**INTRODUCTION TO PYTHON**	**9**
Introduction to python - features of python - modes of working with python. Values and data types: numbers, Boolean, strings; variables, expressions, statements, tuple assignment, precedence of operators, comments - print function- conversion of algorithm in to program - Solving simple problems involving arithmetic computations and sequential logic to solve.		
UNIT III	**CONTROL CONSTRUCTS**	**9**
Flow of execution - control structures: conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass - Solving problems involving decision making and iterations		
UNIT IV	**FUNCTIONS AND PACKAGES**	**9**
Functions - function definition and use, flow of execution, parameters and arguments; parameters, local and global scope, function composition-Anonymous or Lambda Function, recursion -packages.		
UNIT V	**LISTS, TUPLES, DICTIONARIES AND STRINGS**	**9**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension - Strings: string slices; immutability, string functions and methods, string module		
TOTAL PERIODS : = 45 Periods		

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Explain the concepts of Python used to solve the computing problems [Understand]
- Apply the knowledge of arithmetic & sequential logic to solve problems related to mathematical expressions [Apply]
- Apply the concepts of Python to solve computer applied complex engineering problems that meet specified needs [Apply]
- Analyze the suitable control constructs to provide solutions to computer applied complex engineering problems [Analyze]
- Formulate problems to provide solutions to computer applied complex engineering problems using modularity [Analyze]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation [Affective Domain]

TEXT BOOKS

1. Ashok NamdevKamthane&Amit Ashok Kamthane, "Problem solving and python programming", McGraw Hill Education, 2018 (copyright)
2. Anurag Gupta & G P Biswas, "Python Programming – Problem solving, packages and libraries", McGraw Hill Education, 2020 (copyright).

REFERENCE BOOKS

1. John V Guttag, " Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, "Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, "Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, " Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

21UME109	ENGINEERING GRAPHICS (Common to All BranchesExcept CSBS,AIDS and CSD)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To develop student's graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
- To impart knowledge in development of surfaces and isometric projections.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)		4
Importance of Graphics in Engineering Applications - Use of Drafting Instruments - BIS Conventions and Specifications - Size, Layout and Folding of Drawing Sheets - Lettering and Dimensioning - Introduction to Plane Curves, Projection of Points, Lines and Plane Surfaces.		
UNIT I	**PROJECTION OFSOLIDS**	**12**
Projection of simple solids like prisms, pyramids, cylinder and cone with axis is parallel, perpendicular and inclined to one of the plane.		
UNIT II	**SECTION OF SOLIDS**	**10**
Section of solids - simple position with cutting plane parallel, perpendicular and inclined to one of the plane.		
UNIT III	**DEVELOPMENTOF SURFACES**	**10**
Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones - Development of lateral surfaces of sectioned solids.		
UNIT IV	**ISOMETRIC PROJECTIONS**	**12**
Principles of isometric projection – isometric scale – isometric view - isometric projections of simple solids and cut solids.		
UNIT V	**ORTHOGRAPHIC PROJECTION**	**12**
Representation of Three Dimensional objects – General principles of orthographic projection- Need for importance of multiple views and their placement – First angle projection – layout views Developing visualization skills of multiple views (Front, top and side views) from pictorial views of objects. **TOTAL PERIODS 45 (L) + 15 (T) = 60 Periods**		

COURSE OUTCOMES

After successful completion of this course the students will be able to:

- Draw orthographic projections of basic geometrical entities in various positions and translate the Geometric information of engineering objects into engineering drawings(Understand)
- Apply the principles of orthographic projections to draw projections of solids and sections of solids (Apply)
- Develop lateral surfaces of regular and sectioned solids (Apply)
- Prepare isometric drawings of simple solids from orthographic views (Apply)
- Construct orthographic projection from the given pictorial view (Apply)
- Analyze the projections of various solid models using different resting conditions (Analyze)

TEXT BOOKS

1. Natarajan K.V., "A Text book of Engineering Graphics", Dhanalakshmi Publishers,(2006).
2. Bhatt N.D., "Engineering Drawing", Charotar Publishing House,(2012).

REFERENCE BOOKS

1. Venugopal K., and Prabhu Raja V., "Engineering Graphics", New AgeInternational(P) Limited, (2008).
2. Gopalakrishnan K.R.," Engineering Drawing" (Vol.I&II), 23rd edition, SubhasPublications.(2014).
3. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to Auto CAD", Tata McGraw Hill Publishing Company Limited,(2012).
4. Saravanan M, Bensan Raj J, Ganesh Kumar S, "Engineering Graphics", JBR Trisea Publishers, Nagarcoil,2020.

21UCS110	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to All Branches Except CSBS)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To familiarize with programming environment
- To familiarize the implementation of programs in Python

LIST OF EXPERIMENTS

Problems involve Sequential logic and Decision making

1. Develop a computing solution to process the mark processing system (Record has the following fields: Name, Reg_no, Mark1, Mark2, Mark3, Mark4, Total, average). Generate student information with total and average marks.
2. Provide a software solution to compute the +2 Cutoff mark, given the Mathematics, physics and Chemistry marks. A college has decided to admit the students with a cut off marks of180. Decide whether the student is eligible to get an admission in that college or not.
3. A pizza in a circular shape with 8 inches and which is placed in a square box whose side length is 10 inches. Find how much of the box is "empty"?
4. A person owns an air conditioned sleeper bus with 35 seating capacity that routes between Chennai to Bangalore. He wishes to calculate whether the bus is running in profit or loss state based on the following scenario:
    i. Amount he spent for a day for diesel filling is: Rs. 15,000
    ii. Amount he spent for a day for Driver and cleaner beta is: Rs. 3,000
    iii. Ticket amount for a Single person is Rs: 950
    iv. If all the seats are filled, what would be the result?
    v. If only 15 seats are filled, what would be the result?
5. Consider the person 'X' has some amount in his hand and the person 'Y' has some amount in his hand. If they wish to exchange the amount among them, how they can exchange the amount by using the third party 'Z'.

Problems involve iterations

6. A man is blessed with a duck that can lay golden eggs. First day it lays one egg,

in second day it lays two eggs, in third day it lays three eggs, and it continues to lay eggs inan incremental manner day by day. Now calculate how many golden eggs that duck lays till 'n'th day.

7. Four People A,B,C,D are sitting in a Circular arrangement. In how many ways their seating can be arranged.
8. The Greek theater shown at the right has 30 seats in the first row of the center section. Each row behind the first row gains two additional seats.How many seats are in the 5^{th} row in the center section?

Problem involve functions and recursive functions

9. Develop a solution to identify the right angle triangle while giving the sides of a triangle. (Recall from the Pythagoras theorem that in a right triangle, the square of one side equals the sum of the squares of other two sides)
10. A game has to be made from marbles of five colors, yellow, blue, green, red and Violet where five marbles has to be kept one upon another. Write a python program using recursion, to find how many ways these marbles can be arranged.
11. Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:
    Here is a high-level outline of how to move a tower from the starting pole, to the goal pole, using an intermediate pole:
        1. Move a tower of height-1 to an intermediate pole, using the final pole.
        2. Move the remaining disk to the final pole.
        3. Move the tower of height-1 from the intermediate pole to the final pole using original pole

Problems involve List and Nested List

12. In a class of 50 numbers of students, 6 students are selected for state cricket academy. Sports faculty of this school has to report to the state cricket academy about the selected students' physical fitness. Here is one of the physical measures of the selected students'; Height in cm is given for those 6 selected students [153,162,148,167,175,151]. By implementing functions, do the following operations.
    (i) State academy selector has to check whether the given height is present in the selected students list or not.

(ii) State academy selector has to order the height of students in an incremental manner.

(iii) State academy selector has to identify the maximum height from the list.

Problems involve Dictionary and Tuples,Dictionary

13. A university wishes to create and maintain the details of the students such as Rollno, Regno, Name, Dept, Batch, Contact_no, Nativity(Indian/NRI) as key value pairs. Do the following operations:

    (i) Display the complete student details on giving Rollno as input.

    (ii) Display the complete student details whose nativity belongs to NRI.

    (iii) Display the complete student details whose department is CSE.

Tuples

14. A librarian wishes to maintain books details such as ISBN, Book Name, Author Name, Year published, Publisher Name. He wishes to retrieve the book details in the following scenario:

    (i) Retrieve the complete details of the book on giving ISBN.

    (ii) Retrieve the details of the book which published after the year 2015.

    (iii) Retrieve the details of the book whose author name is 'Andrew'.

    (iv) Retrieve the details of the book that name of the book is 'Python'

Problems involve Strings

15. A musical album company has 'n' number of musical albums. The PRO of this company wishes to do following operations based on some scenarios:

    (i) Name of the album starts with 's' or 'S'.

    (ii) Name of the album which contains 'jay' as substring.

    (iii) Check whether the album name presents in the repository or not.

    (iv)Count number of vowels and consonants in the given album name.

TOTAL PERIODS: 30 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Formulate algorithms for simple problems and translate the algorithms to a working program [Apply]
- Formulate algorithms and programs for arithmetic computations and sequential logic[Apply]
- Develop programs using functions, packages and use recursion to reduce

redundancy[Apply]

- Manipulate data using lists, tuples, dictionaries through a program[Analyze]
- Analyze the suitable control constructs to provide solutions to computer applied complex engineering problems that meet specified needs [Analyze]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation [Affective Domain]

HARDWARE AND SOFTWARE REQUIRMENTS

HARDWARE REQUIRMENTS

Persoal Computers With 4GB RAM,500GB HDD,Monitor,Keyboard and Mouse – 30 numbers

SOFTWARE REQUIRMENTS

OS – UNIX CLONE **(License free Linux)**

EDITOR – IDLE

21UCS112	ENGINEERING FUNDAMENTALS LABORATORY (Common to CSE, ECE,IT,BME&BT Branches)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To familiarize the Hardware components of Computer
- To practice the installation of operating systems and other software's

LIST OF EXPERIMENTS:

GROUP A (COMPUTER) **15 Periods**

- Demonstrating basic components of a personal computer
- Assembling hardware components of a computer
- Installation of windows and linux operating systems
- Installation of software's both in windows and linux operating system
- Configuring the computer to connect with internet
- PC trouble shooting and maintenance

GROUP B (ELECTRICAL & ELECTRONICS) **15 Periods**

- Study of electronic components and equipments-
- Resistor color coding
- Measurement of AC signal parameter (peak to peak, rms, period, frequency) using CRO
- Study of logic gates
- Soldering practice – components devices and circuits - using general purpose PCB
- Characteristics of LED
- Interfacing of PIR sensor with micro controller
- Switch control with micro controller
- Temperature measurement with micro controller

Total PERIODS: 30 Periods

COURSE OUTCOMES

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

Apply the knowledge of assembling the hardware components of computer for building the system

- Apply the knowledge of assembling the hardware components of computer for building the system [Apply]
- Select appropriate software components to install for proper functioning of computer system [Apply]
- Configure personal computers to link with local area network settings [Apply]

- Demonstrate the function of electronics components [Apply]
- Develop code for interfacing sensors with microcontroller [Apply]
- work individually or in teams and demonstrate the solutions to the given exercise(Affective domain)

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS
HARDWARE

LAN SYSTEM WITH 30 NODES (OR) STANDALONE PCS – 30 NOS.

SOFTWARE

OS – UNIX CLONE (License free Linux)

EQUIPMENT

Sl.NO	Name of the Equipment / Software	Quantity
1.	Logic Trainer Kit	2
2.	CRO And AFO	2
3.	Small Multipurpose PCBS	5
4.	Soldering Guns	5
5.	Multimeters	5
6.	DC Ammeter	10
7.	DC Voltmeter	10
8.	Variable DC Power Supply	5
9.	Node MCU Development Board	10
10.	PIR Sensor (HC-SR501)	5
11.	Temperature Sensor (IM35 or DHT11)	5
12.	PC With Windows 7	3

21UGS113	BASIC SCIENCES LABORATORY - I (Common to All Branches Except CSBS)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To impart knowledge on basic concepts in applications of chemical analysis
- To explain the knowledge of various instruments.
- To explain the knowledge on the chemical analysis of various metal ions.

LIST OF EXPERIMENTS

1. Preparation of molar and normal solutions of the following substances – Oxalic acid , Sodium Carbonate , Sodium Hydroxide and Hydrochloric acid
2. Conductometric Titration of strong acid with strong base
3. Conductometric Titration of Mixture of Acids
4. Estimation of Iron by potentiometry
5. Determination of Strength of given acid using pHmetry
6. Determination of molecular weight of polymer by viscometry
7. Comparison of the electrical conductivity of two samples-conductometric method
8. Estimation of copper in brass by EDTA method

COURSE OUTCOMES

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

- Apply the knowledge of Molarity and Normality to prepare standard solution for chemical analysis (Apply K3)
- Apply the knowledge of electrochemical techniques to study various ions present in the industrial effluents (Apply K3)
- Analyze the given solution quantitatively using titration.(Analyze K4)

A minimum of FIVE experiments shall be offered for every course

TOTAL PERIODS: 30 Periods

21UGS113	BASIC SCIENCES LABORATORY - I (Common to All Branches Except CSBS)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To create scientific temper among the students.
- To know how to execute experiments properly,presentation of observations and arrival of conclusions.
- To view and realize the theoretical knowledge acquired by the students through experiments

LIST OF EXPERIMENTS

1. Laser– Determination of particle size and wavelength of Laser source using Diode Laser.
2. Ultrasonic Interferometer-Determination of velocity of sound in liquid and compressibility of liquid.
3. Poiseuille's method-Determination of Coefficient of viscosity of liquid.
4. Spectrometer –Determination of dispersive power of a prism.
5. Air Wedge method-Determination of thickness of a thin wire.
6. Uniform bending method–Determination of Young's modulus of the given rectangular beam.

COURSE OUTCOMES:

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

- Apply the principles of Optics,Laser physics and spectroscopy to determine the Engineering properties of materials(Apply)
- Analyze the given liquid sample to determine the viscosity and compressibility of the liquid.(Analyze)
- Apply the principles of Elasticity to determine the Young's modulus of the materials. (Apply)

A minimum of FIVE experiments shall be offered for every course

TOTAL PERIODS: 30 Periods

21UGM131	INDUCTION PROGRAMME (Common to All Branches)	L	T	P	C
		0	3	0	P/F

COURSE OBJECTIVES :

- To rejuvenate the Body and Mind
- To strengthen Attitude and soft skills
- To practice Moral values of life.

UNIT I	PHYSICAL ACTIVITY	10
Zumba - Bokwa Fitness - Yoga - Mediation - Fine Arts		
UNIT II	**CREATIVE ARTS**	**5**
Painting - Class Painting - Wall Painting - Art from waste		
UNIT III	**UNIVERSAL HUMAN VALUES & EMINENT SPEAKERS**	**5**
Ethical values - Ambition and Family Expectation, Gratitude, Competition and Excellence - Belief - Morality of life - Guest Lecture by Eminent personality.		
UNIT IV	**LITERARY**	**5**
Elocution - Essay writing Competition - Impromptu Session - Dance and singing competition.		
UNIT V	**PROFICIENCY MODULES**	**10**
Toastmaster club meet.		
UNIT VI	**INDUSTRIAL & LOCAL VISIT**	**8**
Vaigai Dam - Theni - VOC- Port-Tuticorin - Madurai Radio City-Madurai - Aavin Milk - Madurai-NSS Activities.		
UNIT VII	**FAMILIARIZATION OF THE DEPT. AND INNOVATION**	**2**
Department Introduction and Purpose of Course - Eminent speakers – Scope and Feature of the Course - Latest Innovation.		
	TOTAL PERIODS : = 45 Periods	

COURSE OUTCOMES

After successful completion of this course the students will be able to:

- Practice physical activities regularly.
- Implement creativity in drawing and waste material.
- Communicate their ideas effectively.
- Identify inputs and outputs of different industry process.
- Describe the scope and features of their programme of study.

Reference Book

1. Student Induction Programme: A Detailed Guide by AICTE, New Delhi.

Semester II

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN201	Communication Skills for Professionals (Integrated Course) (Common to All Branches except CSBS)	1	0	1	1.5	HSS
21UMA203	Differential Equations and Complex Analysis (Common to CSE and IT)	3	1	0	4	BS
21UPH205	Physics for Information Science (Common to CSE, IT,EEE ,AIDS & CSD)	3	0	0	3	BS
OTHER THEORY COURSES						
21UIT204	Digital Principles and System Design (Only for IT)	3	0	0	3	ES
21UIT205	C Programming (Integrated Course) (Only for IT)	3	0	3	4.5	ES
PRACTICAL						
21UGS210	Basic Sciences Laboratory II (Common to All Branches Except CSBS)	0	0	2	1	BS
MANDATORY						
21UGM231	Environmental Science (Common to All Branches)	3	0	0	P/F	MC
	TOTAL	**16**	**1**	**6**	**17**	
Total No of Credits - 17						

21UEN201	**Communication Skills for Professionals (Integrated Course)** (Common to All Branches except CSBS)	**L**	**T**	**P**	**C**
		1	**0**	**1**	**1.5**

COURSE OBJECTIVES :

- To improve the communication skills
- To develop the public speaking skills
- To develop their confidence and ability to speak in public
- To develop the leadership capacity

UNIT I	**ERROR FREE LANGUAGE**	**3**
Parliamentary English words, Pronounce the words with stress, Words often confused. Finding Common Errors.		
UNIT II	**LUCID WRITING**	**3**
Principles of Communicative English, Business Letters, Writing Technical Proposal.		
UNIT III	**INDIVIDUAL AND TEAM WORK**	**3**
Creative Writing- Writing Paragraph, Dialogue Writing (Various situations), Rearrange the jumbled sentences.		
UNIT IV	**LIFE SKILLS**	**3**
Professional Ethics, Code of Conduct, Relative Clauses		
UNIT V	**INTERPERSONAL SKILLS**	**3**
Swot Analysis& Life Positions		
Total Lecture Hours=15		

5 Oral Projects

Project 1: SELF INTRODUCTION&DELIVER A SPEECH BEFORE AUDIENCE

(Time: 5 to 7 minutes)

- To Speak in front of an audience with courage.
- Make your message clear, with supporting material.
- Create a strong opening and conclusion.

Project 2: SPEAK ON THE CHOSEN CONTENT (Time: 5 to 7 minutes)

- Select a general topic and bring out specific purposes.
- Avoid using notes.
- Use symbolic ideas to develop your ideas.

Project 3: USE EFFECTIVE BODY LANGUAGE& INTONATION(Time: 5 to 7 minutes)

- Use appropriate posture, gestures, facial expressions and eye contact to express your ideas.
- Use proper intonation and adequate speech module.

Project 4: PRESENT YOUR TOPIC WITH VISUAL AIDS (Time: 5 to 7 minutes)

- Persuade your points with suitable illustration, specific facts, examples
- Use suitable visual aids to present your topic with confidence.

Project 5: GRASP THE ATTENTION OF THE AUDIENCE (Time: 5 to 7 minutes)

- Influence your listeners by adopting holistic viewpoint.
- Use emotions, stories, and positive quotes in your speech.

TOTAL LECTURE HOURS : = 15 Periods

Total Hours =15+15= 30 Hours

COURSE OUTCOMES

After successful completion of this course the students will be able to:

- Communicate orally with fluency and clarity in a given contextual situation.(Responding A2)
- Adapt them to work in a group as a member or leader for effectively executing the task. (Organizing A4)
- Write language appropriately without error in any given circumstances. (Responding A2)
- Communicate information ideas and opinions in any given situations. (Responding A2)
- Present the ideas creatively with coherence for given topic. (Organizing A4)

REFERENCE BOOK

1. CompetentCommunication- A Practical Guide to becoming a better speaker, Toastmasters International, USA.
2. Raman, Meenakshi, Sangeetha Sharma, Business Communication, New Delhi, Oxford University Press, 2014.
3. Norman Lewis – Word Power Made Easy, Pocket Book Publication, 2019.

21UMA203	DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS (COMMON TO CSE AND IT)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To develop an understanding of the basics of vector calculus comprising of gradient, divergence and curl, and line, surface and volume integrals and the classical theorems involving them.
- To acquaint the student with the concepts of analytic functions and their interesting properties which could be exploited in a few engineering areas, and be introduced to the host of conformal mappings with a few standard examples that have direct application.
- To make the student knowledgeable in formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.

UNIT I	SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS	9 + 3

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Applications of ODE in Computer Science Engineering.

UNIT II	VECTOR CALCULUS	9 + 3

Gradient Divergence and Curl - Directional derivative - Irrotational and Solenoidal vector fields - Vector integration - Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) - Simple applications involving cubes and rectangular parallelopiped.

UNIT III	ANALYTIC FUNCTIONS	9 + 3

Functions of a complex variable - Analytic function - Necessary and Sufficient Conditions (excluding Proofs) - Harmonic function - Properties of an analytic function - Harmonic conjugate - Construction of analytic functions - Conformal mapping- Simple transformation w = z+c, cz, 1/z, and Bilinear transformation.

UNIT IV	COMPLEX INTEGRATION	9 + 3

Statement and applications of Cauchy's integral theorem, Cauchy's integral formula and Cauchy Residue Theorem - Taylor's and Laurent's expansions - Applications of residue theorem to evaluate real integrals - Unit circle and semi-circular contour (excluding Poles on the real axis).

UNIT V	PDE & APPLICATION OF PDE	9 + 3
Formation of partial differential equations – Singular integrals- Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types- Solutions of one dimensional wave equation		
TOTAL PERIODS : 45 (L) + 15 (T) = 60 Periods		

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Apply the knowledge of higher order ordinary differential equations in real life Engineering problems.(CO1) AP- K3
- Apply the knowledge of vector calculus to solveEngineering problems.(CO2) AP - K3
- Apply the knowledge of complex derivatives and transformation to solve engineering problems.(CO3) AP - K3
- Apply the knowledge of complex integrationto solve engineering problems.(CO4) AP - K3
- Apply the knowledge of partial differential equations to solve Engineering problems. (CO5). AP- K3
- Explain the concepts of ordinary differential equations , vector identities and complex analysis. (CO6) U-K2

TEXT BOOKS

- Veerarajan.T "Engineering Mathematics" Tata McGraw Hill Publishing Company, New Delhi, vol 15.
- Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Laxmi Publications (P) Ltd., New Delhi, 3rd Edition, (2008).
- Thomas G.B. and Finney R.L. "Calculus and Analytic Geometry", 9th Edition, Pearson Reprint 2002.

REFERENCE BOOKS

- Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
- Kreyszig. E, "Advanced Engineering Mathematics", John Wiley & Sons, New York, 10th Edition, (2011).
- Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House Pvt. Ltd., New Delhi, 3rd Edition, (2007).

- Grewal. B.S, “Higher Engineering Mathematics”, Khanna Publications, New Delhi, 43rd Edition, (2014).

21UPH205	PHYSICS FOR INFORMATION SCIENCE (Common to CSE, IT ,EEE ,AIDS & CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To introduce the essential principles of physics for information science and related Engineering applications.
- To demonstrate the concepts of conduction in conductors.
- To enable the students to understand the dielectric and magnetic materials.
- To apply fundamental knowledge in the area of fiber optics.

UNIT I	CONDUCTINGMATERIALS	9
Introduction-Conduction in metals-mobility and conductivity - classical free electron theory of metals - merits and demerits - Electrical and thermal conductivity (derivation) - Wiedemann - Franz law - Lorentz number - Fermi distribution function- Effect of temperature on Fermi function-Density of energystates - carrier concentration in metals.		
UNIT II	**TRANSPORT PROPERTIES OF SEMICONDUCTORS**	**9**
Introduction - Properties -Types of semiconductor - Electron and hole concentration - Intrinsic CarrierConcentration - Expression for electrical conductivity of a semiconductor - Band gap determination-Hall effect and its applications.		
UNIT III	**MAGNETIC ANDDIELECTRICSMATERIALS**	**9**
Introduction - Classification of magnetic materials - Domain theory - Hysteresis -soft and hard magnetic material - Ferrites - Magnetic storage devices - hard disc - compact disc - RAM -ROM - Applications - Introduction - Types of polarization - Dielectric loss - Dielectric breakdown - Capacitor and its types - Applications		
UNIT IV	**OPTICAL PROPERTIES**	**9**
Introduction- Optical properties of metal, insulator and semiconductor - Display devices - photoluminescence - EL display -Liquid crystal - LCD andits phases - Light Emitting Diode - DiodeLaser -Solar cell – Detector		
UNIT-V	**FIBRE OPTIC COMMUNICATION**	**9**
Introduction - Principle and propagation of lightin optical fibres - Numerical aperture and acceptance angle - Types of optical fibre - Attenuation - Fibre optic communication systems (Blockdiagram)- Fibreopticsensors - Temperature and pressure sensor- Applications		
TOTAL PERIODS:45 Periods		

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- CO1:Summarize the importance of free electrons in determining the properties of metals, semiconductors and dielectric materials.(Understand)
- CO2: Interpret the characteristics of conducting materials and semiconducting materials in terms of bandgapand charge carriers(Analyze)
- CO3: Apply the concept of spin and orbital motion of electrons in determining magnetic properties of materials and concept of polarization in dielectric materials

having specific engineering applications.(Apply)

- CO4:Apply the principle of Laser in optical fiber communication(Apply)
- CO5: Analyze the structural behavior and properties of conducting, semiconducting and magnetic materials to select suitable material for industrial application.(Analyze)
- CO6: Illustrate the strategies of magnetism and fiber optics to facilitate and to solve the engineering problems (Apply)

TEXTBOOKS

1. WilliamD.Callister,Jr. "Material Science and Engineering", Seventh Edition, JohnWiley& Sons Inc.NewDelhi, 2015
2. Dr.Mani.P, "Engineering Physics II", Dhanam Publications, Edition, 2018, Chennai
3. Rajendran.V, "Engineering Physics", TataMc-Graw Hill Publishing Company limited, NewDelhi, Revised Edition 2016.

REFERENCEBOOKS

1. Raghuvenshi G.S., "Engineering Physics", PHILearning Private Limited,NewDelhi,Revised Edition 2014.
2. Aruldoss.G., "Engineering Physics", PHILearning Limited, NewDelhi, Revised Edition 2013.
3. Marikani.A., "Engineering Physics", PHILearning Private Limited, NewDelhi, Revised Edition 2012.
4. SankarB.N., and Pillai.S.O., "Engineering Physics- I", New Age International Publishers Private Limited,New Delhi, Revised Edition 2015.
5. Ghatak&Thyagarajan, "Introduction to fiberoptics," Cambridge Univ.Press. 1998 (reprinted 2000)

21UIT204	DIGITAL PRINCIPLES AND SYSTEM DESIGN (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- Aims at providing the basic understanding of the fundamentals of digital logic and circuits
- Also aims at providing fundamental knowledge of combinational and sequential circuits.
- It also aims to equip the students to build digital logic circuits.

UNIT I	NUMBER SYSTEM	9
Introduction to number systems - Base conversions - Circuits for arithmetic operations- Binary Adder/ Subtractor / Multiplier - BCD adder - code conversions - Binary to gray - Gray to binary - BCD to Excess-3 code - Computer arithmetic: Floating point representation - Floating point conversions.		
UNIT II	**LOGIC GATES**	**9**
Logic gates - Properties of Boolean algebra - Minimization of Boolean functions - Representation of Boolean functions - Canonical and standard form - Sum of Products form (SOP) - Product of sum form (POS) - K-Map method -QuineMckulskey method.		
UNIT III	**COMBINATIONAL CIRCUITS**	**9**
Half adder - Full adder - Half subtractor - Full subtractor - Parallel adder - Parallel subtractor - BCD adder - Carry lookahead adder - Encoders and Decoders - Multiplexers and Demultiplxers - Magnitude comparator - Programmable logic array (PLA) - Programmable Array Logic (PAL) - Read only memory (ROM)		
UNIT IV	**SEQUENTIAL CIRCUITS**	**9**
Introduction to sequential circuits - Latches - Flipflop - SR flipflop - JK flipflop - T Flipflop - D flipflop - Race around condition - Flipflop conversions - Shift registers - Counters - Synchronous UP/DOWN counters - Asynchronous UP / DOWN counters		
UNIT V	**SEQUENTIAL LOGIC**	**9**
Analysis and design procedures of synchronous and asynchronous sequential circuits - state reduction and state assignment - Reduction of state and flow tables - Race free assignments – Hazards		
	TOTAL PERIODS:45 Periods	

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Gain knowledge between different types of number systems and their conversions and understand the different methods used for the simplification of Boolean functions [Understand]
- Apply the knowledge of digital logic principles to design and implement various combinational and sequential circuits[Apply]
- Analyze different types of digital electronic circuit using various mapping and logical tools and identify the techniques to prepare the most simplified circuit using mapping and mathematical methods[Analysis]
- Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints[Create]
- Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application [Evaluate]

TEXT BOOKS

1. M. Morris Mano, "Digital Design", IV edition, Pearson Education, 2006.
2. Mark zwolinski,"Digital System Design with VHDL,Pearson Education, second Edition,2004.
3. Digital Principles and System Design – J.S.Khatre, macmillan India Ltd

REFERENCE BOOKS

1. Frank Vahid ,"Digital System Design" John Wiley & Sons ,Second Edition,2010
2. Charles H.RothJr, "Fundamentals of Logic Design", V edition – Jaico Publishing House, Mumbai,2003.
3. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill, 2003.
4. Ronald J.Tocci, Neal S. Widmer ,"Digital Systems Principles and Applications,EE Edition, Eighth Edition,2001.
5. W.H.GOTHMANN, "Digital Electronics - An Introduction to Theory and Practice", Prentice Hall of India, 2000

21UIT205	C PROGRAMMING (INTEGRATEDCOURSE) (Only to IT)	L	T	P	C
		3	0	3	4.5

COURSE OBJECTIVES:

- To develop c programs using basic programming constructs
- To develop c programs using functions, array and string
- To develop applications in cusing pointers and structures
- To do input/output and file handling in c

UNIT I	BASICS OF C PROGRAMMING	8+8

Introduction to C -Introduction, Structure of C program, writing simple C Program, comments, Tokens, Character set, Keywords and Identifiers, Data Types, Variables, Constants, Input and Output statements -Print(), Scanf(), Assignment statement, Operator and its precedence, Decision Control Statements – Conditional Branching Statements, Pre-processor directives.

List of Experiments:

1. Implement Simple C programs
2. Implement c programs using operators
3. Implement C Programs using Decision constructs
4. Implement C Programs using Pre-processor directives

Example Experiments:

1. Temperature of a city in Fahrenheit degrees is input through the keyboard. Write a program to convert this temperature into Centigrade degrees.
2. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit he made or loss he incurred.
3. The marks obtained by a student in 5 different subjects are input through the keyboard.The student gets agrade as pert he following rules:

   Percentage above or equal to 60 – First grade

   Percentage between 50 and 59 - Second grade

   Percentage between 40 and 49 – Third grade

   Percentage less than 40 - Fail

   Writea program to calculate the grade obtained by the student with the use of logical

operators

4. Write macro definitions with arguments for calculation of Simple Interest and Amount.Store these macro definitions in a file called “interest.h”. Include this file in your program, and use them acro definitions for calculating simple interest and amount.

UNIT II	LOOPING STATEMENTS AND FUNCTIONS	9+9

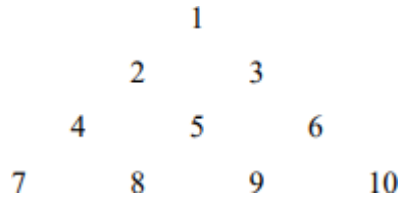
Iterative Statements, Nested Loops, Break and Continue Statements, goto Statement. Introduction tof unction-using function, function declaration and definition, function call,return statement, Recursive function, Passing parameter to function, Storage classes.

Experiments:

- Implement C Programs using Looping statements
- Implement CPrograms using Functions

ExampleExperiments:

1. Writea program to produce the following output:



2. Write a program which to find the grace marks for a student using switch. The user should enter the class obtained by the student and the number of subjects he has failed in.

   a) If the student gets first class and the number ofsubjects he failed in is greater than 3,then he does not get any grace. If the number of subjects he failed in is less than or equal to 3 then the grace is of 5marks per subject.

   b) If the student gets second class and the number of subjects he failed in is greater than 2,then he does not get any grace. If the number of subjects he failed in is less than or equalto2thenthe graceisof4markspersubject.

   c) Ifthe student gets third class and the number of subjects he failed in is greater than

   1,thenhedoesnotgetanygrace.Ifthenumberofsubjectshefailedinisequalto1thenthegraceis of5markspersubject

3. Writeaprogram toproducea“2times”tablefrom1to12

```
1 x 2 =  2
2 x 2 =  4
3 x 2 =  6
4 x 2 =  8
5 x 2 = 10
6 x 2 = 12
7 x 2 = 14
8 x 2 = 16
9 x 2 = 18
10 x 2 = 20
11 x 2 = 22
12 x 2 = 24
```

4. Writeaprogramtocalculateovertimepayof10employees.OvertimeispaidattherateofRs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work forfractionalpartofanhour.

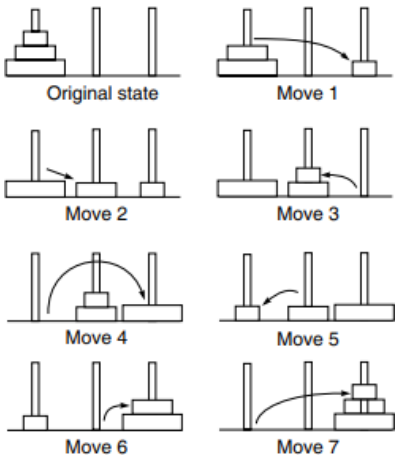
5. The Towers of Hanoi problem is a classic case study in recursion. It involves moving a specifiednumberofdisksfromonetowertoanotherusingathirdasanauxiliaryower.Legendh asitthatat the time of the creation of the world, the priests of the Temple of Brahma were given theproblem with 64 disks and told that when they had completed the task, the world would come toan end.

MovendisksfrompegAtopegC,usingpegBasneeded.

Thefollowingconditionsapply.

a) Onlyonediskmaybemovedatatime.
b) Thisdiskmustbethetopdiskonapeg.
c) Alargerdiskcanneverbeplacedontopofasmaller disk

.



UNITIII	ARRAYS AND STRINGS	10+10

Introduction to Array-Declaration of array, Accessing the elements, operations, passing array tofunctions,Twodimensionalarrayandoperation,multi-dimensionalarray.Introductiontostring-Declaration,Initialization,Printingstring,Stringinput,Manipulation/operationsonString-Length, Compare,Concatenate,copy,Reverse, Inserting, Indexing &Deleting,Arrayofstrings

LabExperiments:

1. ImplementCProgramsusingArrays
2. Implement CProgramsusingStringanditsoperations

ExampleExperiments:

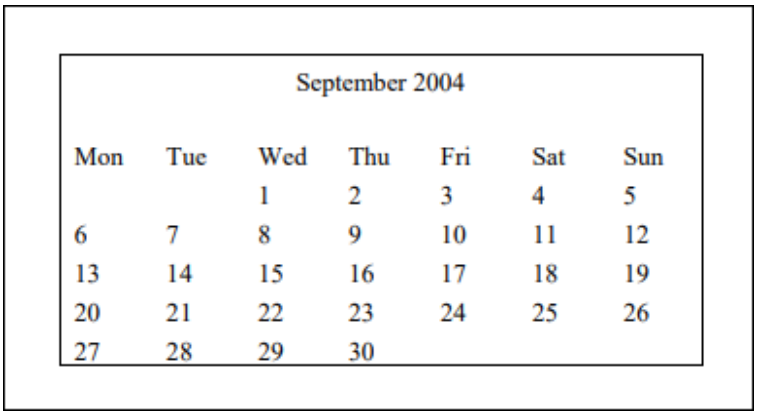
1. Writeaprogramtopickupthelargestnumberfromany5row by5columnmatrix
2. Given an array p[5], write a function to shift it circularly left by two positions. Thus, if p[0] = 15,p[1]=30, p[2] =28, p[3]=19andp[4] =61 thenaftertheshiftp[0]=28, p[1]=19, p[2]=61,p[3]=15andp[4]=30.Callthisfunctionfora(4x5) matrixandgetitsrowsleftshifted.
3. Theareaofatrianglecanbecomputedbythesinelaw when2sidesofthetriangleandthe anglebetweenthemare-known

   Area=(1/2)absin(angle)

   Given the following 6 triangular pieces of land, write a program to find their area anddeterminewhichislargest.

A	B	Angle
137.4	80.9	0.78
155.2	92.62	0.89
149.3	97.93	1.35
160.0		
100.25	9.00	
155.6	68.95	1.25
149.7	120.0	1.75

4. Write a program that extracts part of the given string from the specified position. For example,ifthestingis"Workingwithstringsisfun",theniffrom position4,4charactersaretobeextractedthentheprogramshouldreturnstringas"king".Moreover,ifthepositionfromwhere the string is to be extracted is given and the number of characters to be extracted is 0thentheprogramshouldextractentirestringfromthespecifiedposition.
5. Develop a program that receives the month and year from the keyboard as integersandprintsthecalendarinthefollowing format.



September 2004

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Note that according to the Gregorian calendar 01/01/1900 was Monday. With this as the basethecalendarshould be generated..

UNIT IV	STRUCTURES AND POINTERS	10+10

Introductionto Pointers-Declaring pointer variables,Null pointers and Generic pointers, passingarguments to functions using pointers, Pointers and array, Array of pointers, pointers and string,Pointers to Pointers, Dynamic memory allocation-malloc(), calloc(),realloc(),free(). Introduction tostructures,Nestedstructures,Arrayofstructures,structuresandfunctions,Self–referential structures.

Lab Experiments:

1. Implement CProgramsusingstructures
2. Implement CProgramsusingpointers

Example experiments:

1. WriteaCprogramtoreadanddisplaystudentdetailsusingstructure.
2. Anautomobilecompanyhasserialnumberforenginepartsstartingfrom AA0toFF9. Theothercharacteristicsofpartstobespecifiedinastructureare:Yearofmanufacture,material

andquantitymanufactured.

(a) Specifyastructuretostoreinformationcorrespondingtoapart.

(b) Write a program to retrieve information on parts with serial numbers between BB1 and CC6.

3. A record contains name of cricketer, his age, number of test matches that he has played andthe average runs that he has scored in each test match. Create an array of structure to holdrecords of 20 such cricketer and then write a program to read these records and arrange them inascendingorderbyaverageruns.Usethequsort()standardlibraryfunction.

3. WriteaprograminCtocountthenumberofvowelsandconsonantsinastringusinga pointer.Linkgiven

UNIT V	FILE PROCESSING	8+8

Introduction to files-using files in C,Read data from files, Write data to files,Detecting the End-of-file,Error handling during file operations, accepting command line arguments Functions for Randomaccess-ftell(), fseek(), rewind(), fgetpos(), fsetpos(), remove(), Renamingthefile.

LabExperiments:

1. Implement CProgramsthatusesfiles
2. ImplementCProgramsusingCommandline arguments

Example experiments:

1. Write a program to compare two files specified by the user, displaying a message indicatingwhetherthefilesareidenticalordifferent.
2. Suppose a file contains student's records with each record containing name and age of astudent. Write a program to read these records and display them in sorted order by name.
3. Write a program to find the size of a text file without traversing it character by character.
4. Write a program to display the contents of a text file on the screen. Make following provisions:Display the contents inside a box drawn with opposite corner co-ordinates being (0, 1) and (79, 23). Display the name of the file whose contents are being displayed, and the pagenumbers in the zeroth row. The moment one screenful of file has been displayed, flash amessage 'Press any key...' in 24th row. When a key is hit, the next page's contents should

bedisplayed,and so ontillthe end offile.

5. A hospital keeps a file of blood donors in which each record has the format:

   Name:20 Columns

   Address:40Columns

   Age:2Columns

   BloodType:1Column(Type1,2, 3or4)

   Writeaprogramtoreadthefileandprintalistofallblooddonorswhoseageisbelow 25andbloodistype2..

TOTAL PERIODS: 90 Periods

COURSE OUTCOMES:

- After the successful completion of this course,the student will be able to:
- Infer the Knowledge of fundamental C programming concepts [Understand]
- Apply various concepts of C program for solving problems [Apply]
- Analyze different features of C program for a given scenario [Analyze]
- Design a solution without anomalies using C programming concept for the given applications [Create]
- Select and apply appropriate tools to implement any few concepts of C programming [Apply]
- Identify the requirement and take further preparation in order to adopt Technological change [Value]

TEXTBOOKS:

1. ReemaThareja,"ProgramminginC",2nd Edition,Oxforduniversitypress,2015.
2. YashavantP.Kanetkar,"LetusC",5th Edition,BPBPublications,2004.

REFERENCEBOOKS:

1. Brian.K.Kernighan, Dennis.M.Ritchie, "The C Programming Language", 2nd Edition, Pearson,
2. PradipDey, ManasGhosh, "Computer fundamentals and programming in C",2nd edition,Oxforduniversitypress,2013.
3. NoelKalicharan, "Learn to program with C", Apress, 2015.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS

HARDWARE REQUIREMENT

PERSONAL COMPUTER WITH 4GB RAM ,500GBHDD, MONITOR,KEYBOARD MOUSE

SOFTWARE REQUIREMENT

TURBO C

21UGS210	BASIC SCIENCES LABORATORY-II (Common to all Branches, Except CSBS)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To analyze the Band gap,moment of inertia,thermal conductivity and rigidity modulus of the materials.
- To gain knowledge in PHOTONICS.

PHYSICSLABORATORY

LISTOFEXPERIMENTS

1. Determination of Energy band gap of a semiconductor.
2. Torsion pendulum – Determination of Moment of inertia of a metallic disc and rigidity modulus of a given metallic wire.
3. Spectrometer-Determination of wavelength of mercury spectrum using grating.
4. Laser–Determination of numerical aperture and acceptance angle of an optical fiber
5. Newton's rings–Determination of radius of curvature of a convexlens
6. Lee'sDisc –Determination of thermal conductivity of a bad conductor.
7. Determination of Solar cell characteristics using optical transducers kit.
8. Digital Logic gates (Virtuallab)

A minimum of FIVE experiments shall be offered

TOTAL:30Periods

COURSE OUTCOMES

After the successful completion of this course,the student shall be able to

- Apply the Principles of Optics, Light and Elasticity to determine the Engineering properties of materials(Apply)
- Analyze the thermal conductivities of different bad conductors(Analyze)
- Analyze the Characteristics of a semiconductor(Analyze)

21UGS210	**BASICS SCIENCES LABORATORY - II (Common to all, Except CSBS)**	**L**	**T**	**P**	**C**
	CHEMISTRY LABORATORY	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

- To describe the theoretical concepts to perform lab experiments**.**
  To explain the water quality parameters.
- To impart the knowledge on water quality parameters for the analysis of industrial effluents

LIST OF EXPERIMENTS

1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of Chloride in water sample (Argentometric method)
4. Determination of DO in water
5. Estimation of chromium in tannery wastes
6. Estimation of available chlorine in bleaching powder
7. Estimation of iron by Spectrophotometry.
8. Determination of acidity of industrial effluents

A minimum of FIVE experiments shall be offered

TOTAL: 30 Periods

COURSE OUTCOMES

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

- Apply the basic knowledge of testing methods of water to identify the water quality for environmental sustainability.(Apply)
- Estimate the quality of water parameters that suits for domestic application (Apply).
- Analyze the industrial effluents to identify the quality parameters and impurities to prevent water pollution. (Analyze)

21UGM231	ENVIRONMENTAL SCIENCE (Common to All Branches)	L	T	P	C
		3	0	0	P/F

COURSE OBJECTIVES:

- To explain the concepts of Environment ecosystem and Pollution.
- To impart the environmental issues in the society and the impact of environment related to human health.
- To describe the knowledge in alternative energies

UNIT I	ENVIRONMENTAND ECOSYSTEMS	9
Definition, scope and importance of environment - Need for public awareness - Concept of ecosystem - Structure and function of ecosystem - Producers, consumers and decomposers - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Aquatic ecosystems (c) Grassland ecosystem.		
UNIT II	**ENVIRONMENTALPOLLUTION**	**9**
Definition - Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution - pollution case studies - Role of an individual in prevention of pollution - Disaster management: floods, earthquake, cyclone and landslides		
UNIT III	**SOCIAL ISSUES AND THE ENVIRONMENT**	**9**
Water conservation, rain water harvesting, watershed management - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Environmental laws/Acts, (EPA).		
UNIT IV	**HUMAN POPULATION AND THE ENVIRONMENT**	**9**

Population growth, variation among nations - Population explosion - Human rights - Family welfare programme - Environment and Human Health - Human Rights - Value education - HIV / AIDS - Women and child welfare - Role of information technology in environment and human health.

UNIT V	FUTURE POLICY AND ALTERNATIVES	9

Introduction to future policy and alternatives - fossil fuels - nuclear energy - solar energy -wind energy - hydroelectric energy - geothermal energy - tidal energy - sustainability - green power - nanotechnology**.**

TOTAL PERIODS: 45 Periods

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- Explain the environmental issues, consequences and suitable solution. (Understand-K2)
- Explain the various types of renewable energy sources for sustainable development of natural resources (Understand-K2)
- Apply the principles of value education with respect to human population to preserve environment (Apply-K3)
- Apply the knowledge of various pollution types to prevent the ecosystem and Environment (Apply-K3)
- Analyze the environmental problem to report the social issues and provide sustainable solution. (Analyze-K4)
- write a report on environmental issues and provide solution for sustainable development (Respond-A2)

TEXT BOOKS

1. 1.Anubha Kaushik, kaushik C.P., “Environmental Science and Engineering”,Third Edition, New Age International, New Delhi, 2009.
2. 2.Benny Joseph “Environmental Science and Engineering”, Tata Mc-Graw Hill, New Delhi, 2006.

REFERENCE BOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', Pearson Education,Upper saddle River, New Jersey, 2008.
2. Miller T.G. Jr., Environmental Science", Wadsworth PublishingCompany, Belmont, California, 2005
3. De A.K., "Environmental Chemistry", Wiley Eastern Ltd., New Delhi,2001.
4. Trivedi R.K., Goel P.K., "Introduction to Air Pollution", Techno-Science Publication, Jaipur,2005.

Semester III

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA322	Probability, Queueing Theory and Numerical Methods (Common to CSE and IT)	3	1	0	4	BS
21UIT302	Data Structures (Common to CSE,IT,AIDS&CSD)	3	0	0	3	PC
21UCS303	Object Oriented Programming using C++ (Integrated Course) (Common to CSE,IT,CSBS & CSD)	3	0	2	4	PC
21UIT304	Principles of Operating Systems (Common to CSE ,IT,AIDS&CSD)	3	0	0	3	PC
21UCS305	Computer Organization (Common to CSE ,IT,CSBS & AIDS)	3	0	0	3	PC
21UCD306	Database system Design (Common to CSE,IT, AIDS& CSD)	3	0	0	3	PC
PRACTICAL						
21UIT307	Data Structures Laboratory (Common to CSE,IT, AIDS&CSD	0	0	2	1	PC
21UCD308	Database system Design Laboratory (Common to CSE,IT, AIDS & CSD)	0	0	2	1	PC
MANDATORY						
21UGM331	Biology for Engineers (Common to All except BME and BT)	2	0	0	P/F	MC
	TOTAL	**20**	**1**	**6**	**22**	
Total No of Credits - 22						

21UMA322	PROBABILITY, QUEUEING THEORY AND NUMERICAL METHODS (Common to CSE & IT)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To make the student acquire sound knowledge of standard distributions that can describe real life phenomena.
- To provide the basic characteristic features of a queuing system and develop the skills in analyzing queuing models.
- To acquaint the student with the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and Eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

UNIT I	PROBABILITY & RANDOM VARIABLES	9 + 3
Axioms of probability - Conditional probability - Total probability - Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Normal and Exponential- Joint probability distributions - Marginal and Conditional distributions – Covariance - Correlation and Regression.		
UNIT II	**QUEUEING THEORY**	**9 + 3**
Definitions - Basic terms of Queueing theory - Markovian models - Birth and Death Queuing models - Steady state results: Single and multiple server queuing models - Little's Formula - Queues with finite waiting rooms - Finite source models.		
UNIT III	**CURVE FITTING**	**9 + 3**
Method of Group Averages - The least squares method - Fitting a straight line - Fitting a Parabola - Fitting a curve of the form $y = ax^b$ - Fitting an exponential curve - Method of moments.		
UNIT IV	**SOLUTION OF ALGEBRAIC, TRANSCENDENTAL EQUATIONS AND EIGENVALUE PROBLEMS**	**9 + 3**
Iteration method - Newton-Raphson method - Gauss Elimination method - Pivoting - Gauss Jordan methods - iterative methods : Gauss Jacobi method ,Gauss Seidel method - Eigen values of a matrix by Power method - Jacobi's method for a real symmetric matrix		

UNIT V	NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS	9 + 3

Single step methods: Taylor series method - Euler method, Modified Euler's Method - Fourth order Runge - Kutta method for solving first and second order equations - Multistep methods: Milne's and Adam's predictor and corrector methods

TOTAL PERIODS : 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Apply the knowledge of probability and distributions to solve Engineering problems. (CO1) AP - K3
- Analyze the characteristic features of queuing models in computer system and networks.(CO2) A - K4
- Apply the knowledge of curve fitting methods to fit a curveof a given data set in Engineering problems. (CO3). AP - K3
- Apply Numerical techniques to solve the Engineering problems involving system of equations and Eigen values. (CO4) AP - K3
- Apply Numerical techniques to solve first and second order Ordinary Differential Equation. (CO5). AP - K3
- Explain the concepts of probability, Markovian queue and Numerical techniques. (CO6) U- K2

TEXT BOOKS

1. Gupta S.C, Kapoor V.K. "Fundamental of Mathematical Statistics", 10th Edition, Sultan Chand and Sons, New Delhi, 2002.
2. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 35th Edition, (2010).
3. Veerarajan T. "Probability, Statistics and Random Process with Queueing theory and Queueing Networks", Tata McGraw Hill Education, New Delhi-6, 4thEdition, (2006).
4. Iyengar S.R.K , Jain R.K. , Mahiden Kumar Jain " Numerical Methods for Scientific and Engineering Computations" New Age International Publishers 7th Edition 2019

REFERENCE BOOKS:

1. Allen.A.O, "Probability, Statistics and Queuing Theory with Computer Applications", Elsevier, New Delhi, 2nd Edition, (2005).
2. Taha.H. A., "Operations Research-An Introduction", Pearson Education, New Delhi, 9th Edition, (2010).
3. Trivedi.K. S., "Probability & Statistics with Reliability, Queuing & Computer Science Applications", Prentice Hall of India, New Delhi, 2nd Edition, (2009).
4. Johnson R.A, and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 8thEdition, (2011).
5. Subramanian .N "Probability and Queueing Theory ", SCM Publishers 2010.

21UIT302	DATA STRUCTURES (Common to CSE,IT,AIDS&CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
- To impart a thorough understanding of linear non-linear data structures such as list, stacks, queues, trees, graphs and their applications.
- To impart familiarity with various sorting, searching and hashing techniques and their performance comparison.

UNIT I	LINEAR DATA STRUCTURE – LIST	9
Basic Terminologies: Elementary Data Organizations, Abstract Data Types (ADTs) - List ADT- linked list implementation - singly linked lists- circularly linked lists- doubly-linked lists - applications of lists - Polynomial Manipulation - All operations (Insertion, Deletion, Merge, Traversal).		
UNIT II	**LINEAR DATA STRUCTURE - STACK, QUEUE**	**9**
Stack ADT - Operations - Applications - Evaluating arithmetic expressions - Conversion of Infix to postfix expression - Queue ADT - Operations - Circular Queue - Priority Queue - deQueue - applications of queues.		
UNIT III	**NON-LINEAR DATA STRUCTURE - TREE, HEAP**	**9**
Introduction - Basic Terminology - Traversal - Operations: Binary trees - Binary Search trees - AVL Trees-B Trees - B+ Trees. Heap: Binary Heaps.		
UNIT IV	**NON-LINEAR DATA STRUCTURE - GRAPH**	**9**
Introduction - Graph Terminology - Representation of Graphs - Graph Traversal - Topological sort - Minimum Spanning Trees - Prim's and Kruskal's Algorithm - Shortest path algorithm - Dijkstra's algorithm - Applications of graphs.		
UNIT V	**SEARCHING, SORTING AND HASHING**	**9**
Searching: Linear Search - Binary Search, Sorting: Selection Sort - Bubble Sort - Insertion Sort - Merge sort - Quick sort - Hashing: Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.		
		TOTAL PERIODS : 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Describe the relationships between different data structures [Understand]
- Apply different data structures for real-world programming challenges [Apply]
- Analyze various data structures in solving real world problems [Analyze]
- Evaluate the efficiency and effectiveness in various operations of Data Structures [Evaluate]
- Integrate multiple data structures and algorithms to build innovative solutions for complex computational problems[Create]
- Work individually or in teams and demonstrate the solutions to the real time applications [Value]

TEXT BOOKS

1. ReemaThareja, “Data Structures Using C”, Oxford University Press, Second Edition, 2014.
2. Weiss. M.A, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2012.

REFERENCE BOOKS

1. Aaron M.Tenenbaum, YedidyahLangsam, Moshe J.Augenstein, "Data Structures using C", Pearson Education India, 7th Edition, New Delhi, 2009.
2. Aho.V, Hopcroft.J.E, Ullman.J.D, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006.
3. Gilberg.R.F, Forouzan.B.A, "Data Structures", Thomson India Education, 2nd Edition, 2005.
4. Sara Baase and A.VanGelder, "Computer Algorithms", Pearson Education, 3rd Edition, 2005.
5. Cormen.T.H, C.A.Leiserson.B.A, R.L.Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2009.

21UCS303	OBJECT ORIENTED PROGRAMMING USING C++ (Integrated Course) (Common to CSE,IT,CSBS & CSD)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES :

- To explain OOP principles in C++.
- To introduce generic programming and exception handling mechanism.
- To enable the students to work with files

UNIT I	INTRODUCTION	9 +9

Object-Oriented Paradigm - Elements of Object Oriented Programming - Directives - Operators - Control Statement - Arrays - Structures - Enumerations - Functions-Inline functions - default arguments.

List of Exercises

1. Write C++ programs that produce following outputs.

   A B C D E

   A B C D

   A B C

   A B

   A

2. An electricity board charges the following rates to domestic users to discourage large conceptions of energy.
   i. First 100 units Rs 1.50 p/unit
   ii. From 100 to 200 units Rs 1.80 p/unit
   iii. Beyond 200 Rs 2.50 p/unit
   iv. All users are charged a minimum of Rs 50/-. If the total amount is more than
   v. 300 then an additional surcharge of 15% of the calculated amount is added.
3. Write a c++ program to read the name of an user, number of units consumed and print out the Electricity bill in a neat format.
4. Write a C++ program using functions to perform matrix addition & subtraction.
5. Write a C++ program to find and print the volume of a cube using inline functions.

UNIT II	CLASSES AND OBJECTS	9+6

Classes and Objects - Passing objects as arguments - returning objects - Friend functions- Constructors -Parameterized constructor- Copy constructor - Destructor - Array of Objects - pointer to object members - Static member.

List of Exercises

1. Define a class to represent a bank account. Include the following members. Data Members: Name of depositor, Account number, Type of Account, Balance amount in the account Member functions : To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display name and balance.
2. Create a class complex with real and imaginary as data members. Also include member functions to get the values for a complex number, to add two complex number, to multiply two complex numbers, to print the complex number in a+ib format.
3. Create a class complex with real and imaginary as data members. Also include member functions to get the values for a complex number and to print the complex number in a+ib format. Also include friend functions to add two complex numbers and multiply two complex numbers.
4. Write a C++ program to count the number of objects created and destroyed for a class using stating data members and static member functions

UNIT III	POLYMORPHISM	9 +6

Polymorphism - Function overloading - Unary operator overloading - binary operator overloading - Data Conversion - Overloading with Friend Functions

List of Exercises

1.Write a C++ program to find the area of a square and rectangle using function overloading.

2.Write a C++ program to swap two integers, floats, characters and two strings using function overloading concept.

3.Write a C++ program to perform complex number addition, subtraction, multiplication using operator overloading with friend functions.

4.Write a C++ program to perform complex number addition, subtraction, multiplication using operator overloading with member functions.

5.Write a C++ program to perform matrix addition, subtraction, multiplication using

operator overloading with friend functions.

6. Write a C++ program to perform matrix addition, subtraction, multiplication using operator overloading with member functions.
7. Write a C++ program to overload all arithmetic assignment operator (+=, -=, *=, /=) for the complex number class using friend functions and member functions.

UNIT IV	INHERITANCE AND VIRTUAL FUNCTIONS	9 +6

Inheritance -Derived class - Abstract Classes - Types of Inheritance - Virtual functions - Need - Definition - Pure Virtual Functions - Virtual Destructors

List of Exercises

1. Imagine a publishing company that market s both book and audio-cassette versions of its work. Create a class publication that stores the title and price. From this class derive two classes book and tape; book includes one more property: page numbers and tape contains its length in minutes (float). Each of these classes must have getdata ( ) functions and putdata ( ) functions to input/output its data. Write a main function to test the book and tape classes.
2. Create three classes Student, Test and Result classes. The student class contains student relevant information. Test class contains marks for five subjects. The result class contains Total and average of the marks obtained in five subjects. Inherit the properties of Student and Test class details in Result class through multilevel inheritance.
3. Create three classes Student, Test and Result classes. The student class contains student relevant information. Test class contains marks for five subjects. The result class contains Total and average of the marks obtained in five subjects. Inherit the properties of Student and Test class details in Result class through multiple inheritance.
4. Create a base class Shape with relevant data members and member functions to get data and print the area. Create two more classes Rectangle and Triangle which inherit Shape class. Make the print data function as virtual function in base class. Write a C++ main ( ) function to check this.

UNIT V	TEMPLATES, EXCEPTION HANDLING AND FILES	9+3

Template - Class template - Function Template - Exception handling - catching multiple

exceptions - Streams and formatted I/O - I/O manipulators - File modes - File I/O

List of Exercises

1. Write a C++ program to represent a stack data structure using class template.
2. Write a function template for finding the minimum value contained in an array.
3. Write C++ programs handle multiple catch block, default catch block and re-throwing exceptions for your own problem situation.
4. Create a user defined manipulator for displaying the details of employees in a neat table format. (Hint: Employee details can be maintained as array of structures).
5. Write a C++ program to perform Sorting of File contents.

TOTAL PERIODS : = 75 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Explain the concepts of object oriented programming principles and its benefits [Understand]
- Apply the object orientation to solve real world problems [Apply]
- Analyze the complex engineering problems and reach the conclusion using the object oriented programming standards. [Analyze]
- Design object oriented programming solutions for real world problems that meet the specified needs with appropriate consideration [Create]
- Apply appropriate techniques and modern IT tools with an understanding of the limitations in object oriented programming. [Modern Tool Usage]
- Work individually or in teams and communicate effectively to solve real world problems using object oriented programming principles. [Affective domain]

TEXT BOOKS

1.K.R.Venugopal, RajkumarBuyya, T.Ravishankar, ”Mastering C++”, Tata McGraw Hill, 2nd Edition, 2013.

REFERENCE BOOKS

1.Robert Lafore, Object Oriented Programming in C++, Pearson, 4th Edition, 2002.

2.Ira Pohl, “Object Oriented Programming using C++”, Pearson Education, Second Edition, Reprint, 2004.

3.Lippman.S.B, JoseeLajoie, Barbara E. MooC++ Primer”, Pearson Education, ,fourth Edition, 2005

4.E.Balagurusamy, Object-Oriented Programming with C++, 7th Edition,2017.

HARDWARE AND SOFTWARE REQUIREMENTS

HARDWARE REQUIREMENTS:

PERSONAL COMPUTER WITH 8GB RAM, 500GB HARD DISK, MONITOR,MOUSE, KEYBOARD

SOFTWAREREQUIREMENTS:

ANY C PLUS PLUS COMPILER COMPATILE WITH LINUX/WINDOWS

21UIT304	PRINCIPLES OF OPERATING SYSTEMS (Common to CSE ,IT,AIDS&CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To impart major Operating System components and its principles
- To provide an in-depth exposure to process, memory, device and file management techniques
- To initiate knowledge on various security challenges related to Operating Systems

UNIT I	FUNDAMENTALS AND PROCESS CONCEPTS	9
Introduction: Introduction: Mainframe systems - Desktop Systems - Multiprocessor Systems - Distributed Systems - Clustered Systems - Real Time Systems - Handheld Systems - Hardware Protection Operating System operations, Kernel data structures, computing environments. Operating System structure: Operating System Services, User- Operating System interface, System Calls, Types of system calls, system programs, Operating System design and implementation. Processes: Inter process communication, cooperating Process		
UNIT II	**PROCESS SYNCHRONIZATION AND SCHEDULING**	**9**
Threads: Overview, Multithreading models, Threading issues Process Synchronization: The critical section problem, Peterson's solution, Mutex locks, Semaphores, Classical problems of synchronization. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms		
Unit III	**DEADLOCK AND MAIN MEMORY MANAGEMENT**	**9**
Deadlocks: System Model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock. Main Memory: Background, swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table.		
UNIT IV	**VIRTUAL MEMORY MANAGEMENT AND VIRUTALIZATION**	**9**
Virtual Memory: Background, Demand paging, Copy on write, Page replacement algorithms, Allocation of frames, Thrashing Virtualization :Virtual Machines Virtualization (Hardware/Software, Server, Service, Network) Hypervisors -OS - Container Virtualization - Cost of virtualization		

UNIT V	STORAGE MANAGEMENT AND SAFETY METHODS	9

File Concepts: File System Structure - File System Implementation - Directory Implementation - Allocation Methods - Free-space Management - IO Systems - Kernel I/O Subsystems - Mass Storage Structure: Disk Structure - Disk Scheduling

Disk Management - Swap-Space Management

Protection And Security : Goals, Principles, Domain, Access Matrix, Access Control, Revocation of access rights and Capability Based Systems Security Problems, Program Threats, System and Network Threats, Cryptography as a security tool

TOTAL PERIODS: = 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Realize the concepts of operating system structures, services and functionalities[Understand]
- Apply Various Process Scheduling Algorithms, Disk Scheduling algorithms, Page replacement algorithms. Deadlock detection and avoidance techniques for providing Operating System functionalities [Apply]
- Analyze various process management concepts (including scheduling, synchronization and deadlocks), Memory Management strategies and Design considerations of file system. [Analysis]
- Design solutions for complex engineering processes that meet specified needs with Scheduling, Synchronization, Page replacement and Disk Scheduling algorithms using Programming Language and present the same along with the report [Create]
- Evaluate the Multiprogramming, Synchronization and Virtual Memory Concepts[Evaluate]
- Make an effective communication and presentation in a team to demonstrate the concepts of OS [Value]

TEXT BOOKS

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating Systems Concepts, 9 thEdition, John Wiley Edition.

REFERENCE BOOKS

1. William Stallings, Operating Systems –Internals and Design Principles, 7th Edition, Prentice Hall, 2012
2. Andrew S.Tanenbaum, Modern Operating System, 2014, 4th Edition Pearson

21UCS305	COMPUTER ORGANIZATION (Common to CSE ,IT,CSBS &AIDS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To familiarize the components of computer system and instructions
- To discuss in detail the operation of the arithmetic unit.
- To design pipelining and parallel processing architecture
- To give knowledge on memory and I/O systems

UNIT I	OVERVIEW AND INSTRUCTIONS	9
Components of a computer system - Basic Operational Concepts - Operations and Operands - Representing instructions - Logical Operations - Control Operations - Instruction and Instruction Sequencing - Addressing and Addressing modes.		
UNIT II	**ARITHMETIC OPERATIONS**	**9**
Addition and Subtraction of signed numbers - Multiplication of unsigned and signed numbers - Fast Multiplication - Integer division - Floating point numbers and operations - ALU - Data path and Control Unit.		
UNIT III	**PIPELINING & PARALLEL PROCESSORS**	**9**
Pipelining - Instruction and Arithmetic Pipeline - Data hazards - Instruction hazards - Superscalar operation. Parallel processors: Introduction to parallel processors, Concurrent access to memory and cache coherency		
UNIT IV	**MEMORY CONCEPTS**	**9**
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs- Memory Management Requirements		
UNIT V	**I / O SYSTEMS**	**9**
Input / output system-Accessing I/O Devices - Interrupts - Direct Memory Access - Bus Structure - Bus Operation - Arbitration - Interface Circuits - USB		
TOTAL PERIODS: = 45 Periods		

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Explain the functional units and components of a computer system. (Understand)
- Apply the principles of computing to identify solutions for complex computing problems. (Apply)

- Analyze the design issues in terms of speed, technology, and cost to improve the performance of CPU. (Analyze)
- Analyze the technologies used to measure and improve the cache performance. (Analyze)
- Design a processor considering the performance issues of memory and CPU. (Create)
- Work individually or in teams and communicate effectively to justify the computing practice based on legal and ethical principles. (Affective domain)

TEXT BOOKS

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.
2. David A. Patterson and John L. Hennessey, “Computer organization and design the hardware / software interface”, Morgan Kauffman / Elsevier, Fifth edition, 2014.

REFERENCE BOOKS

1. William Stallings “Computer Organization and Architecture” , Seventh Edition , Pearson Education, 2006.
2. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.
3. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
4. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.

21UCD306	DATABASE SYSTEM DESIGN (Common to CSE,IT, AIDS & CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To impart the knowledge in Relational Database Management Systems.
- To inculcate knowledge Normalization techniques.
- To familiarize in transaction management.
- To understand the storage and retrieval mechanisms in Databases.
- To learn query optimization techniques.
- To gain knowledge in advanced databases.

UNIT I	RELATIONAL DATABASES	9
Purpose of Database System - Views of data - Database System Architecture - Introduction to relational databases - Relational Model - Keys - Relational Algebra - Entity-Relationship model - ER Diagrams - Enhanced ER Model - ER to Relational Mapping		
UNIT II	**SQL AND NORMALIZATION**	**9**
SQL fundamentals - Advanced SQL - Embedded SQL - Functional Dependencies - Non-loss Decomposition - First, Second, Third Normal Forms, Dependency Preservation - Boyce-Codd Normal Form		
UNIT III	**TRANSACTION PROCESSING AND CONCURRENCY CONTROL**	**9**
Transaction Concepts - ACID Properties - Schedules - Serializability - Concurrency Control - Need for Concurrency - Locking Protocols - Two Phase Locking - Deadlock - Transaction Recovery - Save Points - Isolation Levels - SQL Facilities for Concurrency and Recovery		
UNIT IV	**IMPLEMENTATION TECHNIQUES**	**9**
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 - Algorithms for SELECT and JOIN operations - Query optimization using Heuristics and Cost Estimation		
UNIT V	**NoSQL**	**9**
Overview of NoSQL Databases - Definition of the Four Types of NoSQL Database - Comparison of relational databases to new NoSQL stores - NoSQL Key/Value databases using MongoDB -		

CRUD operation in MongoDB - Column oriented NoSQL databases using Apache Cassandra, Create, Alter & Drop Key space in Cassandra - Cassandra Query Language (CQL): Insert Into, Update, Delete.

TOTAL PERIODS : = 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- Explain the basic as well as advanced concepts of Database Management Systems.(Understand)
- Apply the database design techniques to find solutions to complex engineering problems in real world applications.(Apply)
- Analyze various database design techniques to develop a database application for a given scenario.(Analyze)
- Evaluate various storage and query evaluation plans to optimize query cost(Evaluate)
- Design Database for a given real life scenario using the concepts of Relational model and ER diagrams(Create)
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation (Affective Domain)

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw Hill Education (India) Private Limited, Sixth Edition, 2013.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006
3. PramodJ.Sadalage, Martin Fowler "NoSQL A Brief Guide to the emerging World of Polyglot Persistence Distilled", Pearson Education Inc, 2013

REFERENCE BOOKS

1. RamezElmasri and ShamkantB.Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2008.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.
3. AtulKahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.
4. Alexis Leon and Mathews Leon, "Database Management Systems", Vikas Publishing House Private Limited, New Delhi, 2003.

21UIT307	Data Structures Laboratory (Common to CSE,IT, AIDS&CSD)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To demonstrate the systematic way of solving problems using linear and non - linear data structures
- To demonstrate the hashing techniques
- To demonstrate the sorting, searching algorithms

SYLLABUS

1. Implement of Linked list.
2. Implement Polynomial Arithmetic using Linked List.
3. Applications of Stack ADT
4. Applications of queue ADT
5. Balancing Brackets
6. Implementation of Binary search tree.
7. Expression of Tree construction and Traversals.
8. Minimum Spanning Tree.
9. Single Source Shortest Path
10. Implementation of Insertion sort and bubble sort.

TOTAL PERIODS : 30 Periods

COURSE OUTCOMES:

After the successful completion of the course, the students will be able to :

- Apply the linear and non-linear data structures and sorting searching and hashing algorithms appropriately to develop solutions [Apply]
- Identify the requirement and take further preparation in order to adopt Technological change[Apply]
- Analyze the different Program to implement various data structure algorithms[Analyze]
- Develop efficient linear, non-linear, sorting, searching and hashing data structure algorithms to solve problems for real world complex engineering problems [Design]
- Work, Communicate and present as an individual and as a member or leader in diverse teams for solving data structure problems[Affective Domain]

HARDWARE AND SOFTWARE REQUIRMENTS

HARDWARE REQUIREMENTS

PERSONAL COMPUTER WITH 8GB RAM ,500GB HARD DISK ,MONITOR,MOUSE KEYBOARD

SOFTWAREREQUIREMENTS

TURBO C, WINDOWS OS/LINUX OPERATING SYSTEM WITH GCC

21UCD308	DATABASE SYSTEM DESIGN LABORATORY (Common to CSE,IT, AIDS & CSD)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To demonstrate the creation and usage of database

LIST OF EXPERIMENTS

1. A TV Company wishes to develop a database to store data about the TV series that the company produces. The data includes information about actors who play in the series, and directors who direct the episodes of the series. Actors and directors are employed by the company. A TV series are divided into episodes. Each episode may be transmitted at several occasions. An actor is hired to participate in a series, but may participate in many series. Each episode of a series is directed by one of the directors, but different episodes may be directed by different directors.
    a. Create tables with necessary integrity constraints. Insert minimum of 10 records in each table.
2. A departmental store has many sections such as Toys, Cosmetics, Clothing, Household Items, and Electronics etc. Each section has many employees. Employees can belong to only one section. In addition, each section also has a head that is responsible for the section's performance.
    a. The department store also has many customers who purchase goods from various sections. Customers can be of two types Regular and Ad-hoc. Regular customers get credit at the department store. Maximum credit limit allowed is Rs.10000. The store procures goods from various suppliers. The goods are stored in a warehouse and transferred to the store as and when requirement comes up. Quantity of goods supplied cannot be less than 0 and cannot be greater than 10000 for a particular supply. The store has a computerized system for all its operations.
    b. Create the tables with all appropriate constraints. Use the constraints UNIQUE, NOT NULL, CHECK, PRIMARY KEY, FOREIGN KEY etc. wherever necessary.
3. Solve the following queries using the database created in Ex.1:
    a. Which actors play in the series 'The Devil'?
    b. In which series does the actor 'Rayan' participate?
    c. Which actors participate in more than one series?

d. How many times has the first episode of the series 'The Devil' been transmitted? At what times?
e. How many directors are employed by the company?
f. Which director has directed the greatest number of episodes?

4. Solve the following queries using the database created in Ex.2:
   a. Find all employees whose names begin with A and end with A.
   b. Find all products whose descriptions have the characters me.
   c. Find the total salary paid by each section to employees.
   d. Display the section names and the names of the employees who belong
   e. to that section.
   f. Display the section name and the name of the person who heads the section.
   g. Display supplier names and cities. If the city is null, display LOCAL.
   h. Display the customer names and the customer type. If the customer type is R, display as 'Regular'. If the customer type is A, display 'Ad-hoc'.

5. A municipality needs a database containing information concerning the inhabitants of the municipality. The database will be used for the planning of schools, health care and child care. From the database, you should be able to receive answers to queries of the following types: (Use library functions and aggregate functions)
   a. How many boys and girls will start school during year *x*?
   b. How many people will become old-age pensioners during year *x*?
   c. How many households have more than *x* people?
   d. How many people are single parents?
   e. In how many households is at least one member unemployed?
   f. How many households have a total income that is less than the norm for receiving social benefits?
6. A medical health research project has a database containing data about all patients at a hospital. For each patient, data about the symptoms that the patient shows is registered: fever, headache, cough, chest pains, . . . Symptoms can have different severity: low, middle, or high. A patient may show several symptoms, e.g., high fever, medium headache and some cough. The database also contains data about diseases. Each disease is characterized by different symptoms: a patient with a cold should have fever and a cough, a malaria patient should have fever and fits of shivering, etc.

Write SQL statements that answer the following questions (define and use views). Find the names of all patients that:

a. don't have any symptom of high severity,
b. have at least two different symptoms,
c. have at least one of the symptoms of malaria
d. have all the symptoms of malaria.

7. A company has several employees, all with different names, who perform interviews with job applicants (one applicant is interviewed by one employee). The job applicants also have different names. The interviewer makes appointments for interviews with the applicants. Each applicant may be interviewed at several occasions, possibly by different interviewers, but in that case the interviews take place during different days.

   The company has special interview rooms. Each interviewer uses the same room for all interviews during a day. A room may, however, be used by different interviewers during a day, as long as the interviews don't collide in time.

   The reservation of interview appointments is to be computerized. The database developer has decided to use a single relation for all data, with the following schema:

   Interviews(interviewer, applicant, day, time, room)

   a. From the text, find functional dependencies in the relation.
   b. Find the keys of the relation.
   c. Show that the relation is in 3NF but not in BCNF.
   d. Decompose the relation in relations that are in BCNF.

8. Shops sell items at varying prices. Customers buy items from shops. This is described by the following relations:

   Shops(shopId, name, address)
   Items(itemId, name, description)
   Sells(shopId, itemId, price)
   Customers(customerId, name, address)
   Sales(saleId, customerId, itemId, shopId, date)

   a. Write a procedure to print the name and address of all customers who haven't bought any item.
   b. Write a procedure for all customers that have bought at least one item: print the customer id and the total sum of all purchases.
   c. Write a function to print the number of shops that sell items with id's starting with

'EF'.

d. Write a function to print the name and address of the shop(s) that sell the item with id = 'EF123-A' at the lowest price.

9. A company organizes its activities in projects. Products that are used in the projects are bought from suppliers. This is described in a database with the following schema:

   Projects(projNbr, name, city)

   Products(prodNbr, name, color)

   Suppliers(supplNbr, name, city)

   Deliveries(*supplNbr*, *prodNbr*, *projNbr*, number)

   a. Write a trigger which displays a message whenever an entry is made in the table 'Deliveries'.

   b. Write a trigger which is invoked automatically whenever a product is supplied to the city 'London'.

   c. Execute an exception if the 'number' field in 'Deliveries' table is zero.

10. Design a logical data model for Hotel App using a cassandra physical Model. A hotel that wants to allow guests to book a reservation. Our conceptual domain includes hotels, guests that stay in the hotels, a collection of rooms for each hotel, and a record of the reservation, which is a certain guest in a certain room for a certain period of time (called the "stay"). Hotels typically also maintain a collection of "points of interest," which are parks, museums, shopping galleries, monuments, or other places near the hotel that guests might want to visit during their stay. Both hotels and points of interest need to maintain geo location data so that they can be found on maps for mash ups, and to calculate distances.

TOTAL PERIODS : 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the concepts of database systems to design a good database schema for a given application. (Apply)
- Construct queries using SQL and NoSQL to extract information from a database. (Apply)
- Analyze various database design techniques to develop a database application for a given scenario. (Analyze)
- Design Database application for a given real life scenario using the concepts of SQL,

PL/SQL, and NoSQL. (Create)

- Communicate effectively to justify the computing solutions based on legal and ethical principles. (Affective domain)
- Function effectively as an individual or in teams to develop database application for a given scenario. (Affective domain)

HARDWARE AND SOFTWARE REQUIREMENTS

HARDWARE REQUIREMENTS

PERSONAL COMPUTER WITH 8GB RAM ,500GB HARD DISK ,MONITOR,MOUSE KEYBOARD

SOFTWARE REQUIREMENTS

ORACLE APEX CLOUD WORKSPACE, SQL,NOSQL

21UGM331	BIOLOGY FOR ENGINEERS (Common to All Except BME & BT)	L	T	P	C
		2	0	0	P/F

COURSE OBJECTIVES :

- To provide a basic understanding of biological mechanisms of living organisms and the human biology from the perspective of engineers.
- To encourage engineering students to think about solving biological problems with engineering principles and tools.

UNIT I	INTRODUCTION AND CLASSIFICATION	5
Introduction to Biology - Comparison of Biology and Engineering - Eye and Camera - Bird flying and Aircraft - Brownian motion and Thermodynamics - Classification - Unicellular or multicellular - Unicellular: Bacteria, Protozoa, Yeast - Multi Cellular: Animals, Humans, Plants, fungi etc. - Ultra structure: prokaryotes or eukaryotes - Habitat: aquatic or terrestrial.		
UNIT II	**DIGESTIVE & RESPIRATORY SYSTEMS - ENZYME**	**6**
Study of digestive - Respiratory systems and their functions -.Enzyme - Classification of Enzyme - Mechanism of Enzyme activity - Enzymes for Industrial Applications: Waste management - Food processing industry - Beverages - Pharmaceutical - Paper Industry etc.		
UNIT III	**GENETICS AND BIO MOLECULES (BASICS ONLY)**	**7**
Basics of Genes - DNA structure - Genes and hereditary - Genetic Code - Coding and decoding Genetic information - Gene Mapping - Gene Interactions - Mutations - Genetic disorders - Gene therapy - Biomolecules: Carbohydrates, lipids, nucleic acids, proteins. Biological Applications in Engineering: Genetic Algorithm - Computer Application in Genetic Engineering - Genetic Programming - Genetic Computers.		
UNIT IV	**NERVOUS SYSTEM AND CELL SIGNALING**	**7**
Central Nervous System: Brain and Spinal Cord - Peripheral Nervous System - Sensory Division - Motor Division - Neurons - sensory, motor, and interneurons - Signals - Transfer of Information - Bio Signals - Electrocardiography (ECG) - Electroencephalography (EEG) - Electromyography (EMG) - Electrooculography (EOG) - X-ray - CT Scan - MRI scan - Biological Applications in Engineering - Neurons and Neural Network		
UNIT V	**BIOLOGY AND ITS INDUSTRIAL APPLICATION**	**5**
Bioreactors - Biopharming - Recombinant vaccines - Cloning - Drug discovery		

Bioremediation - Biofertilizer - Biocontrol - Biofilters - Biosensors - Biopolymers - Bioenergy - Biomaterials - Biochips.

TOTAL PERIODS : = 30 Periods

COURSE OUTCOMES

At the end ofthe course thestudentswillbeableto:

- Explain the fundamentals of living things, their classification, cell structure and biochemical constituents. [Understand]
- Apply the concept of plant, animal and microbial systems and growth in real life situations. [Apply]
- Analyze biological engineering principles and procedures needed to solve societal issues. [Analyze]

TEXT BOOKS

1. R.C.Dubey, "A Text book of Biotechnology", S. Chand Higher Academic Publications, 2013.
2. R. Khandpur, "Biomedical instrumentation - Technology and applications", McGraw Hill Professional, 2004.

REFERENCE BOOKS

1. Arthur T. Johnson, "Biology for Engineers", CRC Press, Taylor and Francis, 2nd Edition, 2019.
2. Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, "Cell Biology and Genetics (Biology: The unity and diversity of life Volume I)", Cengage Learning, 12th Edition, 2008.
3. Gerard J. Tortora and Bryan H.Derrickson, "Principles of Anatomy and Physiology",15thEdition,Wiley publications, 2016.

Semester IV

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA421	Transforms and Discrete Mathematics (Common to CSE and IT)	3	1	0	4	BS
21UCS402	Computer Networks (Common to CSE, IT & CSD)	3	0	0	3	PC
21UCS403	Algorithm Analysis (Common to CSE, IT,AIDS& CSD)	3	0	0	3	PC
21UIT404	Java Programming (Integrated course) (Offered By Infosys-Springboard) (Common to CSE, IT & CSD)	3	0	2	4	PC
21UIT405	Software Engineering Methodology (Common to CSE &IT)	3	0	0	3	PC
21UIT406	Microprocessor Based System Design (Integrated Course) (Only to IT)	3	0	2	4	ES
PRACTICAL						
21UCS407	Computer Networks Laboratory (Common to CSE, IT & CSD)	0	0	2	1	PC
MANDATORY						
21UGM431	Gender Equality (Common to all)	1	0	0	P/F	MC
		19	**1**	**6**	**22**	
Total No of Credits -22						

21UMA421	TRANSFORMS AND DISCRETE MATHEMATICS (COMMON TO CSE AND IT)	L	T	P	C
		3	1	0	4

OBJECTIVES :

- To make the student acquire sound knowledge to test the logic of program.
- To familiarize the student to be aware of generating functions.
- To acquaint the student with the basics of Z - transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z - transform technique bringing out the elegance of the procedure involved

UNIT I	LOGIC AND PROOF METHODS	9 + 3
Propositional Logic - Propositional equivalences - Predicates and quantifiers - Nested Quantifiers - Rules of inference - Introduction to Proofs - Proof Methods and Strategy.		
UNIT II	**COMBINATORICS**	**9 + 3**
Permutations and Combinations - Mathematical inductions - Strong induction and well ordering - The basics of counting - The pigeonhole Principle - Recurrence relations - Solving Linear recurrence relations - Generating functions - Inclusion and exclusion and applications.		
UNIT III	**ALGEBRAIC STRUCTURES**	**9 + 3**
Algebraic systems - Semi groups and Monoids - Groups - Subgroups and Homomorphisms - Cosets and Lagrange's theorem - Ring & Fields - Vector Spaces (Definitions and examples).		
UNIT IV	**FOURIER TRANSFORM**	**9 + 3**
Fourier integral theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity - Application of Fourier Transform		
UNIT V	**Z-TRANSFORM AND DIFFERENCE EQUATIONS**	**9 + 3**
Z-transform - Elementary properties - Inverse Z-transform - Convolution theorem - Initial and Final value Theorems - Formation of difference equations - Solution of difference equations.		
TOTAL PERIODS: 45 (L) + 15 (T) = 60 Periods		

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the knowledge of logic and proofs to find the logical consistency of a given Engineering problems. (CO1) AP- K3
- Apply the knowledge of various combinatorical techniques to solve the real life Engineering problems.(CO2) AP - K3
- Apply the knowledge of algebraic structures to asses the properties of groups of Engineering problems. (CO3) AP - K3
- Apply the knowledge of Fourier transform to solve the Engineering problems. (CO4) AP - K3
- Apply the knowledge of Z transform to solve the Engineering problems.(CO5) AP - K3
- Explain the concepts of Logics, combinatorics and transforms. (CO6) U- K2

TEXT BOOKS:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Special Indian Edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 5th Edition, (2008).
2. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 35th Re-print, (2008).
3. Veerajan.T, "Engineering Mathematics for semester III", Tata McGraw-Hill, New Delhi (2000).

REFERENCE BOOKS:

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education, New Delhi, 4th Edition, (2002).
2. Tamilarasi.A, and Natarajan.A.M, "Discrete Mathematics and its Applications", Khanna Publishers, New Delhi, 3rd Edition, (2008).
3. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", Schaum's Outlines, Tata McGraw-Hill, New Delhi, 2nd Edition, (2007).
4. Veerarajan, T. "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw-Hill, New Delhi, 7th Edition, (2008).
5. Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Engineering Mathematics III, Chand & Company Ltd., New Delhi, 3rd Edition, (1996).

21UCS402	COMPUTER NETWORKS (Common for CSE,IT and CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To impart the knowledge about the principles of data communication
- To understand the layering concepts in computer networks
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the transport layer
- To acquire the knowledge on applications of networks

UNIT I	INTRODUCTION AND PHYSICAL LAYERS	9

Data Communication - Networks - Network Types - Protocol Layering - OSI Model - TCP/IP Protocol suite - Physical Layer: Performance - multiplexing -Transmission media - Switching.

UNIT II	DATA LINK LAYER AND MEDIA ACCESS CONTROL	9

Error Detection and Error Correction - DLC Services - Data-Link Layer Protocols - HDLC - PPP - Media Access Control- Wired LANs- Ethernet -Wireless LAN- IEEE 802.11 -Bluetooth - Connecting Devices-FDDI

UNIT III	NETWORK LAYER	9

Network Layer Services - Logical Addressing- Internet Protocols (IPV4 and IPv6)- Address Mapping - Network Layer Protocols: ICMP - IGMP - ICMP v6 - Delivery- Forwarding - Routing Protocol (Unicast - Multicast)

UNIT IV	TRANSPORT LAYER	9

Transport Services - Elements of Transport Protocols -Process to Process Communication-UDP, TCP and SCTP- Congestion Control- QoS improving techniques- RPC

UNIT V	APPLICATION LAYER	9

WWW and HTTP- FTP - Email-Telnet-DNS-SNMP, Basic concepts of Cryptography and digital signature - Firewalls.

TOTAL PERIODS : 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Explain the principles of various computer network terminologies. (Understand)
- Apply the knowledge of layer functionalities to provide error free and congestion free data flow. (Apply)
- Analyze the working principles of various protocols for effective data communication. (Analyze)

- Estimate the performance of various network parameters to improve QoS. (Evaluate)
- Design a LAN network with the principles of protocol stack for a given real world scenario. (Create)
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation (Affective Domain)

TEXT BOOKS

1. Behrouz A. Forouzan, "Data Communications and Networking", Fifth Edition TMH, 2013.
2. Andrew S Tanenbaum, "Computer Networks", PHI, 2010.
3. Walliam Stallings , "Data and Computer Communications", PHI,2002

REFERENCE BOOKS

1. James F. Kuross, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Addison Wesley, Third Edition, 2004.
2. Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2007.
3. Comer, "Computer Networks and Internets with Internet Applications", Pearson Education, Fourth Edition, 2007.
4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

21UCS403	ALGORITHM ANALYSIS (Common to CSE ,IT,CSD & AI&DS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To analyze a problem and identify the computing requirements appropriate for its solutions.
- To summarize sorting , searching algorithms and report algorithm design methods.
- To become familiar with the different algorithm design techniques.

UNIT I	INTRODUCTION	9

Introduction - Notion of an Algorithm - Important Problem Types - Fundamentals of the Algorithm Analysis- Analysis Framework - Asymptotic Notations and its properties - Mathematical analysis for Recursive and Non-recursive algorithms.

UNIT II	SEARCHING AND TRAVERSAL TECHNIQUES	9

Brute Force - Selection Sort and Bubble Sort - Sequential Search and Brute-force string matching - Divide and conquer methodology - Merge sort - Quick sort - Binary search -Binary tree traversal algorithm, Graph traversals - Breadth first search and Depth first search.

UNIT III	ALGORITHMIC TECHNIQUES	9

Dynamic Programming - Warshall's and Floyd' algorithm - Optimal Binary Search Trees - Greedy Technique - Prim's algorithm- Kruskal's Algorithm - Dijkstra's Algorithm-Huffman Trees

UNIT IV	BACKTRACKING AND BRANCH AND BOUND	9

Backtracking - n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem- Branch and Bound - Assignment problem - Knapsack Problem- Traveling Salesman Problem-Iterative Improvement-Maximum Flow Problem-Maximum Matching in Bipartite Graphs

UNIT V	COMPUTATIONAL COMPLEXITY AND PARALLEL ALGORITHMS	9

Non Deterministic algorithms, The classes P, NP, NP Complete, NP hard Proofs for NP Complete Problems: Clique, Vertex Cover Parallel Algorithms

TOTAL PERIODS : 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Understand the concept of Notation of Algorithm that apply in various methodologies like brute force divide and Conquer, Greedy Techniques **[Understand]**
- Apply various Methodology based algorithm and different types of searching sorting

techniques for providing Betterment solution for the problems. **[Apply]**

- Analyze various methodology based algorithm for enhancing the efficiency of the problem **[Analyze]**
- Analyze different set of problem and to Design a solution using algorithm design methodology **[Design]**
- Evaluate running time, efficiency of the problem using different set of algorithm **[Evaluate]**
- Demonstrate the algorithms with analyzed solution based on time complexity , efficiency and also shows the concepts of difference between different methodology using Virtualization tools **[Modern Tool Usage]**

TEXT BOOKS

1. AnanyLevitin, "Introduction to the Design & Analysis of Algorithm", Pearson Education Asia,Third Edition, 2012.
2. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Computer Algorithms / C++", Universities Press, Second Edition, 2007

REFERENCE BOOKS

1. Thomas H Cormen, Charles E.L Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithm", PHI Pvt. Ltd, Third Edition, 2012.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, Fundamentals of Computer Algorithms,Second Edition, Universities Press, Hyderabad, 2008.
3. Fayez Gebali," Algorithms and Parallel Computing", Willy (Indian Paperback Edition), 2011.
4. Aho.A.V, Hopcroft.J.E, Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, Third Edition, 2008.
5. Lee. R.C.T, Tseng.S.S, Chang.R.C, Tsai Y.T, "Introduction to the Design and Analysis of Algorithms A Strategic Approach", McGraw-Hill Education, First Edition, 2005.

21UIT404	JAVA PROGRAMMING (Integrated course) (Offered By Infosys-Springboard) (Common to CSE, IT & CSD)	L	T	P	C
		3	0	2	4

Course Objectives:

- To implement object-oriented designs with Java.
- To extend Java classes with inheritance and dynamic binding.
- To work with Java Collections API and Packages.
- To handle Exceptions with Exceptions classes.
- To make use of String Classes in Java

UNIT I	Java Fundamentals	9+6

Introduction to Java - Java Architecture - keywords - Identifiers - Variables - Data types- Operators- Type conversion- Selection control Structure - Iteration Control Structure

Case Study:

a. Implement a program to calculate the product of three positive integer values. However, if one of the integers is 7, consider only the values to the right of 7 for calculation. If 7 is the last integer, then display -1

b. Quadratic equation is an equation with degree 2 in the form of ax2 +bx + c = 0 where a, b and c are the coefficients.

1. Implement a program to solve a quadratic equation.
   Find the discriminant value using the formula given below.
   discriminant = b2 - 4ac
2. If the discriminant is 0, the values of both the roots will be same. Display the value of the root.
3. If the discriminant is greater than 0, the roots will be unequal real roots. Display the values of both the roots.
4. If the discriminant is less than 0, there will be no real roots. Display the message "The equation has no real root"
5. Use the formula given below to find the roots of a quadratic equation.
   x = (-b ± discriminant)/2a

UNIT II	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	9+6

Introduction to Object Oriented Programming - Methods - Constructors - This keyword - Memory management - Encapsulation - Abstraction - Access Modifiers - Arrays

Case Study:

a) Implement a class Calculator with the method mentioned below.

Method Description

findAverage()

1. Calculate the average of three numbers
2. Return the average rounded off to two decimal digits
3. Test the functionalities using the provided Tester class.

b) Modify the Restaurant class created before and add the below mentioned constructor.

Method Description

Restaurant(String name, long restaurantContact, String restaurantAddress, float rating)

- Initialize the instance variables appropriately with the values passed to the constructor.
- Create an object of the Restaurant class and invoke the **displayRestaurantDetails()** method in the main() method of the Tester class.

UNIT III	**ADVANCED JAVA CONCEPTS**	**9+6**

Inheritance - Introduction to inheritance - Single Inheritance - Multilevel Inheritance - Polymorphism - Method overloading - Method Overriding - Constructor overloading - Super keyword - Final Keyword - Static modifier - Abstract class - Interfaces

Case Study:

a) The Point class is used for representing a point with two coordinates.

Implement the class Point based on the class diagram and description given below.

Method Description

1. **Point(double xCoordinate , double yCoordinate)**

   Initialize the instance variables xCoordinate and yCoordinate appropriately with the values passed to the constructor.

2. **calculateDistance()**

   Calculate and return the distance of the point from the origin (0,0). The distance can be calculated using the formula given below. The distance should be rounded off to 2 decimal digits.

   distance=√((x2-x1)2+(y2-y1)2),

   where x1 and x2 are values of x-coordinates of two points and y1 and y2 are values of y-coordinates of two points

   calculateDistance(Point point)

Calculate and return the distance of the point from the 'point' passed to the method. The distance should be rounded off to 2 decimal digits.

Hints:

Use Math.sqrt(double d) method to calculate the square root

Use Math.round(double d) method to round off the values

Implement the getter and setter methods appropriately.

Test the functionalities using the provided Tester class.

UNIT IV	COLLECTIONS , PACKAGES AND EXCEPTION HANDLING	9+6

Collection Interface - Collection Class - Array List - Linked List - Introduction to Package - Import - Exception - Try - Throw - Catch -Finally - User defined Exception - throws

Case study:

a) A bank wants to conduct examinations for recruitment. You need to develop an application for the applicants to submit their details by implementing the classes based on the description given below.

Method Description

validateName(String name)

Validate that the name is not null or empty. If the name is null or empty, return false, else return true.

validateJobProfile(String jobProfile)

Validate that the jobProfile is either 'Associate' or 'Clerk' or 'Executive' or 'Officer'. If the jobProfile is valid, return true, else return false. Perform case-insensitive comparison.

validateAge(int age)

Validate that the age is between 18 and 30 (both inclusive). If the age is valid, return true, else return false

validate(Applicant applicant)

Validate the details of the applicant by calling the appropriate methods. If any validation fails, throw user defined exceptions based on the below description.

Field violated	User defined exception	Exception message
name	InvalidNameException	Invalid name
jobProfile	InvalidJobProfileException	Invalid job profile
age	InvalidAgeException	Invalid age

Implement the required user defined exception classes.

Test the functionalities using the main method of the provided Tester class based on the below description.

Create an object of Applicant class and set the values of all the instance variables

Validate the details of the applicant by invoking the validate() method of the Validator class

If all the details are valid, display 'Application submitted successfully!', else, display appropriate error message

UNIT V	STRING HANDLING	9+6

String Constructors – Character extraction – String Comparison – Searching strings – String Buffer

Case Study:

a)Complete the removeWhiteSpaces() method given in the Tester class.

Method Description

removeWhiteSpaces(String str)

Remove all the white spaces from the string passed to the method and return the modified string.

Test the functionalities using the main() method of the Tester class.

Total: 45 (Lecture) + 30(Practical) Periods

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the Object oriented features of Java[Understand]
- Write Java code for various applications [Apply]
- Analyze the suitable object oriented methodology for solving a complex engineering problem[Analyze]
- Design various real time java applications[Design]
- Compare the given code with original for logical and syntactical errors[Evaluate]
- Use modern tools to implement coding[Modern Tool Usage]
- Work in a diversified team[Individual and Team Work]

Text Books

1. Cay S. Horstmann "Core Java Volume I—Fundamentals", Pearson Publishers, Eleventh Edition, 2018

References

1. Infosys Offered Course (https://infyspringboard.onwingspan.com/)
2. Herbert Schildt“ The Complete Reference Java “, McGraw Hill , Eleventh Edition , 2018

HARDWARE REQUIREMENTS:

Personal computer with 8GB RAM, 500GB Hard disk,OS:Windows/Linux

SOFTWAREREQUIREMENTS:

OPERATING SYSTEM -LINUX /WINDOWS ,JDK VERSION 6(or) ANY IDE LIKE NETBEANS /ECLIPSE CODE etc

21UIT405	SOFTWARE ENGINEERING METHODOLOGY (Common to CSE &IT)	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the phases in asoftware project
- Understand fundamental concepts of requirements engineering and Analysis Modeling
- Understand the major considerations for enterprise integration and deployment
- Learn various testing and maintenance measures

UNIT I	SOFTWARE PROCESS	9
Introduction to Software Engineering, Software Process, Prescriptive Process Models and Specialized Process Models - Agile Process Model - Agile Manifesto and Principles		
UNIT II	**REQUIREMENT 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		
UNIT III	**SOFTWARE DESIGN AND DEVELOPMENT**	**9**
Design Process – Design Concepts – Design Model-Design Heuristic – Architectural Design – Architectural Styles, Architectural Design, Architectural Mapping using Data Flow – User Interface Design: Interface Analysis, Interface Design – Introduction to Real Time Software Design – Component Level Design: Designing Class Based Components, Traditional Components		
UNIT IV	**SOFTWARE TESTING AND MAINTENANCE**	**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 - Software Implementation Techniques: Coding Practices - Refactoring-Maintenance and Reengineering - BPRModel-Reengineering Process Model - Reverse and Forward Engineering.		
UNIT V	**PROJECT MANAGEMENT**	**9**
Software Project Management: Estimation, Make / Buy Decision,COCOMO-II-Project Planning - Project Scheduling - Risk Management - RMMM Plan - CASE Tools		

Total PERIODS: 45 Periods

COURSE OUTCOMES

At the end of the course the student will be able to

- Elaborate the software engineering methodologies and project management techniques[Understand]
- Apply the software development and management techniques for real time projects in agile scenario[Apply]
- Analyze various software methodologies, design techniques,testing strategies by means of software project management[Analysis]
- Design a process model which suits the business need[Create]
- Use modern tools to demonstrate the software engineering process[Apply [Modern ToolUsage]]
- Work individually and as a member in multidisciplinary teams[Individual and Team Work[Value]]

Text Books

1. Roger Pressman.S, "Software Engineering – A Practitioner's Approach", McGraw Hill International Edition, 9th Edition, 2019.
2. Ian Sommerville, "Software Engineering", Pearson Education Asia10th Edition, 2017

References

1. RajibMall, "Fundamentals of Software Engineering", PHILearning Private Limited, 3rd Edition, 2009.
2. PankajJalote, "Software Engineering, A Precise Approach Fundamentals of Software Engineering", Wiley India, 2010.
3. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

21UIT406	MICROPROCESSOR BASED SYSTEM DESIGN (Integrated Course) (Only to IT)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
- The student will learn hardware and software interaction and integration.
- The students will learn the design of microprocessors/microcontrollers- based systems..

UNIT I	8086 MICROPROCESSOR	9 + 6

Introduction to 8086 Microprocessor architecture - Addressing modes - Assembly language programming - Instruction set and assembler directives - Modular Programming - Linking and Relocation - Stacks - Procedures - Macros - Interrupts and interrupt service routines - Byte and String Manipulation.

Experiments

1. Write an ALP using 8086 for :
   a) Addition of two 16-bit numbers
   b) Subtraction of two 16 bit numbers and
   c) Multiplication of two 16 bit numbers
2. Arranging an array of data (ascending order & descending order).

UNIT II	8086 SYSTEM BUS STRUCTURE	9 + 6

IO programming-Introduction to Multiprogramming - System Bus Structure - Multiprocessor configurations – Coprocessor - Closely coupled and loosely Coupled configurations

Experiments

1. Code Conversion (BCD to HEX, HEX to BCD,
2. Code Conversion (HEX to ASCII & ASCII to HEX).

UNIT III	I / O INTERFACING	9 + 6

Memory Interfacing and I/O interfacing - Serial communication interface - Parallel communication interface - D/A and A/D Interface - Timer – Keyboard / display controller - Interrupt controller - DMA controller - Programming and applications Case studies: Traffic Light control - Keyboard display interface.

Experiments

1. Write an ALP using 8051 for Timer / Counter. Find the value for TMOD if we want to

program Timer 0 in mode 2, use 8051 XTAL for the clock source, and use instructions to start and stop the timer.

2. Write an ALP using 8051 for Interrupt Handling Find the amount of time delay in the DELAY subroutine generated by the timer. Assume that XTAL = 11.0592 MHz.
3. Interfacing (8251 (USART), ADC/DAC, 8253 (Timer IC) & 8279 (Keyboard/Display Controller). Assembly Language Programming With 8051 Microcontroller:
4. Interfacing a Traffic Light control / LED display/ LCD display/ Keyboard display interface and Alarm Controller.

UNIT IV	MICROCONTROLLER	9 + 6

Architecture of 8051 - Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Experiments

1. Write an ALP using ARM for:
   a) Addition of two 8 numbers
   b) Subtraction of two 8 bit numbers
   c) Multiplication of two 8 bit numbers
   d) Division of two 8 bit numbers
2. Write an ALP using ARM for:
   a) Convert packed BCD to Unpacked BCD.
   b) Convert packed BCD to ASCII.
   c) Convert hexadecimal to ASCII

UNIT V	INTERFACING MICROCONTROLLER	9 + 6

Programming 8051 Timers - Serial Port Programming - Interrupts Programming - LCD & Keyboard Interfacing - DAC , ADC & Sensor Interfacing - External Memory Interface - Stepper Motor generation.

Experiments

1. Interfacing ADC/DAC, Matrix/Keyboard & LCD Assembly Language Programming with ARM Processor
2. Interfacing Stepper Motor Assembly Language Programming with ARM Processor

Mini Project

1. Programming / interfacing experiments with IDE for 8051/PIC/MSP/Arduino/Raspberry Pi). Relay control, Distance measurement, Temperature measurement, Digital Thermometer Txr-Rxr interface, Alphanumeric

LCD display interface.
Total PERIODS: 75 Periods

COURSE OUTCOMES

At the end of the course the student will be able to

- Assess and solve basic binary math operations using the microprocessor [Understand]
- Apply knowledge and demonstrate programming proficiency using the various Basic configurations by executing new assembly language programs using instruction sets of 8086[Apply]
- Analyze various interfacing devices with 8085 and 8086 Micro processors with defined standards and guidelines to select the appropriate Microprocessor and Microcontroller that meet out performance requirements.[Analyze]
- Recreate the programs and Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices [Create]
- Evaluate assembly language programs and download the machine code that will provide solutions for complex and real-world control problems.[Evaluate]
- Select appropriate machine tool for a cross assembler utility of a microprocessor and microcontroller and also Demonstrate programming proficiency using the various addressing modes and data transfer instructions[Design]

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture,Programming and Design”, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011.
3. Krishna Kant, “ Microprocessors and Microcontrollers Architecture, Programming and system design 8085,8086,8051,8096,PHI,2011

REFERENCE BOOKS:

1. Frank Vahid ,”Digita l System Design” John Wiley & Sons ,Second Edition,2010
2. Ray A K , Bhurchandi K M , “Advanced Microprocessors and Peripherals”, TMH
3. D. V. Hall, "Microprocessor and Interfacing Programming and Hardware", McGraw Hill, II Edition, 1999
4. B. B. Brey, "The Intel Microprocessors 8086/8088, 80186/ 80188, 80286, 80386, 80486 and Pentium and Pentium Pro Processor", Prentice Hall of India, V Edition, 2006.

Content beyond Syllabus: AURDINO MICROCONTROLLER

HARDWARE REQUIREMENTS:

PERSONAL COMPUTER WITH 8GB RAM, 500GB HARD DISK, MONITOR,MOUSE, KEYBOARD

SOFTWAREREQUIREMENTS:

KEIL SOFTWARE, TASM ,GUI, TURBO ASSEMBLER,PROTEUS SOFTWARE

21UCS407	COMPUTER NETWORKS LABORATORY (Common for CSE,IT and CSD)	L	T	P	C
		0	0	2	1

PRE-REQUISITE :

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine and Implementation of Data Encryption and Decryption
2. Simulation of error correction code (like CRC and Hamming Code generation).
3. Implementation of Stop and Wait Protocol and Sliding Window Protocol
4. Simulation of Distance Vector / Link State Vector Routing Protocol algorithm
5. Applications using TCP sockets like:
   (i) Data and Time Server & Client & Chat
   (ii) Echo Server & Client
   (iii) File Transfer
   (iv) Web page Upload and Download
6. Simulation of DNS using UDP socket
7. Write a code simulating ARP/RARP Protocols & RPC
8. Simulation of Congestion Control Algorithms using NS.
9. Implementation of TCP/UDP performance using Simulation tool.
10. Performance evaluation of Routing protocols using Simulation tool.

TOTAL : 30 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Apply various error detection and correction algorithms to implement secure data transfer. (Apply)
- Analyze various interfaces to implement application layer protocols. (Analyze)

- Apply the concept of encryption and decryption for secure message transfer. (Apply)
- Simulate various routing protocols to find an optimal solution for the effective data communication. (Create)
- Communicate effectively to justify the computing solutions based on legal and ethical principles. (Affective domain)
- Work effectively as an individual or in teams to simulate routing protocols for a given scenario. (Affective domain)

HARDWARE AND SOFTWARE REQUIRMENTS

HARDWARE REQUIREMENTS:

PEROSNAL COMPUTER WITH 8GB RAM, 500 GB HARDDISK, MONITOR ,MOUSE, KEYBOARD

SOFTWAREREQUIREMENTS:

C COMPILER, J2SDK, NETWORK SIMULATORS NS2 , PACKET TRACER

21UGM431	GENDER EQUALITY (Common to All Branches)	L 1	T 0	P 0	C P/F

OBJECTIVES:

- To introduce basic concepts relating to gender and to provide logical understanding of gender roles.

UNITI	GENDER SENSITIZATION	5

Definition of gender, Perspectives – Gender sensitive approach - Gender and sex- Social construction of gender and gender roles – Socialization – institutions of socialization –changing content and context of gender – need for re-socialization.Gender Stereotyping and Gender Discrimination

UNITII	GENDER EQUALITY AND CONSTITUTION	5

Indian constitution related to equality – Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation – cultural and educational rights – the right to constitutional remedy - University Declaration of Human Rights -Enforcement of Human Rights for Women and Children - Role ofCells and Counseling Centers - Internal Complaints Committee –Legal AID cells, Helpline, State and National Level Commission

UNITIII	GENDER ROLES & EQUALITY	5

Gender & Morality **–** Structural and functionalist views of Gender - Gender in the Classroom - Beyond access for girls and boys- Gender equality in schools –Gender equality and adult basic education – Developing capacity to achieve gender equality in education - Individuality and removal of gender stereotypes- Respect for eachothers – Promote equal Opportunity

TOTAL PERIODS: 15Periods

COURSEOUTCOMES:

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

- Describe the social construction of gender and sexuality and the irinfluence in social context [Understand]
- Analyze how the concepts of gender equality are created, maintained, and / or challenged [Analyze]
- Apply concepts of gender roles and equality in classroom, school, disciplinary or interdisciplinary creative, scholarly,and / or activist project [Apply]

REFERENCE BOOKS

1. Sheila A Ikman and Elaine Unter Halter, - Practicing Gender Equality in Education ‖, OxfamGB, 2007.
2. Pasadena and Hackensack,- Gender roles and Equality ‖, Salem Press, 2011.

Semester V

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UGS531	Reasoning and Aptitude (Common to CSE, ECE, IT, CSBS, AIDS and CSD)	1	0	0	1	BS
21UIT501	Internet and web Technology (Only to IT)	3	0	0	3	PC
21UCS502	Mobile applications design and development (Common to CSE &IT)	3	0	0	3	PC
21UIT503	Mining and analysis of big data (Only to IT)	3	0	0	3	PC
21UIT504	Object Oriented Analysis and Design (Only to IT)	3	0	0	3	PC
PE1	ProfessionalElective–I	3	0	0	3	PE
OE1	Open Elective–I	3	0	0	3	OE
PRACTICAL						
21UGS532	Soft Skills Laboratory (Common to CSE,EEE,IT,AGRI,CSBS,AIDS and CSD)	0	0	2	1	HSS
21UIT506	Internet and web Technology Laboratory (Only to IT)	0	0	2	1	PC
21UIT 507	Creative thinking and Innovation	0	0	2	1	PW
21UIT508	Mining and Analysis of Big Data Laboratory (Only to IT)	0	0	2	1	PC
21UCS509	Mobile applications design and development Laboratory (Common to CSE &IT)	0	0	2	1	PC
MANDATORY						
21UGT140	Heritage of Tamil (Common to all)	1	0	0	1	MC
	TOTAL	**20**	**0**	**10**	**25**	
Total No of Credits –25						

21UGS531	REASONING AND APTITUDE (Common to ECE,CSE, IT, CSBS, AIDS &CSD)	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES :

- To make the student acquire sound knowledge of the characteristic of quantitative and qualitative aptitude.
- To familiarize the student with various principles involved in solving mathematical problems.
- To develop an understanding of the basic concepts of reasoning skills.

UNIT I	QUANTITATIVE APTITUDE	8

Ratio and Proportion - Averages - Percentages - Problems on ages - Profit and Loss - Simple and Compound Interest - Time - Speed - Distance - Time and Work - Permutation and Combination - Alligation or Mixture - Probability - Clocks - Calendars.

UNIT II	VERBAL AND NON VERBAL REASONING	7

Analytical Reasoning - Circular an Linear arrangement - Direction problems - Blood relations - Analogy - Odd Man Out - Venn Diagrams - Data Sufficiency - Data interpretation - Syllogism - Coding - Decoding.

TOTAL = 15 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Select an appropriate technique to solve the quantitative problems within the stipulated time. (Apply)
- Apply Verbal and Non Verbal Reasoning skills to solve the problems based on the logical and analytical reasoning. (Apply)
- Analyse the direction to solve equations involving one are more unknowns. (Analyse)

WEBSITES:

- www.m4maths.com
- www.indiabix.com
- www.fresherworld.com
- www.campusgate.co.in
- www.indianstudyhub.in
- www.tcyonline.com

21UIT501	INTERNET AND WEB TECHNOLOGY (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To make the students design a webpage using HTML and Cascading Style Sheets.
- To make the students design web pages with good look and feel using Bootstrap.
- To demonstrate validations and manipulation of contents of the webpage using JavaScript
- To demonstrate dynamic web pages using server side scripting.

UNIT I	MARK UP LANGUAGE	7
Introduction to HTML 5: First HTML5 Example - Headings – Linking – Images – Lists – Tables – Forms – Internal Linking – meta Elements - New HTML 5 Form input Types – Page Structure Elements -– Canvas – Audio - Video.		
UNIT II	**CASCADING STYLE SHEETS**	**9**
Introduction to Cascading Style Sheets: Inline Styles - Embedded Style Sheets - Linking External Style Sheets - Positioning Elements - Backgrounds - Element Dimensions - Box Model and Text Flow - Drop-Down Menus - Animation; Selectors.		
UNIT III	**FRONT END FRAMEWORK**	**9**
Bootstrap: Bootstrap File Structure – Basic HTML Template – Default Grid System – Forms - Buttons – Images – Icons - Dropdown Menus – Navigation Elements – Navbar – Tooltips - GitHub Project.		
UNIT IV	**CLIENT SIDE PROGRAMMING**	**9**
JavaScript: Introduction to Scripting – Obtaining User Input with prompt Dialogs - Memory Concepts - Arithmetic - Decision Making - Control Statements – Functions – Arrays – Objects - Event Handling.		
UNIT V	**SERVER SIDE PROGRAMMING**	**9**
PHP: Server Side Basics - Converting Between Data Types - Arithmetic Operators - Initializing and Manipulating Arrays - String Comparisons - String Processing with Regular		

Expressions - Form Processing and Business Logic - Reading from a Database - Using Cookies - Dynamic Content.

Total PERIODS: 45 Periods

COURSE OUTCOMES

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

- Explain the basic structure and syntax of HTML 5, CSS, Bootstrap, JavaScript and PHP[Understand]
- Apply the knowledge of HTML, CSS and Scripting technologies to develop interactive web applications[Apply]
- Analyze front-end web coding languages to add dynamic content, animation and effects to websites[Analysis]
- Develop a real time web applications using HTML, CSS and Scripting technologies[Design]
- Demonstrate web applications using modern web frameworks and tools[Apply]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation.[Affective Domain]

TEXT BOOKS

1. Paul Deitel, Harvey M.Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", 5th Edition, Prentice Hall, 2011.
2. Jake Spurlock, "Bootstrap Responsive Web Development", Kindle Edition, O'REILLY, 2013.

REFERENCE BOOKS

1. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2007.
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5 - A Step-by-Step Guide to Creating Dynamic Websites", O'Reilly Media, 3rd Edition , 2014
3. Kogent Learning Solutions Inc., "Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book", Dreamtech Press.

21UCS502	MOBILE APPLICATIONS DESIGN AND DEVELOPMENT (Common to CSE &IT)	L	T	P	C
		3	0	0	3

PRE-REQUISTIES: Java Programming

COURSE OBJECTIVES :

- Aims at providing techniques for deploying and testing mobile applications, and for enhancing their performance and scalability
- Identify the capabilities and limitations of mobile platforms that affect application development and deployment
- Elaborating the characterization and architecture of mobile applications
- Analyzing the impact of technology and business trends in mobile application development

UNIT I	INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT	9
Introduction – Android architecture overview – Android Application lifecycle – Write and view logs with Logcat - Androiduserinterfacefundamentals -Userinteraction - Android activities –Androidwidgets-Layouts—Userinputcontrols–Event Handling.		
UNIT II	**USER INTERFACE DESIGN FUNDAMENTALS AND INTENT FILTERS**	**9**
Menus–Fragments–Views– Drawables-styles–themes–Intent overview :Implicitintents–Explicitintents–Intentswithactivities–Intentswithbroadcastreceivers.		
UNIT III	**LOCATION BASED SERVICES**	**9**
Maps–Geocodingandlocationbasedservices–Usinglocationbasedservices–Selectinga locationprovider–Usinggeocoder–CreatingMapbased activities.		
UNIT IV	**MULTIMEDIA, TELEPHONY AND SMS MANAGER**	**9**
Audio, Video and Using the camera – Playing Audio and video — Usingaudio effects– Using the camera for taking pictures– Bluetooth and WI-FI –UsingBluetooth–ManagingWi-Fi-TelephonyandSMS–SendingSMSand MMS		
UNIT V	**DATABASE CONNECTIVITY**	**9**
Introduction to SQLlite and Firebase – SQLlite:CRUDOperations.Firebase:AddingAndroidapplicationtoFirebase–FirebaseDatabase-		

StoredataintoFirebase–ReaddatafromFirebase–Firebase Authentication–Firebasestorage–Firebasehosting.

TOTAL PERIODS: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Gain knowledge about the fundamentals of mobile application development tools and concepts (Understand)
- Develop solutions to existing problems by building an effective and advanced application using integrated development environment.(Apply)
- Analyze the existing security issues in real world scenario and build a secure, reliable and effective mobile application. (Analyze)
- Evaluate the prominence of the deployed android application using Cloud hosting function. (Evaluate)
- Design a full stack android mobile application that can be deployed to the real world. (Create)
- Follow the design pattern and effectively communicate with team members to developan effective software product. (Affective domain)

TEXT BOOK

1. "Head first android development, A brain friendly guide" – Dawn Griffiths and David Griffiths, Oreilly, third edition, 2015.

REFERENCE BOOKS

1. "Android Application development", O'reilly, Rick rogers, John Lombardo, Zegurdmednieks& Blake meike, 2009.
2. "Android 4 Application development" ,Retomeier, Jonhwiley& sons, 2007.

21UIT503	MINING AND ANALYSIS OF BIG DATA (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To understand the fundamental processes, concepts and techniques of data mining and develop an appreciation for the inherent complexity of the data- mining task.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.
- To gain experience doing independent study and research.

UNIT I	DATA WAREHOUSING	9
Introduction to Data Warehousing-An overview and definition-Differences between Operational Database Systems and Data Warehouses- Difference between OLTP&OLAP - Multi-dimensional Data Model- Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases-OLAP Operationsin Multi-dimensional Data Model:Roll-up,DrillDown,Slice&Dice,Pivot(Rotate) Indexing OLAP Data-Type of OLAP Servers-OLAP versus MOLAP versus HOLAP-Data Warehouse Architecture–The Design of a Data Warehouse-The Process of Data Warehouse Design-A3-Tier Data Warehouse Architecture.		
UNIT II	**DATA MINING AND ASSOCIATION RULE MINING**	**9**
Introduction–Data–Types of Data–Data Mining Functionalities–Data Preprocessing- Basic concepts, Association Rule Mining, The Apriori Algorithm, Mining Multilevel Association Rule Mining, Mining Multidimensional Association Rule Mining.		
UNIT III	**CLASSIFICATION, PREDICTION AND CLUSTERING**	**9**
Classification and Prediction –Basic Concepts –Decision Tree Induction–Bayesian Classification – Rule Based Classification– Naive Bayes, K-Nearest Neighbors(KNN) - Prediction techniques: Linear and non-linear regression - Clustering techniques: K-Means and K-Mediods.		
UNIT IV	**INTRODUCTION TO BIG DATA**	**9**
Introduction to Big Data, Traditional Distributed file system vs. Big Data Software, Big data Characteristics. **Hadoop Input and Output:**Hadoop Architecture, Explanation of Hadoop		

Eco-System, Hadoop Basic commands. Data Integrity in Hadoop, Data Compression and Data Serialization in Hadoop.

UNIT V	HADOOP ECOSYSTEM/ENVIRONMENT: PIG, HIVE, HBASE	9

Pig Latin Structures, Statements, Functions, User-Defined Function in Pig, Loading, Storing and Sorting Data in Pig, HiveQL, Tables in Hive, Querying Data, User-Defined Function in Hive, Introduction to HBase, HBASE vs RDBMS.

TOTAL PERIODS:45 Periods

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the basic concepts of Data warehousing, Data mining & Big data techniques and its tools. [Understand]
- Apply the knowledge of OLAP models & schema, and implement various DM algorithms in an optimized way to solve the complex engineering problems using various big data tools.[Apply]
- Analyze the performance of how data analytics map with various DM algorithms.[Analyze]
- Create a model for various real time big data mining applications using the concepts of Schema, DM algorithms and big data tools & techniques to solve the complex engineering problems.[Create]
- Use modern tools to demonstrate the distributed computing process[Evaluate]
- Communicate effectively when working on Mini projects as teams.[Value]

TEXTBOOKS

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.
2. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.

REFERENCEBOOKS

1. Margaret H.Dunham,S.Sridhar,"Data Mining Introductory &Advance Topics",GNU Press,1stEdition,2006.
2. C.S.R.Prabhu,"Data Warehousing: Concept, Techniques ,Products and Applications", Prentice Hall of India,3rd Edition, 2008.
3. Pang Ning Tan, Michael Steinbach, VipinKumar,"Introduction to DataMining", Person Education, 1st Edition,2011.
4. K.P. Soman, ShyamDiwakarandV.Ajay,"Insight into Data mining Theory and Practice",Prentice Hall of India,Easter Economy Edition, 2006.

21UIT504	OBJECT ORIENTED ANALYSIS AND DESIGN (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concept of Object-Oriented Design.
- To be familiar with problems of complex systems, evolution of object-oriented model, classes, object-oriented methodology and it notations
- To provide the students with applications, case studies and CASE tools
- To learn different diagram techniques of recommender system

UNIT - I	INTRODUCTION	9

Object Orientation – System development – Review of objects - Inheritance - Object relationship – Dynamic binding – OOSD life cycle – Process – Analysis – Design – prototyping – Implementation – Testing- Overview of Methodologies.

UNIT – II	OBJECT ORIENTED ANALYSIS	9

Objects Analysis – Use case diagram – Identifying use cases and relationships – Class Diagram –Identifying Attributes and Methods- Meta model - Analysis and design - more information. Outline Development Process: Overview of the process-Inception – Elaboration – Construction - Refactoring - Patterns transmission- Iterative development - Use Cases.

UNIT - III	OBJECT ORIENTED DESIGN	9

Design process and Design axioms – Interaction Diagram: Sequence and Collaboration Diagram - State Chart Diagram - Activity Diagram – Package Diagram - UML and programming.

UNIT – IV	OBJECT ORIENTED METHODLOGIES	9

Object Modeling Techniques (OMT)-Object Process Methodology (OPM)-Rational Unified Process (RUP) Rumbaugh Methodology – Booch Methodology – Jacobson Methodology – Patterns – Frameworks – Unified Approach.

UNIT – V	OBJECT ORIENTED TESTING	9

Testing – Issues in OO testing: Units, Implications and Levels – Class Testing – Object Oriented testing Techniques - Software Quality Assurance - Object Oriented Metrics - OO Integration Testing - Component and Deployment Diagrams.

TOTAL PERIODS: 45 Periods

Course Outcomes

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

- Explain various concepts of Object Oriented System Design [Understand]
- Apply various UML diagrams for real time applications [Apply]
- Analyze the suitable design methodology for Software applications [Analyze]
- Test an application using OO Testing tools [Evaluate]
- Design and develop an application using object oriented methodology [Create]
- Use modern tools to design and test OO Applications [Apply]

Text Books

1. Ali Bahrami, "Object Oriented System Development", Tata McGraw Hill Education Private Limited, Special Indian Edition, 2008.
2. MichealBlaha, James Rambaugh, "Object – Oriented Modeling and Design with UML", Prentice Hall of India, Second Edition, 2007.

References

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, Second Edition, 2005.
2. 2. Grady Booch, James Rumbaugh, Ivar Jacobson, "Applying UML and Patterns: AnIntroduction to Object – Oriented Analysis and Design and Iterative Development",Pearson Education, Third Edition, 2008.
3. Erich Gamma, Richard Helm, Raph Johnson, "Design patterns: Elements of ReusableObject – Oriented Software," Addison Wesley, Second Edition, 2005.
4. Mike O'Docherty, Ralph Johnson, Ivar Jacobson, "Object – Oriented Analysis & Design Understanding System Development with UML 2.0", John Wiley & Third Edition, 2008.

21UGS532	SOFT SKILLS LABORATORY (Common to CSE,IT,CSBS,AIDS,EEE,CSD &AGRI)	L	T	P	C
		0	0	2	1

PRE-REQUISITE:

COURSE OBJECTIVES :

- To develop a requisite knowledge in Communication skills and Soft skills.
- To enhance the students' acumen in honing the skills to meet the Global changes and Industrial needs.

UNIT I	SPEAKING SKILLS	9

Conversational Skills - Self Introduction - Group Discussion - Public Speaking - Presentation Skills

UNIT II	WRITING SKILLS	9

Letter Writing - Report Writing - Email Writing - Job Application - Resume Preparation

UNIT III	READING AND LISTENING	9

Reading Comprehension - Enriching Vocabulary - Error Spotting - Listening and Note Taking

UNIT IV	SOFTSKILLS	9

Professional Ethics - Interpersonal Skills - Stress Management - Leadership Qualities - Time Management - Conflict Resolution

UNIT V	INTERVIEW SKILLS	9

Types of Interview - Body Language - Professional Grooming - Basic Etiquette

TOTAL PERIODS: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Answer the queries precisely after carefully listening to the conversation or speech.(Affective domain - Responding)
- Communicate orally with fluency and clarity in a given contextual situation (Affective domain - Responding)
- Debate with clarity of thought and expression to convey their ideas politely to others (Affective domain - Valuing)
- Apply correct usage of English grammar in writing, fluent speaking and comprehending. (Cognitive Domain - Apply)

REFERENCE BOOKS:

1. Skills for Success, Listening and Speaking – Level 4 by Brooks and Margret – Oxford University Press, Oxford 2011 Edition.

2. Professional Communication by Raman, Meenakshi and Sangeetha Sharma – Oxford University Press, 2014 Edition.
3. Developing Soft Skills by Sherfield, Robert M, R J Montgomery and Patricia G Moody – PearsonEducation Publishers.

Hardware and Software Requirements

Desktop Computer with Orell Talk Software

21UIT506	INTERNET AND WEB TECHNOLOGY LABORATORY (Only to IT)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To make the students design a webpage using HTML and Cascading Style Sheets.
- To make the students design web pages with good look and feel using Bootstrap.
- To demonstrate validations and manipulation of contents of the webpage using JavaScript
- To demonstrate dynamic web pages using server side scripting.

List of Exercises / Experiments:

1. Design a web page using HTML5 (forms, frames, links, tables)
2. Design a web page with all types of Cascading style sheets and selectors
3. Design a web page using Bootstrap with various grid layouts
4. Design a registration form and perform form validation using JavaScript
5. Design a webpage to create simple interactive CGPA calculator using Event Handling
6. Design a web page using HTML form in PHP
7. Design a web page using database in PHP
8. Mini Project (Minimum 3 Sessions or 9 Hours should be allocated)

Total: 30 Periods

Course Outcomes

At the end of the course the student will be able to

- Apply the knowledge of HTML, CSS and Scripting technologies to develop interactive web applications[Apply]
- Analyze front-end web coding languages to add dynamic content, animation and effects to websites[Analysis]
- Develop a real time web applications using HTML, CSS and Scripting technologies[Design]
- Demonstrate web applications using modern web frameworks and tools[Apply]
- Work individually and as a member in multidisciplinary teams[Individual and Team Work]
- Communicate effectively with the team[Communication]

HARDWARE / SOFTWARE REQUIREMENTS

HARDWARE REQUIREMENTS

PERSONAL COMPUTER WITH 8GB RAM,500GB HARDDISK, MONITOR ,MOUSE, KEYBOARD

SOFTWARE REQUIREMENTS:

XAMPP SERVER, VISUAL STUDIO CODE, WINDOWS

21UIT507	CREATIVE THINKING AND INNOVATION	L	T	P	C
		0	0	2	1

PREAMBLE:

Creativity is vital in nearly every industry and occupation. Creativity and innovation are key to generation of new ideas and methods of improving goods and services for customer satisfaction. This course enhances the creative thinking and innovation skills of the students. Being creative helps one to be a better problem solver in all areas of life and work.

COURSE OBJECTIVES:

- To develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
- To transform innovative ideas into successful businesses
- To use a range of creative thinking tools to develop Out of the Box Ideas

Course Content

Introduction to Creativity and Innovation- Creative Techniques - Problem Identification through Brain Storming - Solution Identification through Creative Techniques - Presentation on the Innovative Idea - Market Analysis - Revenue and Business Model - Preparation of promotional aids - Customer Feedback Analysis.

List of Activities:

Duration	What does the Faculty do?	What do the students do?
Week 1	Explains creativity and innovation	Team Formation (Team Size: 3)
Week 2	Explains the Creative Techniques (Through Video / Presentation)	Discovering Consumer Need through Need Analysis (Customer Segment)
Week 3	Facilitates the brain storming	Problem Identification through brain storming
Week 4	Facilitates problem solving	Identify the solution for the chosen problem through creative techniques

Week 5	Evaluates the presentation	Presentation on the Innovative Idea and Value Proposition
Week 6	Evaluates the presentation	Presentation on the Innovative Idea and Value Proposition
Week 7	Explains about the Market Research / Competitor Analysis, Revenue Model and Business Model	Market Analysis after the explanation
Week 8	Facilitates the students work	Preparation of Innovation Development Plan, Business Development Plan and Financial Plan
Week 9	Facilitates the students work	Preparing product promotional material
Week 10	Facilitates the students work	Improvement through Feedback

Total Hours: 30 Periods

Assessment Pattern

1. Internal Assessment: Presentation on the Innovative Idea
2. End Semester Assessment:
    I. Submission of Business Plan
    II. Presentation on My Startup Idea (Evaluator : From Industry)

Course Outcomes

After successful completion of the course students will be able to

- Demonstrate the ability to assess societal, health and safety issues and the consequent responsibilities relevant to the professional engineering practice [Valuing – Affective Domain]
- Examine impact on environment and society in the proposed innovative idea and provide solutions for sustainable development [Organization – Affective Domain]
- Adapt themselves to work in a group as a member or a leader for efficiently executing the given task [Organization – Affective Domain]

21UIT508	MINING AND ANALYSIS OF BIG DATA LABORATORY (Only to IT)	L	T	P	C
		0	0	2	1

COURSE DESIGNATION :

PRE-REQUISTIES:

COURSE OBJECTIVES :

- To develop skills for using recent data mining software and big data tools to solve practical problems in a variety of disciplines.

LIST OF EXPERIMENTS:

1. Design and implement a Data Warehouse.
   - Identify source tables and populate sample data.
   - Create the dimension table and fact table in the data warehouse
   - Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc.)
2. Application of Apriori algorithms on two different data sets.
3. Application of Tree Based classification algorithms on any two data sets
4. Application of any two Regression classification algorithms on data sets.
5. Application of Naive Bayes classification algorithms on data sets.
6. Application of clustering classification algorithms on data sets.
7. Installation and use of Hadoop on Windows OS
8. Execute HDFS commands in Hadoop environment.
9. Implementation of a MapReduce Algorithm.
10. Hive installation and run commands on given data.
11. Install HBASE and apply various table queries.
12. Mini project

TOTAL PERIODS:30 Periods

Course Outcomes

At the end of the course the student will be able to

- Understand the basics of various mining concepts such as association, classification, and clustering.(Understand)
- Apply the basic knowledge of SQL and various DM algorithms on different data set for various complex engineering problems. (Apply)
- Analyze the performance of how data analytic map with various DM algorithms. (Analyze)
- Design various real time big data mining applications using the concepts of Schema, DM algorithms and big data tools & techniques. (Create)
- Apply management principles for function effectively in the project team for project execution. (Apply)
- Communicate effectively when working on Mini projects as teams. (Affective domain)

Hardware Requirement:
Personal computer with 8GB RAM, 500GB Hard disk,OS:Windows/Linux
Software Requirement:
ANACONDA,PYCHARM,HADOOP,HBASE,HIVE, WINDOWS

21UCS509	MOBILE APPLICATIONS DESIGN AND DEVELOPMENT LABORATORY (Common to CSE &IT)	L	T	P	C
		0	0	2	1

PRE-REQUISTIES: Java Programming Laboratory

COURSE OBJECTIVES :

- To demonstrate and develop the Mobile Application using various Tools and Techniques

LIST OF EXPERIMENTS:

1. Develop an application that uses GUI components, Font and Colors in various layouts.
2. Develop an android application to demonstrate simple event handling.
3. Develop an android application to implement Menus.
4. Develop an android application to implement Fragments.
5. Develop an android application customized Sending Email, Sending SMS and Phone Calls using Intent and intent filter.
6. Develop an android application to implement a Location Based Services.
7. Develop an application to capture image using built in camera
8. Develop a simple Video player like application using video view and video Recorder.
9. Develop an application that creates an alert upon receiving a message and call.
10. Develop an android application to demonstrate Firebase Database.

TOTAL PERIODS:30 Periods

Course Outcomes

At the end of the course the student will be able to

- Apply simple programs to display various layouts. (Apply)
- Implement the different menu button controls. (APPLY)
- Analyze the appropriate UI layout for the animation application development. (Analyze)
- Design database connectivity for mobile application development (APPLY)
- Develop mobile apps using Android as development platform with key focus on userexperience design. [Create]
- Work effectively as an individual or in teams to develop machine learning models for the given problem. (Affective domain)

HARDWARE & SOFTWARE REQUIREMETS:

HARDWARE REQUIREMETS

PERSONAL COMPUTER WITH 8GB RAM, 500GB HARDDISK, MONITOR,MOUSE, KEYBOARD

SOFTWARE REQUIREMETS

JAVA JDK, ANDROID STUDIO

21UGT140	HERITAGE OF TAMIL (Common to all Branches)	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES :

- To provide insights regarding the cultural heritage of the Tamil , Sangam Literature and the past History during ancient periods.

UNIT I	HERITAGE AND CIVILIZATION OF TAMIL THROUGH ARCHAEOLOGY	4
Introduction - Basics of archaeology – Historical Source - Archaeological Excavations in Keeladi - Findings based on Keeladi Excavation - Excavations near Mayiladumparai - Excavations near Sivagalai - Excavations at Adichanallur - An Analysis of the excavations in Tamilnadu		
UNIT II	**TAMIL HERITAGE IN SANGAM AGE**	**5**
Introduction - Sangam Literature - Political History of Sangam Period - Sangam Polity and Administration – Sangam Society - Position of Women during Sangam Age - Economy of the Sangam Age		
UNIT III	**SOURCES OF ANCIENT TAMIL HERITAGE AND HISTORY**	**4**
Evidences of Tamilakam in Greek and Roman Literature - Archaeological sources - Evidencefor economic activities - Literary sources in Tamil - Literary Evidences about Tamil History in other languages - Epigraphical sources - Cave inscriptions - Pottery inscriptions - Numismatic(Coins) sources		
UNIT IV	**EVIDENCE FOR ANCIENTNESS OF TAMIL LITERAURE AND HERITAGE**	**4**
Tamil Literature - India‟s Earliest Script: Tamili (Tamil Brahmi) - Literary work of AncientTamil - Tolkappiam - Thirukkural & Naladiyar - Tracing Ancient Tamil Literature by U.V. Saminaytha Iyer - Tamil, a Classical Language		
TOTAL PERIODS: 15 Periods		

Course Outcomes :

- On successful completion of this course, the students will be able to:
- Describe the Heritage and Civilization of Tamil through Archaeology [Understand]

- Interpret the Tamil Literature and Civilization in historical manner. [Understand]
- Demonstrate the ability to appreciate the ancientness Tamil heritage and literature [Apply] [Valuing – Affective Domain)
- Analyze the sources of Tamil Civilization relating to Indus Valley Civilization. [Analyze]

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மகக்களாமக் பணப் பொடுமக் – ககக.கக. பிளக்ளள (தவளியீடா:தமிழக்நொடு பொடநாலல் மறக்றுமக் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முளனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – ளவளக நதிகக்களரயிலக் சஙக்ககலல நகர நொகரிகமக் (ததொலல்லியலக் Fளற தவளியீடு)
4. தபொருளந – ஆறற்றங்களர நொகரிகமக். (ததொலல்லியலக் Fளற தவளியீடா)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: 36 International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology& Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

Semester VI

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UIT601	Internet of Things (Only to IT)	3	0	0	3	PC
21UCS603	Artificial Intelligence and Machine learning (Common to CSE &IT)	3	0	0	3	PC
PE-II	ProfessionalElective–II	3	0	0	3	PE
PE-III	ProfessionalElective–III	3	0	0	3	PE
OE-II	OpenElective–II	3	0	0	3	OE
PRACTICAL						
21UIT606	Internet of Things Laboratory (Only to IT)	0	0	3	1.5	PC
21UIT607	Product Development Project	0	0	8	4	PW
21UCS608	Artificial Intelligence and Machine Learning Laboratory (Common to CSE &IT)	0	0	2	1	PC
21UGS633	Interpersonal Skills Development Laboratory (Common to CSE,EEE,IT,AGRI,CSBS, AIDS and CSD)	0	0	3	1.5	HSS
MANDATORY						
21UGM631	Indian Constitution (Common to all Branches)	1	0	0	P/F	MC
	TOTAL	**16**	**0**	**16**	**23**	
Total No of Credits - 23						

21UIT601	INTERNET OF THINGS (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To explain the basic concept of IoT realization and demonstration of device-to-device and machine-to-machine integration
- To learn about various IoT-related key wireless technologies and different protocols for the IOT system of five layer architecture that are used for IoT devices.
- To discuss the various potential IoT platforms in terms of applications and analytics, engines, middleware, gateways, communication protocols, and so on.

UNIT I	INTRODUCTION TO INTERNET OF THINGS (IOT)	9

Why the IoT Is Strategically Sound- The Brewing and Blossoming Trends in IT Space-Envisioning the Internet of Things Era-Illustrating the Device-to-Device/ Machine-to-Machine Integration Concept-The IoT: The Key Application Domains

UNIT II	REALIZATION OF IOT ECOSYSTEM USING WIRELESS TECHNOLOGIES	9

Introduction, Architecture for IoT Using Mobile Devices, Mobile Technologies for Supporting IoT Ecosystem-Energy Harvesting for Power Conservation in the IoT System-Mobile Application Development Platforms-Mobile Use Cases for IoT-Low Power Wide Area Networking Technologies-Sigfox-Weightless- NWave-Ingenu-LoRaWAN

UNIT III	INFRASTRUCTURE AND SERVICE DISCOVERY PROTOCOLS FOR THE IOT ECOSYSTEM	9

Layered Architecture for IoT,-Protocol Architecture of IoT-Infrastructure Protocol-Device or service Discovery for IOT-Protocols for IoT service Discovery

UNIT IV	THE INTEGRATION TECHNOLOGIES AND TOOLS FOR IOT ENVIRONMENTS	9

The IoT Portion for Smarter Enterprises and Environments- Sensor and Actuator Networks- The IoT Device Integration Concepts, Standards, and Implementations- The Device Integration Protocols and Middleware- The Protocol Landscape for IoT-IoT Applications Enablement Platforms

UNIT V	PLATFORM ENABLEMENT FOR IOT APPLICATIONS AND ANALYTICS	9

IoT Application Enablement Platforms- IoT and M2M Sensor Data Platform by AerCloud-ThingWorsIoT AEP, ORBCOMM IoT Platform-Amazon Web Service IoT Platform -The AxedaIoT

Platform -The IoT Data Analytics Platforms - Security Management of an IoT Ecosystem.

Total PERIODS: 45Periods

COURSE OUTCOMES

- At the end of the course the student will be able to Understand the fundamentals and advanced concepts of Internet of Things prime concerns and challenges associated with device and machine integration.[Understand]
- Solve the key challenges in the IoT world and solve the problem using Mobile technologies supporting IoT Ecosystem.[Apply]
- Analyze the integration technologies identify the appropriate protocols for five-layered architecture and define the protocols for infrastructure and service management layers.[Analyze]
- Examine the various IoT related connectivity technologies, topologies and tools and their contributions for setting up and sustaining smarter environments.[Evaluate]
- Develop proven and potential IoT platforms in terms of applications and analytics, engines, middleware, gateways, communication protocols and so on.[Create]
- Use modern tools to implement the IOT enable platform[Apply(Modern Tool Usage)]

TEXT BOOKS

1. Raj, Pethuru, and Anupama C. Raman. The Internet of Things: Enabling technologies, platforms, and use cases. Auerbach Publications, 2017.

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.

REFERENCE BOOKS

1. Tripathy, B. K., and J. Anuradha, eds. Internet of things (IoT): technologies, applications, challenges and solutions. CRC press, 2017.

3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012 (for Unit 2).

4. 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.

5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.

Websites For Reference:

https://www.arduino.cc/

https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

http://postscapes.com/iot-device-discovery

http://pr.huawei.com/en/news/hw-432402-agilenetwork3.0.htm#.Vn-zsEal0Rl

21UCS603	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Common to CSE &IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To introduce the fundamental concepts in Artificial Intelligence.
- To give an idea about the basics of designing intelligent agents that can solve general purpose problems.
- To introduce the concept of Machine Learning

UNIT I	AI AND PROBLEM SOLVING	9
Introduction - Agents - Problem formulation - uninformed search strategies – heuristics - informed search strategies - Heuristic functions.		
UNIT II	**KNOWLEDGE REPRESENTATION AND REASONING**	**9**
Logical agents - propositional logic - inferences - first-order logic - inferences in first order logic - Knowledge engineering in FOL - unification - forward chaining - backward chaining -resolution.		
UNIT III	**REASONING UNDER UNCERTAINTY**	**9**
Uncertainty - review of probability - Inference using full joint distribution-probabilistic Reasoning - Bayesian networks - Syntax and semantics of Bayesian networks - Bayesian nets with continuous variable - Exact inference in Bayesian networks - Naive Bayes algorithim		
UNIT IV	**INTRODUCTION TO MACHINE LEARNING**	**9**
Learning from agents - inductive learning - Types of Machine learning - Supervised learning - learning decision trees - support vector machines - Neural and Belief networks - Perceptron - Multi-layer feed forward networks - Regression - Linear Regression		
UNIT V	**UNSUPERVISED LEARNING**	**9**
Unsupervised learning - K-means clustering - hierarchical clustering - Agglomerative and Divisive clustering - Fuzzy clustering.		
TOTAL: 45 Periods		

COURSE OUTCOMES

After the successful completion of this course, the students will be able to

- Explain the concepts of Artificial Intelligence and Machine Learning. (Understand)
- Apply the concepts of Artificial Intelligence and Machine Learning to solve the real world problems. (Apply)
- Analyze the problem solving and reasoning techniques to find an optimal solution for a real world problem. (Analyze)
- Evaluate various parameters to improve the performance of a learning algorithm to find solution of a complex engineering problem.(Evaluate)
- Design a model to develop solution for a real world problem. (Create)
- Work individually or in teams and demonstrate the solutions to the given problems through presentation. (Affective Domain)

TEXT BOOKS

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2003.
2. D. Poole and A. Mackworth. Artificial Intelligence:Foundations of Computational Agents,Cambridge University Press, 2010.

REFERENCE BOOKS

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.
4. Brachman, H. Levesque. Knowledge Representation and Reasoning, MorganKaufmann, 2004.
5. JiaweiHan ,MichelineKamber, Jian Pei ," Data Mining: Concepts and Techniques", 3rd edition.

21UIT606	INTERNET OF THINGS LABORATORY (Only to IT)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES :

- To demonstrate the device-to-device and machine-to-machine integration process.
- To demonstrate IoT-related key wireless technologies environment creation using IOT simulation software.
- To design IoT platforms for various applications using various IOT embedded devices.

LIST OF EXPERIMENTS

1. Create an IOT enabled environment using Arduino software in microchip studio/Thinker cad/Arduino IDE and perform necessary software installation in embedded platform.
2. Demonstrate the IOT programming by configuring the buzzer as output device with the Arduino microcontroller and turn it ON and OFF at an interval of 1 second by using the Microchip Studio IDE/ Tinker cad/Arduino IDE.
3. Implement IOT program to blink LED by selecting the Atmel based microcontroller card in the Arduino Integrated Development Environment/ Tinker cad/Microship studio IDE.
4. Implement the IOT programming by interfacing the Bar-graph LEDs and the interrupt switch to toggle the status of 2 Bar-graph LEDs depending on whether the interrupt switch is pressed or releases using Microchip Studio IDE/ Thinker cad/Arduino IDE.
5. Implement the IOT program by representing the same numeral of up to 8-bits in different number systems on the inbuilt LCD and increment that number every 500 milliseconds loop through this infinitely.
6. Study the Installation process of the operating systems for Raspberry Pi / Beagle board and describe the process of OS installation on Raspberry – Pi/ Beagle board
7. Implement the IOT program by interfacing the LCD with microcontroller to display the moving and scrolling and static text/string on LCD using ATmega2560 controller in Microchip Studio IDE.
8. Implement the IOT program by using the LCD of ATmega 2560 in Microchip studio IDE to represent the same numeral of up to 8-bits in different number systems.
9. Study Connectivity and Configuration of Raspberry-Pi/ Beagle Board circuit with basic peripherals, LEDs, Understanding GPIO and its use in program.
10. Create an IoT based environment for plants monitoring system.
11. Create an IoT based environment for Air Pollution Monitoring System.
12. Create an IOT based Alarm to detect motion using PIR Sensor.

Total: 45 Periods

COURSE OUTCOMES:

- After the successful completion of the course, the students will be able to

Apply the fundamental concepts of Internet of Things to create an IoT based environment [Apply]

- Analyze the challenges in IOT enabled platform by solving problems in different simulation Tools[Analyze]
- Develop IOT based ECO systems to solve problems for real world complex engineering problems.[Design]

- Work as an individual and as a member or leader in diverse teams for solving IOT related application and analytics.[Apply]
- Communicate and present various IOT related design techniques for developing smart environment and collaborate with others [Receive & Respond]
- Identify the requirement and take further preparation in order to adopt Technological change [Apply]

HARDWARE AND SOFTWAREREQUIREMENTS:

HARDWARE REQUIREMENTS:

Personal computer with 8GB RAM, 500GB Hard disk,OS:Windows/Linux

SOFTWAREREQUIREMENTS:

TINKER CAD, ARDUINO IDE, RASPBEERY PI,LED,LCD

21UIT607	PRODUCT DEVELOPMENT PROJECT (Common to All Branches)	L	T	P	C
		0	0	8	4

COURSE OBJECTIVES :

- To develop competency with a set of tools and methods for product design, manufacturing and marketing functions in creating a new product

Project Description:

Product development is the process of delivering a new product or improving and existing product for customers. This course helps students to convert an idea into a product. Eight periods per week will be allotted in the time table and this time shall be utilized by the students to receive directions from the guide, for library reading, laboratory work, computer analysis and field work as assigned by the guide. There shall be periodical seminar presentations about the progress made in the project. The progress of the project is evaluated based on a minimum of three reviews.

Total: 120 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to :

- Design and develop sustainable innovative solutions for societal issues with consideration for public health, safety and environment. [Create]
- Analyze the market potential and evolve the product strategy[Analyze]
- Apply modern engineering and IT tools, algorithms, techniques to provide valid conclusion following the norms of engineering practice[Apply]
- Test and evaluate the performance of the developed innovative product using appropriate techniques and tools.[Evaluate]
- Organize effectively as a team for executing the project [Organize]
- Write effective reports and make clear presentations[Respond]

21UCS608	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY (Common to CSE &IT)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- Implementing the basic concepts in ArtificialIntelligence.
- Implementing Machine LearningAlgorithms

LIST OF EXPERIMENTS

1. Implement Breadth First Search (for 8 puzzle problem or Water jug problemor any AI searchproblem)
2. Implement Depth First Search (for 8-queen problem or 8 puzzle problem orWater jug problem or any AI search problem)
3. Solve travelling salesperson problem using Best FirstSearch
4. Build a Knowledge based system for forecasting the weather
5. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease DataSet.
6. Demonstrate the working of decision tree based on ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify the new sample
7. Construct model to predict the residential home prize as a function of the homes living area.
8. Develop a model to determine the likelihood of a patient's successful response to a specific medical treatment
9. Develop an algorithm to predict whether a particular customer buy a computer or not based on the following attribute age, income, student and credit rating.
10. Develop a model to predict stock market using machine learning algorithm.

TOTAL : 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Implement the concepts of Artificial Intelligence and Machine Learning to solve the real world problems. (Apply)
- Analyze various Artificial Intelligence and Machine Learning techniques for the effective solution for a given problem. (Analyze)
- Evaluate the performance of a machine learning model using various parameters. (Evaluate)
- Develop machine learning models to find the optimal solution for the given real world scenario. (Create)
- Communicate effectively to justify the solutions to the given problems based on legal and ethical principles. (Affective domain)
- Work effectively as an individual or in teams to develop machine learning models for the given problem. (Affective domain)

HARDWARE AND SOFTWARE REQUIRMENTS

HARDWARE REQUIREWMENTS:

PERSONAL COMPUTRES WITH 16GB RAM, 1TB HDD, MONITOR,KEYBOARD AND MOUSE

SOFTWARE REQUIREMENTS:

ANACONDA,WINDOWS

21UGS633	INTERPERSONAL SKILLS DEVELOPMENT LABORATORY (Common to CSE,EEE,IT,AGRI,CSBS, AIDS & CSD)	L	T	P	C
		0	0	3	1.5

List of Exercises

Part - A : Communication and Leadership Projects

I) Speech Projects

1. The Open up Speech (Prepared Speech)
2. Speech Organizing to the Point (Prepared Speech)
3. Table Topics Speech

II) Evaluation Projects

4. Speech Evaluation
5. TAG (Timer, Ah Counter and Grammarian) Evaluation

III) Leadership Roles

6. Speech Master of the Day
7. General Evaluator
8. Table Topics Master

Part - B : Problem-Solving and Decision- Making Project

IV) Quality Circle Project

TOTAL : 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Communicate orally with fluency and clarity in a given contextual situation [Responding - Affective Domain]
- Evaluate a speech and offer constructive evaluation of the speech [Evaluating - Cognitive Domain]
- Adapt themselves to work in a group as a member or a leader for efficiently executing the given task [Organization – Affective Domain]
- Analyze a problem and find appropriate solution [Analyze - Cognitive Domain]
- Take decision by organizing relevant information and defining alternatives [Create - Cognitive Domain]

21UGM631	INDIAN CONSTITUTION (Common to all Branches)	L	T	P	C
		1	0	0	P/F

PRE-REQUISITE:

COURSE OBJECTIVES :

- The students will be exposed to fundamental rights & duties in Indian Constitution.
- The students will be given knowledge on the components of the parliamentary system to prepare for the process of their career development.
- The student will have knowledge on powers and functions of Local bodies and Indian polity to appear for various competitive exams such as UPSC, TNPSC and RRB…
- The student will know about the functions of judiciary and electoral process followed in the country.

UNIT I	INTRODUCTION ON INDIAN CONSTITUTION	4

Preamble - Salient features of the Constitution of India. Fundamental Rights - its restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) - Fundamental Duties: its Scope and significance in Nation building - Constitution components: schedule, parts and articles of constitution- important Amendments of constitution.

UNIT II	PARLIAMENTARY SYSTEM	4

Parliamentary System – parliamentary system of other countries - Indian parliamentary system-Federal System – LS and RS,Centre-State Relations-Election of member of parliaments- Union Executive - President, Prime Minister, Union Cabinet. State Legislature -State Executives –election of MLA-Governor, Chief Minister, State Cabinet.

UNIT III	JUDICIARY AND ELECTION COMMISSION	4

Supreme Court of India: Structure, Power and Functions of Supreme Court-- Judicial Reviews - Judicial Activism. High Court and Subordinate Courts: Structure, Power and Functions. – Lokadhalats. Elections- Electoral Process - Election Commission of India - Election Laws – Emergency Provisions - types of Emergencies and its consequences.

UNIT IV	LOCAL ADMINISTRATION	3

Local Administration: Powers and functions of Municipalities and Panchayats System-Panchayat Raj-Co–operative Societies and Constitutional and Non-constitutional Bodies.

TOTAL PERIODS: 15 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply knowledge of the fundamental rights and duties prescribed by Indian Constitution to prepare for various competitive examinations.[Apply]
- Manage complex societal issues in society with the knowledge of judiciary and local administration. [Apply]
- Interpret the societal, health, safety, legal and cultural issues with understanding of parliamentary system and electoral process through self-learning skills. [Analyze]
- Understand the ethical responsibilities of municipalities, panchayats and co-operative societies.[Understand]
- Understand and distinguish the functioning of the parliamentary system followed in various countries. [Understand]

TEXT BOOKS:

1. Shubham Singles, Charles E. Haries, et al., "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, 2018.
2. Subhash C. Kashyap,"Our Constitution: An Introduction to India's Constitution and constitutional Law", NBT, 2018.
3. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
4. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

Durga Das Basu, "Introduction to the Constitution on India", Prentice Hall, 2001.

Semester VII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UME701	ProjectManagement and Finance (Common to All Branches Except CSBS and AGRI)	3	0	0	3	HSS
21UIT702	Cloud Service Management (Only to IT)	3	0	0	3	PC
PE-IV	Professional Elective–IV	3	0	0	3	PE
PE-V	Professional Elective –V	3	0	0	3	PE
OE-III	Open Elective–III	3	0	0	3	OE
PRACTICAL						
21UIT705	Cloud Service Management Laboratory (Only to IT)	0	0	2	1	PC
R21UGE710	MDP-Phase I* (Common to all Branches)	0	0	6	3	PW
MANDATORY						
21UGM731	Sports and Social Development (Common to all Branches)	-	-	-	P/F	MC
21UGM732	Skill Development	-	-	-	P/F	MC
21UIT735	Internship	-	-	-	1	MC
	TOTAL	**15**	**0**	**2**	**17**	
Total No of Credits - 17						

***Students those who opt for MDP Phase I are exempted from taking Open Elective III**

		L	T	P	C
21UME701	**PROJECT MANAGEMENT AND FINANCE (Common to all branches except CSBS and AGRI)**	**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- To impart knowledge to find solutions and approaches for various projects.
- To familiarize the utilization of project within time,resource and financial constraints.

UNIT I	**PROJECT MANAGEMENT CONCEPTS**	**9**

Concept and characteristics of a project,importance of project management,types of project,project organizational structure,project lifecycle,Statement of Work,Work Break down Structure.

UNIT II	**PROJECTPLANNING**	**9**

ProjectPlanningandSchedulingtechniques-developingtheprojectnetwork using CPM/PERT,Limitations of CPM/PERT, Precedence Diagramming Method, constructing diagram andcomputationsusingprecedencediagrammingmethod,PERT/CPMsimulation,reducingprojectduration.

UNIT III	**RESOURCES SCHEDULING & CRITICAL CHAIN SCHEDULING**	**9**

Resource Scheduling-Resource allocation method,splitting and multitasking,Multiproject resources scheduling - Critical Chain Scheduling -Concept of critical chain scheduling - critical chain scheduling method,application of Critical chain scheduling and limitations.

UNIT IV	**PROJECT QUALITY MANAGEMENT**	**9**

Concept of project quality, responsibility for quality in projects, quality management at different stages of project, tools and techniques, Quality Management Systems, TQM in projects - ProjectPerformance Measurement and Control - Monitor and assess project performance, schedule, andcost. Earned Value Management, performance measurement methods to monitor, evaluate andcontrol planned cost and schedule performance - Project Closure/ Termination - Meaning of closure/termination,project audit process,termination steps, finalclosure.

UNITV	**FINANCIAL ACCOUNTING**	**9**

Balance sheet and related concepts- Profit & Loss Statement and related concepts-Financial Ratio Analysis-Cash flow analysis-Funds flow analysis–Comparative financial statements.Investments -Average rate of return-Payback Period-Net Present Value-Internal rate of return.

TOTAL PERIODS:45Periods

COURSEOUTCOMES:

Aftersuccessfulcompletionofthiscoursethestudentswillbeableto:

- Describe the concept and characteristics of project management and application of resource scheduling and critical chain scheduling .[Understand]
- Apply the concept of CPM and PERT to develop the project network [Apply]
- Estimate the suitable resources required for given project work[Apply]
- Examine the various tools and techniques at different stages of quality management [Analysis]
- Construct the balance sheet to identify the fund flow and cash flow statements [Apply]
- Evaluate the decisions related to fore casting,inventory,quality control problems etc., for the industries[Evaluate]

TEXT BOOKS:

1. Prasanna Chandra, "'Fundamentals of Financial Management' ", Tata Mcgraw-Hill Publishing Ltd,2015.
2. Jack Meredith, Samuel J.Mantel, "Project Management- A Managerial Approach", John Wiley and Sons.

REFERENCE BOOKS:

1. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process ", Tata Mcgraw-Hill Publishing Co Ltd.
2. John M Nicholas, "Project Management For Business And Technology", Prentice Hall of India Pvt Ltd.
3. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, 2020.

21UIT702	CLOUD SERVICE MANAGEMENT (Only to IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To introduce the essentials of building fully featured applications on various cloud models.
- To familiarize the concepts of designing and developing various service models and deployment models
- To impart the knowledge of classic data centre and different cloud applications.

UNIT I	OVERVIEW OF CLOUD COMPUTING AND INFRASTRUCTURE AS A SERVICES	9
Overview: Roots or Evolution, Characteristics and Benefits of Cloud Computing-The cloud computing reference and Deployment Models and its desired features Economics of Cloud – Open Challenges - Virtualization: Characteristics of virtualized environments - Virtualization and cloud computing - Pros and cons of virtualization - Technology examples: Xen: Para-virtualization, VMware: full virtualization, Microsoft Hyper-V.		
UNIT II	**CLASSIC DATA CENTRES**	**9**
Application – DBMS – Compute – Storage – Networking – Object based and Unifies storage Technologies – and Back-up, Replication technologies – CDC Management - Architectural design of compute and storage clouds - Public cloud Platforms: GAE, AWS, AND AZURE – Inter Cloud Resource Management.		
UNIT III	**PLATFORM AS A SERVICE / SOFTWARE AS A SERVICE**	**9**
Aneka Tools: Aneka Cloud Platform - Aneka Resource Provisioning Service - Hybrid Cloud implementation - Workflow engine for clouds – Workflow management Systems on Cloud, Utilizing Cloud for workflow execution - Building Aneka clouds - Cloud programming and management. Map Reduce: The Map-Reduce Programming model and Implementation – Map-Reduce Programming model - Major Map-Reduce implementation for the cloud		
UNIT IV	**DATA SECURITY AND MANAGING THE CLOUD**	**9**
Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – Security Standards – security concerns and counter measures in a VDC and cloud environment - Managing and Securing Cloud Services - Managing Desktops and Devices in the Cloud - Service Oriented Architecture and the		

Cloud - Managing the Cloud Environment.

UNIT V	CLOUD PLATFORM IN INDUSTRY AND CLOUD APPLICATIONS	9

Cloud in Industry: Amazon Web Services, Google App Engine, Microsoft Azure – Emerging Cloud Software Environments. Cloud Scientific Applications: HealthCare Cloud Business and Consumer Application in CRM and ERP.

TOTAL PERIODS:45 Periods

Course Outcomes

At the end of the course the student will be able to

After the successful completion of this course, the student will be able to,

- Explain the basic concepts of cloud computing and virtualization techniques to build a cloud computing environment [Understand]
- Apply cloud concepts to configure, deploy, and manage cloud-based solutions.[Apply]
- Analyze cloud architectures and identify areas for improvement or optimization [Analyse]
- Evaluate the suitable model and types of cloud computing for the scientific and Business applications.[Evaluate]
- Implement the customized virtualized cloud for various applications. [create]
- Practice in groups to demonstrate the cloud application developed using any innovative tool. [Affective Domain-Value]

TEXT BOOKS

1. Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski," Cloud Computing: Principles and paradigms", Wiley 2013.
2. RajkumarBuyya, Christian Vecchiola, S. TahamaraiSelvi, "Mastering Cloud Computing: Foundation Application Programming", mk publications.
3. Kai Hwang Geoffrey C. Fox Jack J. Dongarra, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things" 2012 Elsevier.

REFERENCE BOOKS

1. John W. RittingHouse and James F. Ransome, " Cloud Computing: Implementation, Management and Security", CRC Press.
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Dr. Fern Halper, " Cloud Computing for Dummies", Wile Publishing, Inc.
3. Cloud infrastructures and services EMC2 Bangalore.

21UIT705	CLOUD SERVICE MANAGEMENT LABORATORY (Only to IT)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To learn the cloud architecture and its efficiency, and tools to provide virtualization on cloud.
- To enable the study and implementation of infrastructure as a service, storage as aservice, and user management on cloud. Cloud computing is a style of computing inwhich dynamically scalable and often virtualized resources are provided as a serviceoverthe Internet.

List of Experiments:

- Install Virtualbox/VMware Workstation with different flavoursof linux orwindowson top of windows7 or 8
- Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
- Test ping command to test the communication between the guest OS andHost OS
- Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim
- Develop a simple hadoop application called Word Count.It countsthe number of occurences of each word in a given input set
- Develop a virtual data centre using cloudsim.
- Develop a web service for calculator using Globus toolkit
- Install Google App Engine.Create hello world app and other simple web applications using python/java (Use GAE launcher to launch)

TOTAL:30 Periods

Course Outcomes

At the end of the course the student will be able to

After the successful completion of this course, the student will be able to,

- Define & implement Virtualization using different types of Hypervisors [Apply]
- Analyze and understand the functioning of different components involved in cloud platform [Analyse]
- Design, implement, and deploy a cloud-based application or service using Cloud [Create]
- Demonstrate cloud applications using modern tools. [Apply]
- Work individually and as a member in multidisciplinary teams. [Individual /Team work]
- Communicate effectively with the team. [Communication]

HARDWARE / SOFTWARE REQUIREMENTS:

HARDWARE REQUIREMENTS :

PERSONAL COMPUTER WITH 8GB RAM, 500 GB HARDDISK, MONITOR,MOUSE,

KEYBOARD

SOFTWARE REQUIREMENTS:

ECLIPSE VM WARE,ApacheHadoop

Semester VIII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
PE-VI	ProfessionalElective–VI(swayam)	3	0	0	3	PE
OE-IV	OpenElective–IV	3	0	0	3	OE
PRACTICAL						
21UIT801	Projectwork	0	0	16	8	PW
21UGE810	MDP-Phase II* (Common to all branches)	0	0	16	8	PW
MANDATORY						
21UGM831	Professional Ethics and Human values (Common to all branches)	2	0	0	P/F	MC
	TOTAL	**8**	**0**	**16**	**14**	
Total No of Credits 14						

***Students those who opt for MDP Phase-I are allowed to take MDP Phase II**

21UIT801	PROJECT WORK	L	T	P	C
		0	0	16	8

PRE-REQUISTIE :

OBJECTIVES :

- To demonstrate the comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a comp based project or management project.

PROJECT DESCRIPTION:

1. The project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.
2. Every project work shall have a guide who is the member of the faculty of the institution.
3. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
4. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
5. The progress of the project is evaluated based on a minimum of three reviews.

TOTAL PERIODS :240

COURSE OUTCOMES

- Design/Develop sustainable solutions for societal issues with environmental considerations applying
  the basic engineering knowledge. **[K6-Create]**
- Analyze and review research literature to synthesize research methods including design of experiments to provide valid conclusion. **[K4-Analyze]**
- Utilize the new tools, algorithms, techniques to provide valid conclusion following the norms of engineering practice. **[K3-Apply]**
- Test and evaluate the performance of the developed solution using appropriate techniques and tools. **[K5-Evaluate]**
- Apply management principles to function effectively in the project team for project execution. **[A4-Organize]**
- Engage in learning for effective project implementation in the broadest context of technological change with consideration for public health, safety, cultural and societal needs. **[A3-Value]**
- Write effective reports and make clear presentation to the engineering community and society. **[A2-Respond]**

21UGM831	PROFESSIONAL ETHICS & HUMAN VALUES (Common to all branches)	L	T	P	C
		2	0	0	P/F

COURSE OBJECTIVES :

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others

UNIT I	HUMAN VALUES	7

Morals - Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment – Empathy - self-Confidence - Character– Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II	ENGINEERING ETHICS	7

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Professions and Professionalism - Professional Ideals and Virtues - Uses of Ethical Theories.

UNIT III	ENGINEERING AS SOCIAL EXPERIMENTATION	4

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV	SAFTY,RESPONSIBILITIES AND RIGHTS	6

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining –Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V	GLOBAL ISSUES	4

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development– Engineers as Managers – Consulting Engineers – Honesty – Moral Leadership – Sample Code of Conduct.

TOTAL PERIODS : 30 Periods

CONTENT BEYOND SYLLABI: Ethics in Green Computing

COURSE OUTCOMES

After successful completion of the course, the students will be able to

- Illustrate the basic perception of profession, professional ethics and various oral issues. (Understand)
- Describe the code of ethics and role of professional ethics in engineering field. (Understand)
- Apply ethical principles to resolve global and cross cultural issues that arise in Professional career.(Apply)

TEXT BOOKS

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
4. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" McGraw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, 'Value Education', Vethathiri publications, Erode, 2011.

VERTICAL I – DATA SCIENCE

Course Code	Course Title	L	T	P	C
21CSV101	Exploratory Data Analysis	3	0	0	3
21CSV102	Recommender Systems	3	0	0	3
21ITV103	Neural Networks and Deep Learning	3	0	0	3
21CSV104	Text and Speech Analysis	3	0	0	3
21ITV105	Business Analytics	3	0	0	3
21ITV106	Image and Video Analytics	3	0	0	3
21CSV107	Computer Vision	3	0	0	3
21ITV108	Big Data Analytics	3	0	0	3

21CSV101	EXPLORATORY DATA ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

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

.

UNIT I	EXPLORATORY DATA ANALYSIS	9
EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.		
UNIT II	**EDA USING PYTHON**	**9**
Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations		
UNIT III	**UNIVARIATE ANALYSIS**	**9**
Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.		
UNIT IV	**BIVARIATE ANALYSIS**	**9**
Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.		
UNIT V	**MULTIVARIATE AND TIME SERIES ANALYSIS**	**9**
Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the fundamentals of exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017. (Unit 2)
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCE BOOKS

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

21CSV102	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

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

UNIT I	INTRODUCTION	9

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

Suggested Activities:

- Practical learning – Implement Data similarity measures.
- External Learning – Singular Value Decomposition (SVD) applications

Suggested Evaluation Methods:

- Quiz on Recommender systems.
- Quiz of python tools available for implementing Recommender systems

UNIT II	CONTENT-BASED RECOMMENDATION SYSTEMS	9

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

Suggested Activities:

- Assignment on content-based recommendation systems
- Assignment of learning user profiles

Suggested Evaluation Methods:

- Quiz on similarity-based retrieval.
- Quiz of content-based filtering

UNIT III	COLLABORATIVE FILTERING	9

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

Suggested Activities:

- Practical learning – Implement collaborative filtering concepts
- Assignment of security aspects of recommender systems

Suggested Evaluation Methods:

- Quiz on collaborative filtering
- Seminar on security measures of recommender systems

UNIT IV	ATTACK-RESISTANT RECOMMENDER SYSTEMS	9

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

Suggested Activities:

- Group Discussion on attacks and their mitigation
- Study of the impact of group attacks
- External Learning – Use of CAPTCHAs

Suggested Evaluation Methods:

- Quiz on attacks on recommender systems
- Seminar on preventing attacks using the CAPTCHAs

UNIT V	EVALUATING RECOMMENDER SYSTEMS	9

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

Suggested Activities:

- Group Discussion on goals of evaluation design
- Study of accuracy metrics

Suggested Evaluation Methods:

- Quiz on evaluation design
- Problems on accuracy measures

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

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

TEXT BOOKS:

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

21ITV103	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

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

UNIT I	INTRODUCTION	9
Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.		
UNIT II	**ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS**	**9**
Training Algorithms for Pattern Association-Auto associative Memory Network-Hetero associative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Auto associative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.		
UNIT III	**THIRD-GENERATION NEURAL NETWORKS**	**9**
Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.		
UNIT IV	**DEEP FEED FORWARD NETWORKS**	**9**
History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.		

UNIT V	RECURRENT NEURAL NETWORKS	9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural

Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Apply Convolution Neural Network for image processing.
- Understand the basics of associative memory and unsupervised learning networks.
- Apply CNN and its variants for suitable applications.
- Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
- Apply autoencoders and generative models for suitable applications.

TEXT BOOKS

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

REFERENCE BOOKS

1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow”,Oreilly, 2018.
2. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
3. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017.
7. S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017

James A Freeman, David M S Kapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

21CSV104	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

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

UNIT I	NATURAL LANGUAGE BASICS	9

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

Suggested Activities

- Flipped classroom on NLP
- Implementation of Text Preprocessing using NLTK
- Implementation of TF-IDF models

Suggested Evaluation Methods

- Quiz on NLP Basics
- Demonstration of Programs

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

Suggested Activities

- classroom on Feature extraction of documents
- Flipped Implementation of SVM models for text classification
- External learning: Text summarization and Topic models

Suggested Evaluation Methods

- Quiz on RNN, Transformers
- Implementing NLP with RNN and Transformers

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

Suggested Activities:

- Flipped classroom on language models for QA
- Developing a knowledge-based question-answering system
- Classic QA model development

Suggested Evaluation Methods

- Assignment on the above topics
- Quiz on knowledge-based question answering system
- Development of simple chatbots

UNIT IV	TEXT-TO-SPEECH SYNTHESIS	9

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

Suggested Activities:

- Flipped classroom on Speech signal processing
- Exploring Text normalization
- Data collection
- Implementation of TTS systems

Suggested Evaluation Methods

- Assignment on the above topics
- Quiz on wavenet, deep learning-based TTS systems
- Finding accuracy with different TTS systems

UNIT V	AUTOMATIC SPEECH RECOGNITION	9

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

Suggested Activities:

- Flipped classroom on Speech recognition.
- Exploring Feature extraction

Suggested Evaluation Methods

- Assignment on the above topics

- Quiz on acoustic modelling

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

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

TEXT BOOKS

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

REFERENCE BOOKS

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.

21ITV105	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

COURSE 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

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

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the real world business problems and model with analytical solutions.
- Identify the business processes for extracting Business Intelligence
- Apply predictive analytics for business fore-casting
- Apply analytics for supply chain and logistics management
- Use analytics for marketing and sales.

TEXT BOOKS

1. R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017
2. R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016
3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016
4. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.
5. Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson Education,2018.

21ITV106	IMAGE AND VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of image processing techniques for computer
- vision.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques.

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

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the basics of image processing techniques for computer vision and video analysis.
- Explain the techniques used for image pre-processing.
- Develop various object detection techniques.
- Understand the various face recognition mechanisms
- Elaborate on deep learning-based video analytics

TEXT BOOKS:

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

REFERENCE BOOKS

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

21CSV107	COMPUTER VISION	L	T	P	C
		3	0	0	3

COURSE 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

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 Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Categoryrecognition - Context and scene understanding- Recognition databases and test sets.		

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- To understand basic knowledge, theories and methods in image
- processing and computer vision.
- To implement basic and some advanced image processing techniques in Open CV.
- To apply 2D a feature-based based image alignment, segmentation and motion estimations.
- To apply 3D image reconstruction techniques
- To design and develop innovative image processing and computer vision applications.

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.

REFERENCE BOOKS

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

21ITV108	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand big data.
- To learn and use NoSQL big data management.
- To learn map reduce analytics using Hadoop and related tools.
- To work with map reduce applications
- To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I	UNDERSTANDING BIG DATA	9
Introduction to Big Data – Data – Data Life Cycle – Sources and Characteristics – Features and Challenges of Big Data – Classifications of Digital Data – Applications of Big Data – Cloud to Big Data. Data Analytics: Traditional Data Analytics – Big Data Analytic Methods – Data Science and Scientist – Role and Responsibility of the Data Scientist.		
UNIT II	**NOSQL DATA MANAGEMENT**	**9**
Introduction to Nosql – Aggregate Data Models – Key-Value and Document Data Models – Relationships – Graph Databases – Schemaless Databases – Materialized Views – Modelling for Data Access - Distribution Models – Master-Slave Replication and Peer-to Peer Replication – Consistency.		
UNIT III	**MAP REDUCE APPLICATIONS**	**9**
Introduction – Processing Data with Hadoop using Map Reduce - Map Reduce Workflows – Architecture – Map Reduce Types – Formats – Features – Real Time Applications – Map Reduce Examples with programme.		
UNIT IV	**BASICS OF HADOOP**	**9**
Introduction – HDFS Features - Components – ecosystems – architecture – File Operations – Hadoop I/O – Data Integrity – Compression – Serialization – AVRO – Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator).		
UNIT V	**HADOOP RELATED TOOLS**	**9**
Hbase – Data Model and Implementations – Hbase Clients – Hbase Examples – Praxis. Pig – Grunt – Pig Data Model – Pig Latin – Developing and Testing Pig Latin Scripts. Hive – Data Types and File Formats – Hive QL Data Definition – Hive QL Data Manipulation – Hive QL Queries.3		

TOTAL PERIODS: 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Describe big data and use cases from selected business domains.
- Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.
- Demonstrate the knowledge of big data analytics and implement different file management task in Hadoop.
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.
- Develop Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.
- Validate Big Data Analytics tools relevant to Hadoop, and conduct simple Hadoop Administration.

TEXT BOOKS

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. Sadalage, Pramod J. “NoSQL distilled”, 2013

REFERENCE BOOKS

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012
2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

VERTICAL II - FULL STACK DEVELOPMENT

Course Code	Course Title	L	T	P	C
21ITV201	Full stack web Development	3	0	0	3
21ITV202	App Development	3	0	0	3
21CSV303	Cloud Essentials	3	0	0	3
21CSV204	UI and UX Design	3	0	0	3
21ITV205	Software Testing and Automation	3	0	0	3
21CSV206	Web Application Security	3	0	0	3
21ITV207	DevOps	3	0	0	3
21CSV208	Principles of Programming Languages	3	0	0	3
21CSV301	Cloud Computing	3	0	0	3

21ITV201	FULL STACK WEB DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the various components of full stack development
- To learn Node.js features and applications
- To develop applications with MongoDB
- To understand the role of Angular and Express in web applications
- To develop simple web applications with React

UNIT I	HTML AND HTML5	9
Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements - Headings - Lists - Links – Images - Tables-Frames-Forms. HTML5: HTML5 New Elements – HTML5 Graphics – HTML5 Audio and Video.		
UNIT II	**CSS AND CLIENT SIDE SCRIPTING**	**9**
Style Sheets: Introduction to CSS – CSS Types–CSS Selectors - background images – colors and properties - manipulating texts using fonts - borders and boxes – margins - padding lists - positioning using CSS.CSS3: CSS3 Multi Backgrounds – CSS3 Text – CSS3 2D Transform and 3D Transform. The JavaScript Language – Syntax-Variables and Data Types – Operators – Literals-Control Statements– Functions- Arrays- JavaScript DOM and Events- forms and validations - CSS and JavaScript - Events and buttons.		
UNIT III	**ANGULAR**	**9**
Getting Started with Angular - Angular Development Environment Setup - Creating Components and Modules – Templates – Directives - Data Binding – Pipes - Nested Components – Forms -Services – Routing - Angular Capstone Projects		
UNIT IV	**NODE.JS AND EXPRESS. JS**	**9**
Node.js: Why and What Node.js - How to use Node.js - Create a web server in Node.js - Node Package Manager - Modular programming in Node.js - Restarting Node Application - File		

Operations. Express.js: Express Development Environment - defining a route - Handling Routes - Route and Query Parameters - How Middleware works - Chaining of Middleware's - Types of Middleware's - connecting to MongoDB with Mongoose - Validation Types and Defaults – Models - CRUD Operations - API Development - Why Session management – Cookies – Sessions - Why and What Security - Helmet Middleware - Using a Template Engine Middleware - Stylus CSS Pre-processor.

UNIT V	**Mongo DB**	**9**

MongoDB: Introduction Module Overview- Document Database Overview- Understanding JSON- MongoDB Structure and Architecture- MongoDB Remote Management- Installing MongoDB on the local computer (Mac or Windows)- Introduction to MongoDB Cloud- Create MongoDB Atlas Cluster- GUI tools Overview- Install and Configure MongoDB Compass- Introduction to the MongoDB Shell- MongoDB Shell JavaScript Engine- MongoDB Shell JavaScript Syntax- Introduction to the MongoDB Data Types- Introduction to the CRUD Operations on documents- Create and Delete Databases and Collections- Introduction to MongoDB Queries.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Explain the basic and advanced web technologies. (Understand)
- Apply suitable web technologies to design a web page. (Apply)
- Analyze the sustainable web development and design methodology for a given real world scenario. (Analyze)
- Develop dynamic websites with good aesthetic sense of designing and latest technical know-how's. (Create)
- Develop web based application using suitable client side and server side web technologies. (Create)
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation (Affective Domain)

TEXT BOOKS

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1stEdition, Pearson Education India.

REFERENCE BOOKS

1. Steven Holzner,"HTML BlackBook", DreamTech press.
2. Web Technologies, Black Book, DreamTech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley- India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.
5. Zak Ruvalcaba Anne Boehm, "Murach's HTML5 and CSS3", 3rdEdition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016.

21ITV202	APP DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT I	FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT	9
Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design		
UNIT II	**NATIVE APP DEVELOPMENT USING JAVA**	**9**
Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props		
UNIT III	**HYBRID APP DEVELOPMENT**	**9**
Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova,		
UNIT IV	**CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE**	**9**
What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons ofCross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props		
UNIT V	**NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS**	**9**
Comparison of different Ap p frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability		

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Develop Native applications with GUI Components.
- Develop hybrid applications with basic event handling.
- Implement cross-platform applications with location and data storage capabilities.
- Implement cross platform applications with basic GUI and event handling.
- Develop web applications with cloud database access.

TEXT BOOKS

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

REFERENCE BOOKS

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition
2. Native Mobile Development by Shaun Lewis, Mike Dunn
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
4. Apache Cordova 4 Programming, John M Wargo, 2015
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition

21CSV303	CLOUD ESSENTIALS	L	T	P	C
		3	0	0	3

COURSE 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
- Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world

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 PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Exhibit cloud-design skills to build and automate business solutions using cloud technologies.
- Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services
- Solve the real world problems using Cloud services and technologies

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications 129
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

REFERENCE BOOKS:

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

21CSV204	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

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

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Build UI for user Applications
- Evaluate UX design of any product or application
- Demonstrate UX Skills in product development
- Implement Sketching principles
- Create Wireframe and Prototype

TEXT BOOKS:

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

REFERENCE BOOKS:

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.

21ITV205	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		3	0	0	3

COURSE 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

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

Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the basic concepts of software testing and the need for software testing
- Design Test planning and different activities involved in test planning
- Design effective test cases that can uncover critical defects in the application
- Carry out advanced types of testing
- Automate the software testing using Selenium and TestNG

TEXT BOOKS:

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

REFERENCE BOOKS:

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, PacktPublishing.
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.

21CSV206	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools

UNIT I	FUNDAMENTALS OF WEB APPLICATION SECURITY	9
The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation		
UNIT II	**SECURE DEVELOPMENT AND DEPLOYMENT**	**9**
Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)		
UNIT III	**SECURE API DEVELOPMENT**	**9**
API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.		
UNIT IV	**VULNERABILITY ASSESSMENT AND PENETRATION TESTING**	**9**
Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database- based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.		
UNIT V	**HACKING TECHNIQUES AND TOOLS**	**9**
Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and		

Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understanding the basic concepts of web application security and the need for it
- Be acquainted with the process for secure development and deployment of web applications
- Acquire the skill to design and develop Secure Web Applications that use Secure APIs
- Be able to get the importance of carrying out vulnerability assessment and penetration testing
- Acquire the skill to think like a hacker and to use hackers tool sets

TEXT BOOKS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCE BOOKS:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

21ITV207	DEVOPS	L	T	P	C
		3	0	0	3

COURSE 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/ Continuous Deployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

UNIT I	INTRODUCTION TO DEVOPS	9
Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github		
UNIT II	**COMPILE AND BUILD USING MAVEN & GRADLE**	**9**
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle		
UNIT III	**CONTINUOUS INTEGRATION USING JENKINS**	**9**
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.		
UNIT IV	**CONFIGURATION MANAGEMENT USING ANSIBLE**	**9**
Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible		
UNIT V	**BUILDING DEVOPS PIPELINES USING AZURE**	**9**
Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline,Build a sample code, Modify azure-pipelines.yaml file		

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand different actions performed through Version control tools like Git
- Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- Ability to Perform Automated Continuous Deployment
- Ability to do configuration management using Ansible
- Understand to leverage Cloud-based DevOps tools using Azure DevOps

TEXT BOOKS

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginnerto 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

REFERENCE BOOKS

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

21CSV208	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

COURSE 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 handling in programming languages
- To develop programs in non-procedural programming paradigms

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

Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages

TOTAL PERIODS :45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Describe syntax and semantics of programming languages
- Explain data, data types, and basic statements of programming languages
- Design and implement subprogram constructs
- Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog
- Understand and adopt new programming languages

TEXT BOOKS

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

VERTICAL III - CLOUD COMPUTING AND DATACENTER TECHNOLOGIES

Course Code	Course Title	L	T	P	C
21CSV301	Cloud Computing	3	0	0	3
21CSV302	Virtualization	3	0	0	3
21CSV303	Cloud Essentials	3	0	0	3
21ITV304	Data Warehousing	3	0	0	3
21ITV305	Storage Technologies	3	0	0	3
21CSV306	Software Defined Networks	3	0	0	3
21ITV307	Stream Processing	3	0	0	3
21ITV308	Security and Privacy in Cloud	3	0	0	3

21CSV301	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

COURSE 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.

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

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the design challenges in the cloud.
- Apply the concept of virtualization and its types.
- Experiment with virtualization of hardware resources and Docker.
- Develop and deploy services on the cloud and set up a cloud environment.
- Explain security challenges in the cloud environment

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.

REFERENCE BOOKS

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems andProcesses", 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.

21CSV302	VIRTUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To Learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT I	INTRODUCTION TO VIRTUALIZATION	9
Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization – Para virtualization-Types of Hypervisors		
UNIT II	**SERVER AND DESKTOP VIRTUALIZATION**	**9**
Virtual machine basics- Types of virtual machines- Understanding Server Virtualization-types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization		
UNIT III	**NETWORK VIRTUALIZATION**	**9**
Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization		
UNIT IV	**STORAGE VIRTUALIZATION**	**9**
Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID		
UNIT V	**VIRTUALIZATION TOOLS**	**9**
VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM-GoogleVirtualization- Case study.		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Analyse the virtualization concepts and Hypervisor
- Apply the Virtualization for real-world applications

- Install & Configure the different VM platforms
- Experiment with the VM with various software

TEXT BOOKS

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
4. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress, 2005.
5. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

21ITV304	DATA WAREHOUSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To identify the significance of Data warehousing.
- To analyze data, choose the relevant models and algorithms for respective applications.
- To introduce the fundamental concepts in partitioning strategy.
- To study Dimensional modelling and Schema.
- To develop research interest towards advance in Data warehouse.

UNIT I	INTRODUCTION TO DATA WAREHOUSE	9
Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse		
UNIT II	**ETL AND OLAP TECHNOLOGY**	**9**
What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.		
UNIT III	**META DATA, DATA MART AND PARTITION STRATEGY**	**9**
Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting Horizontal Partition		
UNIT IV	**DIMENSIONAL MODELING AND SCHEMA**	**9**
Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Datawarehouse Tools		
UNIT V	**SYSTEM & PROCESS MANAGERS**	**9**
Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager-		

Query Manager – Tuning – Testing

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the basic concepts of data warehouse architecture and its various schemas.
- Apply the knowledge of OLAP models & schemas, and to implement the various schemas operations in an optimized way to solve the complex engineering problems.
- Analyze various schemas to develop a data warehouse application for a given scenario.
- Evaluate various dimensional models to improve the performance of a learning process to find solution of a multidimensional cube.
- Design data warehouse for a given real life scenario using the concepts of multi-dimensional schema.
- Work individually or in teams and demonstrate the solutions to the given problems through presentation.

TEXT BOOKS:

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Ralph Kimball, "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", Third edition, 2013.

REFERENCE BOOKS:

1. Paul Raj Ponniah, "Data warehousing fundamentals for IT Professionals", 2012.
2. K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006

21ITV305	STORAGE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE 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

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.		
UNIT 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 PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
- Illustrate the usage of advanced intelligent storage systems and RAID
- Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
- Examine the different role in providing disaster recovery and remote replication technologies
- Infer the security needs and security measures to be employed in information storage management

TEXT BOOKS:

1. EMC Corporation, Information Storage and Management, Wiley, India
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017
3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,Storage Networks Explained, Second Edition, Wiley, 2009

21CSV306	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

UNIT I	SDN: INTRODUCTION	9
Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Control plane and Application Plane		
UNIT II	**SDN DATA PLANE AND CONTROL PLANE**	**9**
Data Plane functions and protocols – Open FLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, Open Daylight, ONOS -Distributed Controllers		
UNIT III	**SDN APPLICATIONS**	**9**
SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking		
UNIT IV	**NETWORK FUNCTION VIRTUALIZATION**	**9**
Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture		
UNIT V	**NFV FUNCTIONALITY**	**9**
NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFVUse cases – SDN and NFV		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Describe the motivation behind SDN
- Identify the functions of the data plane and control plane
- Design and develop network applications using SDN

- Orchestrate network services using NFV
- Explain various use cases of SDN and NFV

TEXT BOOKS

1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015.

REFERENCE BOOKS

1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan
2. Kauffman, 2016.
3. Thomas D Nadeau, Ken Gray, "SDN: Software Defined Networks", O'Reilly
4. Media, 2013.
5. Fei Hu, "Network Innovation through OpenFlow and SDN:
6. Principles and Design", 1st Edition, CRC Press, 2014.
7. Paul Goransson, Chuck Black Timothy Culver,"Software Defined Networks: A Comprehensive Approach", 2nd Edition, Morgan Kaufmann Press, 2016.
8. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with
9. OpenFlow", 2nd Edition, O'Reilly Media, 2017.

21ITV307	STREAM PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
- Explain the concepts of Real-time Data processing
- Select appropriate structures for designing and running real-time data
- services in a business environment
- Illustrate the benefits and drive the adoption of real-time data services to
- solve real world problems

UNIT I	FOUNDATIONS OF DATA SYSTEMS	9
Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges		
UNIT II	**REAL-TIME DATA PROCESSING**	**9**
Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing,Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage		
UNIT III	**DATA MODELS AND QUERY LANGUAGES**	**9**
Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL		
UNIT IV	**EVENT PROCESSING WITH APACHE KAFKA**	**9**
Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API		
UNIT V	**REAL-TIME PROCESSING USING SPARK STREAMING**	**9**
Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant		

Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the applicability and utility of different streaming algorithms.
- Describe and apply current research trends in data-stream processing.
- Analyze the suitability of stream mining algorithms for data stream systems.
- Program and build stream processing systems, services and applications.
- Solve problems in real-world applications that process data streams.

TEXT BOOKS:

1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media
3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

REFERENCE BOOKS

1. https://spark.apache.org/docs/latest/streaming-programming-guide.html
2. Kafka.apache.org

21ITV308	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

COURSE 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

UNIT I	FUNDAMENTALS OF CLOUD SECURITY CONCEPTS	9
Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.		
UNIT II	**SECURITY DESIGN AND ARCHITECTURE FOR CLOUD**	**9**
Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key		
UNIT III	**ACCESS CONTROL AND IDENTITY MANAGEMENT**	**9**
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention		
UNIT IV	**CLOUD SECURITY DESIGN PATTERNS**	**9**
Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud		
UNIT V	**MONITORING, AUDITING AND MANAGEMENT**	**9**
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services,		

Secure Management, User management, Identity management, Security Information and Event Management

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the cloud concepts and fundamentals.
- Explain the security challenges in the cloud.
- Define cloud policy and Identity and Access Management.
- Understand various risks and audit and monitoring mechanisms in the cloud.
- Define the various architectural and design considerations for security in the cloud.

TEXT BOOKS

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, ―Cloud Computing:‖, Wiley 2013
2. Dave shackleford, ―Virtualization Security‖, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, ―Cloud Security and Privacy‖, OREILLY 2011

REFERENCE BOOKS

1. Mark C. Chu-Carroll ―Code in the Cloud‖,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

VERTICAL IV – CYBER SECURITY AND DATA PRIVACY

Course Code	Course Title	L	T	P	C
21ITV401	Ethical Hacking	3	0	0	3
21ITV402	Digital and Mobile Forensics	3	0	0	3
21CSV403	Social Network Security	3	0	0	3
21CSV404	Modern Cryptography	3	0	0	3
21ITV405	Engineering Secure Software Systems	3	0	0	3
21ITV406	Crypto currency and Block chain Technologies	3	0	0	3
21CSV407	Network Security	3	0	0	3
21ITV308	Security and Privacy in Cloud	3	0	0	3

21ITV401	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of computer based vulnerabilities.
- To explore different foot printing, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods.
- To understand hacking options available in Web and wireless applications.
- To explore the options for network protection.
- To practice tools to perform ethical hacking to expose the vulnerabilities

UNIT I	INTRODUCTION	9
Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security		
UNIT II	**FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS**	**9**
Foot printing Concepts – Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence – Foot printing through Social Engineering – Foot printing Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall		
UNIT III	**ENUMERATION AND VULNERABILITY ANALYSIS**	**9**
Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss		
UNIT IV	**SYSTEM HACKING**	**9**
Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade		

UNIT V	NETWORK PROTECTION SYSTEMS	9

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and RiskAnalysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems – Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- To express knowledge on basics of computer based vulnerabilities
- To gain understanding on different foot printing, reconnaissance and scanning methods.
- To demonstrate the enumeration and vulnerability analysis methods
- To gain knowledge on hacking options available in Web and wireless applications.
- To acquire knowledge on the options for network protection.
- To use tools to perform ethical hacking to expose the vulnerabilities

TEXT BOOKS

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3. The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.

REFERENCE BOOKS

1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

21ITV402	DIGITAL AND MOBILE FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To discuss basic digital forensics and techniques.
- To describe digital crime and investigation.
- To outline how to be prepared for digital forensic readiness.
- To illustrate forensics tools for iOS devices.
- To illustrate forensics tools for Android devices

UNIT I	INTRODUCTION TO DIGITAL FORENSICS	9
Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase		
UNIT II	**DIGITAL CRIME AND INVESTIGATION**	**9**
Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence		
UNIT III	**DIGITAL FORENSIC READINESS**	**9**
Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics		
UNIT IV	**IOS FORENSICS**	**9**
Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud		
UNIT V	**ANDROID FORENSICS**	**9**
Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security –Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools –Oxygen Forensics – MobilEdit – Android App Decompiling		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the processes and methodologies used in digital and mobile forensic investigations.
- Apply forensic tools and techniques to gather, analyze, and interpret digital evidence.
- Examine digital evidence to identify relevant information and patterns that support forensic investigations
- Develop comprehensive forensic reports and present findings effectively to stakeholders.
- Acquire knowledge of various digital forensic tools.
- Work individually or in teams to incorporate societal and legal responsibilities into ethical practice.

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.

References

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.
2. RohitTamma, Oleg Skulkin, Heather Mahalik," Practical Mobile Forensics: A hands-on guide to mastering mobile forensics", 3rd Edition, Packt Publishing, 2018
3. Andrew Hoog , Katie Strzempka," iPhone and iOS Forensics: Investigation, Analysis and Mobile Security for Apple iPhone, iPad and iOS Devices",1st Edition, Syngress, 2011
4. Jason Sachowski," Implementing Digital Forensic Readiness", 1st Edition, Syngress, 2016

21CSV403	SOCIAL NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To develop semantic web related simple applications
- To explain Privacy and Security issues in Social Networking
- To explain the data extraction and mining of social networks
- To discuss the prediction of human behavior in social communities
- social networks

UNIT I	FUNDAMENTALS OF SOCIAL NETWORKING	9
Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security		
UNIT II	**SECURITY ISSUES IN SOCIAL NETWORKS**	**9**
The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world		
UNIT III	**EXTRACTION AND MINING IN SOCIAL NETWORKING DATA**	**9**
Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy		
UNIT IV	**PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES**	**9**
Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties		
UNIT V	**ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT**	**9**
Understand the access control requirements for Social Network, Enforcing Access Control		

Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Develop semantic web related simple applications
- Address Privacy and Security issues in Social Networking
- Explain the data extraction and mining of social networks
- Discuss the prediction of human behavior in social communities
- Describe the applications of social networks

TEXT BOOKS

1. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2. BorkoFurht, Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.
3. Learning Neo4j 3.x –Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing
4. David Easley, Jon Kleinberg, Networks, Crowds, and Markets: Reasoning about a Highly Connected World‖, First Edition, Cambridge University Press, 2010.

REFERENCE BOOKS

1. Easley D. Kleinberg J., Networks, Crowds, and Markets – Reasoning about a Highly Connected World‖, Cambridge University Press, 2010.
2. Jackson, Matthew O., Social and Economic Networks‖, Princeton University Press, 2008.
3. GuandongXu ,Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling‖, IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web‖, Springer, 2009.

21CSV404	MODERN CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn about Modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a Pseudorandom permutation.
- To construct Basic cryptanalytic techniques.
- To provide instruction on how to use the concepts of block ciphers and message authentication codes.

UNIT I	INTRODUCTION	9
Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser- Micali Encryption. Goldreich -Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.		
UNIT II	**FORMAL NOTIONS OF ATTACKS**	**9**
Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model		
UNIT III	**RANDOM ORACLES**	**9**
Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo- random Functions (PRF)		
UNIT IV	**BUILDING A PSEUDORANDOM PERMUTATION**	**9**
The LubyRackoff Construction: Formal Definition, Application of the Luby Rack off Construction to the construction of Block Ciphers, The DES in the light of Luby Rack off Construction.		
UNIT V	**MESSAGE AUTHENTICATION CODES**	**9**
Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as		

aMAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Interpret the basic principles of cryptography and general cryptanalysis.
- Determine the concepts of symmetric encryption and authentication.
- Identify the use of public key encryption, digital signatures, and key establishment.
- Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
- Express the use of Message Authentication Codes

TEXT BOOKS:

1. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

REFERENCE BOOKS:

1. 1.ShaffiGoldwasser and MihirBellare, Lecture Notes on Cryptography, Available at http://citeseerx.ist.psu.edu/.
2. 2.OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), Part 1 and Part 23
3. 3.William Stallings, “Cryptography and Network Security: Principles and Practice”, PHI 3rd Edition, 2006.

21ITV405	ENGINEERING SECURE SOFTWARE SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

Course 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.

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		
UINT 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**	**12**
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**	**6**

Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Identify various vulnerabilities related to memory attacks.
- Apply security principles in software development.
- Evaluate the extent of risks.
- Involve selection of testing techniques related to software security in the testing phase of software development.
- Use tools for securing software

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

REFERENCE BOOKS:

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

21ITV406	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT I	INTRODUCTION TO BLOCKCHAIN	9
Block chain- Public Ledgers, Block chain as Public Ledgers - Block in a Block chain, Transactions- The Chain and the Longest Chain - Permissioned Model of Block chain, 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 Hyper ledger 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. Block chain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc- Case Study.		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the fundamental concepts of block chain technology, cryptographic principles, and distributed ledger systems
- Apply crypto currency protocols and consensus mechanisms to solve real-world block chain implementation challenges
- Analyze various block chain frameworks and their applications in different domains such as finance, supply chain, and smart cities
- Evaluate different block chain platforms (Hyper ledger Fabric and Ethereum) and their suitability for specific use cases
- Create decentralized applications (DApps) and smart contracts using blockchain development tools and frameworks
- Design and implement block chain-based solutions for industry-specific problems while considering security and scalability aspects with team members

TEXT BOOKS

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCE BOOKS

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.

21CSV407	NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the fundamentals of cryptography.
- To learn the key management techniques and authentication approaches.
- To explore the network and transport layer security techniques.
- To understand the application layer security standards.
- To learn the real time security practices.

UNIT I	INTRODUCTION	9
Basics of cryptography, conventional and public-key cryptography, hash functions, authentication,and digital signatures		
UNIT II	**KEY MANAGEMENT AND AUTHENTICATION**	**9**
Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. User Authentication: Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption.		
UNIT III	**ACCESS CONTROL AND SECURITY**	**9**
Network Access Control: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE). Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application.		
UNIT IV	**APPLICATION LAYER SECURITY**	**9**
Electronic Mail Security: Pretty Good Privacy, S/MIME, Domain Keys Identified Mail. Wireless Network Security: Mobile Device Security		
UNIT V	**SECURITY PRACTICES**	**9**
Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. Blockchains, Cloud Security and IoT security		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Classify the encryption techniques
- Illustrate the key management technique and authentication.
- Evaluate the security techniques applied to network and transport layer
- Discuss the application layer security standards.
- Apply security practices for real time applications.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN 13:9780133354690.

REFERENCE BOOKS:

1. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.
2. Linux iptables Pocket Reference, Gregor N. Purdy, O'Reilly, 2004, ISBN-13: 978-0596005696.
3. Linux Firewalls, by Michael Rash, No Starch Press, October 2007, ISBN: 978-1-59327- 141-1.
4. Network Security, Firewalls And VPNs, J. Michael Stewart, Jones & Bartlett Learning, 2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.
5. The Network Security Test Lab: A Step-By-Step Guide, Michael Gregg, Dreamtech Press, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148.

VERTICAL V – CREATIVE MEDIA AND DESIGN

Course Code	Course Title	L	T	P	C
21ITV501	Metaverse	3	0	0	3
21ITV502	Multimedia and Animation	3	0	0	3
21ITV503	Video Creation and Editing	3	0	0	3
21ITV504	Digital Audio & Video Production Workflow	3	0	0	3
21CSV505	Digital Marketing	3	0	0	3
21CSV506	Visual Effects	3	0	0	3
21ITV507	Digital Audio & Video Design	3	0	0	3
21ITV508	Short Flim Development	3	0	0	3

21ITV501	METAVERSE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To understand the History of Met Averse.
- Explore the role of met averse to connect the real world and blockchain.
- To understand the advanced development of block chain in the future
- To study an open ecosystem of smart properties and assets.
- To explore the integration of futuristic technologies such as block chain, crypto currency, DAO, AR/VR

UNIT I	INTRODUCTION TO METAVERSE	9
Introduction to Metaverse and immersive experience- History of Metaverse- Metaverse value chain with 7 layer		
UNIT II	**TECHNOLOGIES INVOLVED IN THE METAVERSE**	**9**
Metaverse as a product of Extended Reality- Augmented Reality (AR)- Virtual Reality (VR)-Benefits of AR/VR-Difference between AR/ VR - Mixed Reality (MR)-Artificial Intelligence (AI) Introduction in Metaverse-Financial and Economics of Metaverse-Benefits of Metaverse		
UNIT III	**BLOCKCHAIN ADOPTION IN METAVERSE**	**9**
Blockchain Overview-History of Blockchain-Need of Decentralization in MV-Smart Contract Capabilities in Blockchain - Blockchain in Metaverse -Understanding Tokens-Understanding the NFT-NFT Token Standards-NFTs in MV-Cryptocurrency in MV		
UNIT IV	**AR, VR, AND MR IN METAVERSE**	**9**
Everything about VR (Virtual Reality)-Everything about AR (Augmented Reality)-Everything about MR (Mixed Reality)-Block chain Identity Management in Metaverse -NFT (non-fungible token) for Metaverse-Introduction to NFTs-History of NFTs-Benefits of NFTs		
UNIT V	**USE-CASES**	**9**
Gaming in Metaverse-Meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse-e-commerce in Metaverse-Travel in		

MetaversePersonalized Avatars-Digital Identity in Metaverse

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Students will understand the History of Metaverse.
- Learn the role of Metaverse to connect the real world and blockchain.
- Working with advanced development of blockchain in the future.
- Exploring the open ecosystem of smart properties and assets.
- Integrating futuristic technologies such as blockchain, cryptocurrency, DAO, AR/VR

TEXT BOOKS

1. The Metaverse: And How It Will Revolutionize Everything Kindle Edition by Matthew Ball , Publisher : Liveright ,2022
2. The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift Kindle Edition by QuHarrison Terry (Author), Scott Keeney (Author), Paris Hilton (Foreword), Publisher: Wiley; 1st edition ,2022

REFERENCES

1. The Wearable Technology Handbook, Haider Raad,scholar publcialtions,2017
2. Metaverse Made Easy: A Beginner's Guide to the Metaverse, Dr.Liew Voon Kiong,Publisher, Liew Voon Kiong, 2022
3. Metaverse For Beginners and Advanced: A Complete Journey Into the Metaverse Virtual World (Web 3.0), Darell Freeman,Publisher Darell Freeman,2022
4. Metaverse Glossary - Your Gateway to the Future , Ravindra Dastikop, Evincepub Publishing,2022
5. The Metaverse: Prepare Now for the Next Big Thing Paperback , Terry Winters , Winters media Publiaction 2021

21ITV502	MULTIMEDIA AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To grasp the fundamental knowledge of Multimedia elements and systems
- To get familiar with Multimedia file formats and standards
- To learn the process of Authoring multimedia presentations
- To learn the techniques of animation in 2D and 3D and for the mobile UI
- To explore different popular applications of multimedia

UNIT I	INTRODUCTION TO MULTIMEDIA	9
Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.		
UNIT II	**MULTIMEDIA FILE FORMATS AND STANDARDS**	**9**
File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web		
UNIT III	**MULTIMEDIA AUTHORING**	**9**
Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, simulations.		
UNIT IV	**ANIMATION**	**9**
Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.		
UNIT V	**MULTIMEDIA APPLICATIONS**	**9**
Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, MultimediaCloud Computing, Multimedia streaming cloud, media on demand, security and		

forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Get the bigger picture of the context of Multimedia and its applications
- Use the different types of media elements of different formats on content pages
- Author 2D and 3D creative and interactive presentations for different target multimedia applications.
- Use different standard animation techniques for 2D, 21/2 D, 3D applications
- Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,

TEXT BOOKS

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

REFERENCE BOOKS

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2. Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018.
3. Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System D Pearson Education, 1st Edition, 2015.
4. Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature, 1st Edition, 2021.
5. Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.
6. Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.
7. Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
8. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and

After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.

WEB REFERENCES:

1. https://itsfoss.com/
2. https://www.ucl.ac.uk/slade/know/3396
3. https://handbrake.fr/
4. https://opensource.com/article/18/2/open-source-audio-visual-production-tools
5. https://camstudio.org/
6. https://developer.android.com/training/animation/overview
7. https://developer.android.com/training/animation/overview (UNIT-IV)

21ITV503	VIDEO CREATION AND EDITING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the broad perspective of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with audio and video recording. To apply different media tools.
- To learn and understand the concepts of AVID XPRESS DV 4.

UNIT I	FUNDAMENTALS	9
Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.		
UNIT II	**STORYTELLING**	**9**
Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management.		
UNIT III	**USING AUDIO AND VIDEO**	**9**
Capturing digital and analog video importing audio putting video on exporting digital video to tape recording to CDs and VCDs.		
UNIT IV	**WORKING WITH FINAL CUT PRO**	**9**
Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.		
UNIT V	**WORKING WITH AVID XPRESS DV 4**	**9**
Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing toRecord and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Compare the strengths and limitations of Nonlinear editing.
- Identify the infrastructure and significance of storytelling.
- Apply suitable methods for recording to CDs and VCDs.
- Address the core issues of advanced editing and training techniques. CO5:Design and develop projects using AVID XPRESS DV 4

TEXT BOOKS:

1. Avid Xpress DV 4 User Guide, 2007.
2. Final Cut Pro 6 User Manual, 2004.
3. Keith Underdahl, "Digital Video for Dummies", Third Edition, Dummy Series, 2001.
4. Robert M. Goodman and Partick McGarth, "Editing Digital Video: The Complete Creative and Technical Guide", Digital Video and Audio, McGraw – Hill 2003.

21ITV 504	DIGITAL AUDIO & VIDEO PRODUCTION WORKFLOW	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Describe the types and parts of cameras and demonstrate basic camera operations.
- Discuss various video formats and recording media and the important terms used in video production.
- Discuss and demonstrate the knowledge of the various lighting techniques.
- Apply various audio techniques and discuss sound mixing methods used for a successful audio video production.
- Demonstrate the steps involved in assembling a final video.

UNIT I	BASICS OF AUDIO VIDEO PRODUCTION	9
Introduction to Audio and Video Production – Basic Camera use – Elements of Audio Production – video storage		
UNIT II	**PRE PRODUCTION**	**9**
Elements of Preproduction - Production Planning and Budgeting - Genres and Subgenres - An Approach to Script Writing - Writing for Different Formats.		
UNIT III	**BASICS OF PRODUCTION**	**9**
Shooting a Video - Cinematography and Composition - Basics of Lighting - Audio Techniques and Sound Mixing - Equipment Management.		
UNIT IV	**POST PRODUCTION**	**9**
Learning to Edit - Using Graphics and Animation - Audio Enhancement - Video Assembly.		
UNIT V	**INTRODUCTION TO SPECIAL EFFECTS**	**9**
Introduction to Special/Visual Effects, Special and (Visual) Effects Categories, Physical/Practical/Props Effects, Special Make-Up Effects, In Camera Effects.		

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Ability to understand and utilize general digital audio processing theory
- Ability to practice active listening & audio analysis & Mixing Multitrack sessions using a DAW
- Ability to Understand and utilize pre-production Video Shooting techniques
- Ability to practice Postproduction techniques for video production
- Ability to apply special effects in the final video

REFERENCE BOOKS:

1. The Computer Music Tutorial by Curtis Roads
2. On Sonic Art by Trever Wishart
3. Video Production Handbook by Gerald Millerson, Jim Owens, Asbury College

21CSV505	DIGITAL MARKETING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT I	INTRODUCTION TO ONLINE MARKET	9
Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.		
UNIT II	**SEARCH ENGINE OPTIMISATION**	**9**
Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement		
UNIT III	**E- MAIL MARKETING**	**9**
E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns- Profiling and targeting		
UNIT IV	**SOCIAL MEDIA MARKETING**	**9**
Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing		
UNIT V	**DIGITAL TRANSFORMATION**	**9**
Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the principles and strategies behind successful digital marketing campaigns.
- Utilize digital marketing tools and platforms to implement and manage marketing campaigns effectively.
- Analyze digital marketing data and metrics to measure the performance of campaigns
- Evaluate the success of a digital marketing campaign in achieving its objectives and reaching the target audience.
- Design and create engaging content for digital marketing channels, considering the target audience and the platform's best practices.
- Enhance communication and teamwork skills in the context of digital marketing Projects

TEXT BOOKS

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education, First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
6. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

21CSV506	VISUAL EFFECTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To get a basic idea on animation principles and techniques
- To get exposure to CGI, color and light elements of VFX
- To have a better understanding of basic special effects techniques
- To have a knowledge of state of the art vfx techniques
- To become familiar with popular compositing techniques

UNIT I	ANIMATION BASICS	9
VFX production pipeline, Principles of animation, Techniques: Keyframe, kinematics, Full animation, limited animation, Rotoscoping, stop motion, object animation, pixilation, rigging, shape keys, motion paths		
UNIT II	**CGI, COLOR, LIGHT**	**9**
CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering: color - Color spaces, color depth, Color grading, color effects, HDRI, Light – Area and mesh lights, image based lights, PBR lights, photometric light, BRDF shading model		
UNIT III	**SPECIAL EFFECTS**	**9**
Special Effects – props, scaled models, animatronics, pyrotechniques, Schüfftan process, Particle effects – wind, rain, fog, fire		
UNIT IV	**VISUAL EFFECTS TECHNIQUES**	**9**
Motion Capture, Matt Painting, Rigging, Front Projection.Rotoscoping, Match Moving – Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving		
UNIT V	**COMPOSITING**	**9**
Compositing – chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools - Blender, Natron, GIMP		
	TOTAL PERIODS : 45 PERIODS	

COURSE OUTCOMES

At the end of the course the student will be able to

- To implement animation in 2D / 3D following the principles and techniques
- To use CGI, color and light elements in VFX applications
- To create special effects using any of the state of the art tools
- To apply popular visual effects techniques using advanced tools
- To use compositing tools for creating VFX for a variety of applications

TEXT BOOKS

1. Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.
2. Steve Wright, Digital Compositing for film and video, Routledge, 4th Edition, 2017.
3. John Gress, Digital Visual Effects and Compositing, New Riders Press, 1st Edition, 2014.

REFERENCE BOOKS

1. Jon Gress, "Digital Visual Effects and Compositing", New Riders Press, 1st Edition, 2014.
2. Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", Morgan Kauffman, 2008.
3. Luiz Velho, Bruno Madeira, "Introduction to Visual Effects A Computational Approach", Routledge, 2023.
4. Jasmine Katatikarn, Michael Tanzillo, "Lighting for Animation: The art of visual storytelling, Routledge, 1st Edition, 2016.
5. Eran Dinur, "The Complete guide to Photorealism, for Visual Effects, Visualization
6. Jeffrey A. Okun, Susan Zwerman, Christopher McKittrick, " The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures", Third Edition, 2020.and Games", Routledge, 1st Edition, 2022.
7. https://www.blender.org/features/vfx/
8. https://natrongithub.github.io/

21ITV 507	DIGITAL AUDIO & VIDEO DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Introduce the fundamental principles of Audio processing.
- Provide an overview of Audio enhancement and Audio compression techniques
- Review latest trends and future technologies in Audio processing.
- Introduce the fundamental concepts of Video processing.
- Cover the basics of Video Coding

UNIT I	DIGITAL AUDIO	9
Basics of Digital Audio - Digitization of Sound- Auditory Perception - Sampling, Normalization, Noise Reduction and Visualization. Digital and Analog audio Recording, A/D and D/A Converter, Pitch Shifting and Time Stretching, Audio Data Reduction		
UNIT II	**MUSICAL SOUND SYNTHESIS AND MIDI**	**9**
Acoustic Instruments, Sound Synthesis in Music, MIDI Principles - Hardware aspects, Structure of MIDI Messages, General MIDI, MIDI-to-Wav Conversion.		
UNIT III	**STEREO AND SURROUND SOUND**	**9**
Two-Channel Stereo - Principles of Loudspeaker and Microphone, Stereo and Loudspeaker Stereo, Two-Channel Signal Formats and Microphone techniques, Binaural Recording and Dummy Head Techniques, Surround Sound - Three Channel Stereo, Four Channel Surround, 5.1 Channel Surround, and other Multichannel Configurations. Surround Sound Systems, Matrix Surround Sound Systems, Dolby Digital, DTS, Ambisonics.		
UNIT IV	**VIDEO FUNDAMENTALS**	**9**
Basic concepts and Terminology- Analog video standards – Digital video basics – Analog-to Digital conversion – Color representation and chroma subsampling – Digital video formats and standards – Changing Video sampling rate and standards.		
UNIT V	**MPEG VIDEO CODING**	**9**

Basic Video coding and Audio Compression Techniques- Motion Detection- MPEG Video and audio Compression – Real-time video compression.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Implement basic algorithms related to Audio acquiring and processing
- Analyse audio formats and analysis.
- Understand and implement algorithms for MIDI Processing
- Acquiring and analysis of Video
- Understand the concept of motion detection.

REFERENCES

1. Francis Rumsey & Tim McCormick "Sound and Recording ", Sixth Edition, 2009, Focal Press, Elsevier Ltd.
2. Ian Mcloughlin "Applied Speech and Audio Processing with MATLAB Examples" Cambridge University Press, Cambridge, New York, 2009.
3. Oges Marques, Practical Image and Video Processing Using MATLAB, Wiley-IEEE Press, 2011.

21ITV508	SHORT FLIM DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the fundamentals of short film Making.
- To know the working principles camera.
- To acquire knowledge about the editing software.
- To train the student as a member or leader in diverse teams of short film development.
- To inculcate aesthetic sense involved in creativity and transform creative ideas into short film

UNIT I	INTRODUCTION TO SHORT FILM	9
Introduction – Different Types of Short Film – Documentary and Non-Fiction Film – Animated Short Films – Challenges in Developing Short Films – Creative Approaches.		
UNIT II	**PRE PRODUCTION**	**9**
Developing and Researching Short Film Project – Considering and Selecting an idea – Developing Questions – Research Techniques- Writing a Concept and Treatment - Shooting Script – Hiring Crew – Crew Position and Responsibilities – Producing and Budgeting – Visual Scope and Visual Evidence – Permission – Funding – Proposals – Attracting Funding – Ethics in Short Film Making		
UNIT III	**PRODUCTION**	**9**
Research Leading up to the Shoot – Production Team, Production –Camera Equipment and Shooting Procedure – Lighting Location Sound – Interviewing – Directing Participants – Working Together – Teamwork – Scheduling – Problems and Issues.		
UNIT IV	**POST PRODUCTION**	**9**
Designing a Structure – Working with Editor – Visual Effects – Transition – Adding Sound Effects and Music – Special Effect Dubbing – Rerecording – Narration – Voiceover — Titles –Graphics – Color Exposure and Color Correction – Credits and Acknowledgements.		
UNIT V	**SCREENING**	**9**
Impact of Short Film on the Society – Various Media Techniques used in Short Film Production – Identifying Important Current Social Issues for Short Film – Exploring Background Research Current		

Social Issues – Making Short Film for Television and Theatrical Release – Non-Fiction Presentation – Production of an individually or Group Authored Short Film Based on Historical – Corporate – Institutional – Current Social Issues.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Apply the knowledge of concepts and techniques used in short film development.
- Understand the social issues and projecting them effectively through short film.
- Conduct various experiments for effective short film.
- Design and implement various techniques into short film that brings impact on the society.
- Apply various tools and software for lighting and sound to uphold the professional and social obligation.
- Manage and develop a short film as a life-long activity as a team.

TEXTBOOKS:

1. Clifford Thurlow, "Making Short Films – The Complete Guide from Script to Screen" , Berg Publishers, 2008
2. James R. Matin, "Create Documentary Films, telling Techniques Videos and Multimedia: A Comprehensive Guide to Using Documentary Storytelling Techniques for Film Video, The internet and Digital Media Nonfiction project", Real Deal Press, 2010.
3. Michael Rabiger, "Directing the Documentary", Focal Press, 2004.
4. Daniel Faltesek, "Selling Social Media The Political Economy of Social Networking", Bloomsbury Academic, 2018.

VERTICAL VI – EMERGING TECHNOLOGIES

Course Code	Course Title	L	T	P	C
21ITV501	Metaverse	3	0	0	3
21CSV602	Robotic Process Automation	3	0	0	3
21ITV603	Human Computer Interfaces	3	0	0	3
21CSV604	Cyber security	3	0	0	3
21CSV605	Quantum Computing	3	0	0	3
21ITV406	Crypto currency and Block chain Technologies	3	0	0	3
21ITV207	DevOps	3	0	0	3
21ITV608	3DPrintingandDesign	3	0	0	3

21CSV602	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and Maintain the software bot.

UNIT I	INTRODUCTION TO ROBOTIC PROCESS AUTOMATION	9
Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.		
UNIT II	**AUTOMATION PROCESS ACTIVITIES**	**9**
Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events		
UNIT III	**APP INTEGRATION, RECORDING AND SCRAPING**	**9**
App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.		
UNIT IV	**EXCEPTION HANDLING AND CODE MANAGEMENT**	**9**
Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.		
UNIT V	**DEPLOYMENT AND MAINTENANCE**	**9**
Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Enunciate the key distinctions between RPA and existing automation techniques and platforms.
- Use UiPath to design control flows and work flows for the target process
- Implement recording, web scraping andprocess mining by automation
- Use UIPath Studio to detect, and handle exceptions in automation processes
- Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes.

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.
2. Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.

REFERENCE BOOKS:

1. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, 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

21CSV603	HUMAN COMPUTER INTERFACES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the foundations of Human Computer Interfaces.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I	FOUNDATIONS OF HCI	9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II	DESIGN & SOFTWARE PROCESS	9

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III	MODELS AND THEORIES	9

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements Communication and collaboration models -Hypertext, Multimedia and WWW.

UNIT IV	MOBILE HCI	9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V	WEB INTERFACE DESIGN	9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Analyze the Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation

TEXT BOOKS

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd
2. Edition, Pearson Education, 2004
3. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009

REFERENCE BOOKS

1. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

21CSV604	CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn cybercrime and cyberlaw.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT I	INTRODUCTION	9
Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes-A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.		
UNIT II	**ATTACKS AND COUNTERMEASURES**	**9**
OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach– Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures		
UNIT III	**RECONNAISSANCE**	**9**
Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.		
UNIT IV	**INTRUSION DETECTION**	**9**
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.		
UNIT V	**INTRUSION PREVENTION**	**9**
Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and		

Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Explain the basics of cyber security, cyber crime and cyber law
- Classify various types of attacks and learn the tools to launch the attacks
- Apply various tools to perform information gathering
- Apply intrusion techniques to detect intrusion
- Apply intrusion prevention techniques to prevent intrusion

TEXT BOOKS

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
3. https://owasp.org/www-project-top-ten/

REFERENCE BOOKS

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007 (Unit 3)
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)
5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014 (Lab)

21CSV605	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT I	QUANTUM COMPUTING BASIC CONCEPTS	9
Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Super positions		
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 PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the basics of quantum computing.
- Understand the background of Quantum Mechanics.

- Analyze the computation models.
- Model the circuits using quantum computation. environments and frameworks.
- Understand the quantum operations such as noise and error–correction.

TEXT BOOKS

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (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".

REFERENCE BOOKS

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press,2013.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge UniversityPress, 2007.

21ITV608	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT I	INTRODUCTION	9
Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats		
UNIT II	**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 fabrication – Colourjet.		
UNIT IV	**LASER TECHNOLOGY**	**9**
Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;		
UNIT V	**INDUSTRIAL APPLICATIONS**	**9**
Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food,Medical, Biotechnology, Displays; Future trends;		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Outline and examine the basic concepts of 3D printing technology
- Outline 3D printing workflow`
- Explain and categorise the concepts and working principles of 3D printing
- using inkjet technique
- Explain and categorise the working principles of 3D printing using laser technique
- Explain various method for designing and modeling for industrial applications

TEXT BOOKS

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.

REFERENCE BOOKS

1. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
2. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
3. Joan Horvath, Mastering 3D Printing, APress, 2014

VERTICAL VII – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	Course Title	L	T	P	C
21ITV701	Knowledge Engineering	3	0	0	3
21CSV702	Soft Computing	3	0	0	3
21ITV103	Neural Networks and Deep Learning	3	0	0	3
21CSV104	Text and Speech Analysis	3	0	0	3
21CSV705	Optimization Techniques	3	0	0	3
21ITV706	Game Theory	3	0	0	3
21ITV707	Cognitive Science	3	0	0	3
21CSV708	Ethics And AI	3	0	0	3

21ITV701	KNOWLEDGE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

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

definition of Generalization. Modelling, Learning and Problem Solving –

Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the basics of Knowledge Engineering.
- Apply methodologies and modelling for Agent Design and Development.
- Design and develop ontologies.
- Apply reasoning with ontologies and rules.
- Understand learning and rule learning.

TEXT BOOKS:

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

REFERENCE BOOKS

2. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
3. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
4. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.
5. King , Knowledge Management and Organizational Learning , Springer, 2009.
6. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition, 2001.

21CSV702	SOFT COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing

UNIT I	INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC	9
Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems		
UNIT II	**NEURAL NETWORKS**	**9**
Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks		
UNIT III	**GENETIC ALGORITHMS**	**9**
Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function		
UNIT IV	**NEURO FUZZY MODELING**	**9**
ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability		
UNIT V	**APPLICATIONS**	**9**
Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural		

networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the fundamentals of fuzzy logic operators and inference mechanisms
- Understand neural network architecture for AI applications such as classification and clustering
- Learn the functionality of Genetic Algorithms in Optimization problems
- Use hybrid techniques involving Neural networks and Fuzzy logic
- Apply soft computing techniques in real world applications

TEXT BOOKS

1. SaJANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python
3. With Case Studies and Applications from the Industry, Apress, 2020

REFERENCE BOOKS

1. Roj Kaushikand Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
3. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and Genetic Algorithms, Pearson Education, 2013.
4. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
5. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston, 1996

21CSV705	OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models

UNIT I	LINEAR MODELS	9
Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method		
UNIT II	**INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS**	**9**
Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem.		
UNIT III	**PROJECT SCHEDULING**	**9**
Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM		
UNIT IV	**CLASSICAL OPTIMIZATION THEORY**	**9**
Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions		
UNIT V	**QUEUING MODELS**	**9**
Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.		
TOTAL PERIODS : 45 PERIODS		

COURSE OUTCOMES

At the end of the course the student will be able to

- Formulate and solve linear programming problems (LPP)

- Evaluate Integer Programming Problems, Transportation and Assignment
- Problems.
- Obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.

REFERENCE BOOKS:

1. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
2. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.
3. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.
4. Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.
5. Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

21ITV706	GAME THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets.
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in 41odeIIing applications.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT I	INTRODUCTION	9
Introduction - Making rational choices: basics of Games -strategy -preferences - payoffs - Mathematical basics - Game theory - Rational Choice - Basic solution concepts-non-cooperative versus cooperative games - Basic computational issues - finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).		
UNIT II	**GAMES WITH PERFECT INFORMATION**	**9**
Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies - Nash equilibria -mixed strategy equilibrium - zero-sum games		
UNIT III	**GAMES WITH IMPERFECT INFORMATION**	**9**
Games with Imperfect Information - Bayesian Games - Motivational Examples - General Definitions- Information aspects - Illustrations - Extensive Games with Imperfect - Information - Strategies - Nash Equilibrium -Repeated Games - The Prisoner's Dilemma - Bargaining		
UNIT IV	**NON-COOPERATIVE GAME THEORY**	**9**
Non-cooperative Game Theory - Self-interested agents - Games in normal form - Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal - Form		

Games- Computing Nash equilibria of two-player, zero-sum games -Computing Nash equilibria of two- player, general- sum games - Identifying dominated strategies

UNIT V	MECHANISM DESIGN	9

Aggregating Preferences - Social Choice - Formal Model - Voting - Existence of social functions - Ranking systems - Protocols for Strategic Agents: Mechanism Design - Mechanism design with unrestricted preferences

TOTAL PERIODS : 45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Discuss the notion of a strategic game and equilibria and identify the Discuss the use of Nash Equilibrium for other problems.
- Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
- Identify some applications that need aspects of Bayesian Games.
- Implement a typical Virtual Business scenario using Game theory

TEXT BOOKS

1. M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2012.
2. M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013.
3. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, Algorithmic Game Theory. Cambridge University Press, 2007.
4. A.Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.
5. YoavShoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press 2008.
6. Zhu Han, DusitNiyato, WalidSaad, TamerBasar and Are Hjorungnes, “Game Theory in Wireless and Communication Networks”, Cambridge University Press, 2012.
7. Y.Narahari, “Game Theory and Mechanism Design”, IISC Press, World Scientific.
8. William Spaniel, “Game Theory 101: The Complete Textbook”, CreateSpace Independent Publishing, 2011.

21ITV707	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition

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

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the underlying theory behind cognition.
- Connect to the cognition elements computationally.
- Implement mathematical functions through WebPPL.
- Develop applications using cognitive inference model
- Develop applications using cognitive learning model

TEXT BOOKS

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

REFERENCE BOOKS

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

21CSV708	ETHICS AND AI	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

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

COURSE OUTCOMES

At the end of the course the student will be able to

- Understand the fundamental concepts of morality and ethics to artificial intelligence.
- Apply ethical principles to the benefits and risks of deploying robots in healthcare settings
- Analyze different methods and technologies used to enhance transparency in autonomous systems and their effectiveness.
- Design a framework that incorporates various moral theories to guide ethical AI development and deployment, ensuring fairness and accountability.
- Apply ethical theories to the components and consequences of AI across various sectors
- Work individually and as a member in multidisciplinary teams(Affective Domain)

TEXT BOOKS:

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

REFERENCE BOOKS

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
3. Web link: https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65
4. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteen-challenges-and-opportunities/
5. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/ 7. https://sci-hub.mksa.top/10.1159/000492428

VERTICALS FOR MINOR DEGREE

VERTICAL VI : COMPUTER TECHNOLOGY

Course Code	Course Title	L	T	P	C
21ITVG61	Introduction to Object oriented programming using C++	2	0	2	3
21ITVG62	Algorithms and data structures	3	0	0	3
21ITVG63	Java fundamentals	2	0	2	3
21ITVG64	Agile Software development	3	0	0	3
21ITVG65	Database and data analytics	3	0	0	3
21ITVG66	Networking and data Communication	3	0	0	3
21ITVG67	Applications development (Full Stack) (Offered By Infosys Spring Board)	2	0	2	3
21ITVG68	Machine learning	3	0	0	3
21ITVG69	Cyber Security Essentials	3	0	0	3

Course Code	Course Name	L	T	P	C
21ITVG61	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING USING C++	2	0	2	3

Course Objectives:

- To provide basic understanding of Object Oriented Programming concepts
- To impart in depth knowledge to solve an application using Object Oriented Programming concepts
- To explain the concepts of files and exception handling

UNIT - I	INTRODUCTION	10+10

Basics of C++ programming –C++ Statements-Structure of C++ Program-Simple C++ program, Tokens, Keyword, Identifiers and Constants-Data types-Declaration and Initialization of variables-Reference variables-Operators-Scope Resolution operators- Operator overloading-Control structures

List of Experiments:

1. Implement Basic C++ Programs
2. Implement C++ Programs Using Operators
3. Implement C++ Programs Using Operator overloading
4. Implement C++ Programs Using Control structures

UNIT - II	FUNCTIONS,CLASSES,OBJECTS & CONSTRUCTOR	10+10

Introduction to functions, Main function- Inline functions-Default arguments-Recursion-Function overloading - Basic Concept of Object – Classes and objects, Specifying a class-Defining member functions-A C++ program with class, Returning objects. Introduction to Constructors-Parameterized constructor - Copy and Default Constructor- Destructors

List of Experiments:

1. Implement C++ Programs Using Functions
2. Implement C++ Programs Using Classes & Objects
3. Implement C++ Programs Using Constructors
4. Implement C++ Programs Using Destructors

UNIT - III	INHERITANCE,FILES & EXCEPTION HANDLING	10+10

Introduction to Inheritance - Defining Derived classes-Types of Inheritance- Introduction to files and file stream operations-Opening and closing files-Detecting End-of-File- Exception handling Mechanisms-Specifying exceptions

List of Experiments:

1. Implement C++ Programs Using Inheritance
2. Implement C++ Programs Using Files
3. Implement C++ Programs Using Exceptions

Total: 30 + 30 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Understand the concepts of object oriented programming [Understand]
- Apply object oriented programming concepts to develop Real time applications [Apply]
- Analyze, which object oriented Programming Principles is best to solve a given scenario [Analyze]
- Design software application using various object oriented paradigms [Design]
- Select and apply appropriate modern tools to implement object oriented programming
- Methodologies.
- Work individually or in teams and demonstrate the solutions to the given exercises through
  Presentation - [Apply]

TEXT BOOKS :

1. E.Balagurusamy, "Object oriented programming with C++",6th edition,McGraw hill education,2013

REFERENCES BOOKS :

1. Souravsahay, object oriented programming with c++ , 2nd ed, oxford university press,2006.
2. KanetkarYashavant, "LET US C++", BFB publication, 16th edition.

Course Code	Course Name	L	T	P	C
21UITVG62	ALGORITHMS AND DATA STRUCTURES	3	0	0	3

Course Objectives:

- To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
- To impart a thorough understanding of linear non-linear data structures such as list, stacks, queues, trees, graphs and their applications.
- To impart familiarity with various sorting, searching and hashing techniques and their performance comparison.

UNIT - I	LINEAR DATA STRUCTURE – LIST	9
Basic Terminologies: Elementary Data Organizations, Algorithm, Abstract Data Types (ADTs) – Array Implementation - List ADT- Linked List Implementation - Singly Linked lists - Circularly Linked Lists – Doubly Linked Lists -Applications of Lists - Polynomial Manipulation		
UNIT - II	**LINEAR DATA STRUCTURE - STACK, QUEUE**	**9**
Stack ADT - Array Representation of Stacks –Operations - Linked Representation of Stacks - Operations - Applications - Evaluating Arithmetic Expressions- Queue ADT - Array Representation of Queues- Operations - Linked Representation of Queues– Operations - Circular Queue - Priority Queue -Applications of Queues.		
UNIT - III	**NON-LINEAR DATA STRUCTURE - TREE, HEAP**	**9**
Introduction - Basic Terminology - Binary trees -Traversing a Binary Tree- Binary Search trees- AVL Trees-B Trees- B+ Trees. Heap: Binary Heaps.		
UNIT-IV	**NON-LINEAR DATA STRUCTURE - GRAPH**	**9**
Introduction - Graph Terminology - Representation of Graphs - Graph Traversal - Topological sort - Minimum Spanning Trees - Prim's and Kruskal's Algorithm - Shortest path algorithm - Dijkstra's algorithm -Applications of Graphs.		

UNIT-V	SEARCHING, SORTING AND HASHING	9

Searching: Linear Search - Binary Search, Sorting: Selection Sort - Bubble Sort - Insertion Sort -Merge Sort - Quick Sort, Hashing: Hash Table - Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

Total:45Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Understand the basic concepts of data structures and algorithm like linear and non-linear - [Understand]
- Apply appropriate data structure and algorithm design method for a specified application - [Apply]
- Compare and contrast alternative data structure applications to select the best process - [Analysis]
- Design and develop efficient linear, non-linear, sorting, searching and hashing data structure algorithms to solve problems - [Create]
- Evaluate the problems and find solutions using linear, non-linear applications, searching, sorting and hashing algorithms - [Evaluate]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation - [Apply]

TEXT BOOKS:

1. ReemaThareja, “Data Structures Using C”, Oxford University Press, Second Edition, 2014.
2. Weiss. M.A, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Aaron M.Tenenbaum, YedidyahLangsam, Moshe J.Augenstein, "Data Structures using C", Pearson Education India, 7th Edition, New Delhi, 2009.
2. Aho.V, Hopcroft.J.E, Ullman.J.D, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006.
3. Gilberg.R.F, Forouzan.B.A, "Data Structures", Thomson India Education, 2nd Edition, 2005.
4. Sara Baase and A.VanGelder, "Computer Algorithms", Pearson Education, 3rd Edition, 2005.
5. Cormen.T.H, C.A.Leiserson.B.A, R.L.Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2009

Course Code	Course Name	L	T	P	C
21ITVG63	JAVA FUNDAMENTALS	2	0	2	3

Course Objectives:

- To implement object-oriented designs with Java.
- To extend Java classes with inheritance
- To handle Exceptions with Exceptions classes.
- To make use of String Classes in Java

UNIT - I	INTRODUCTION TO JAVA PROGRAMMING	10+10

Introduction to Java - Java Architecture –keywords –Identifiers –Variables – Data types– Operators– Selection control Structure –Iteration Control Structure

List of Experiments:

1. Basic Java Programs
2. Programs using Data types & Operators
3. Programs on Selection & Iteration control structures

UNIT - II	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	10+10

Introduction to Object Oriented Programming–Methods – Constructors – This keyword- Encapsulation - Abstraction - Access Modifiers- Arrays- inheritance- Single Inheritance – Multilevel Inheritance –Polymorphism –Method overloading –Method Overriding

List of Experiments:

1. Programs using classes and objects
2. Programs using Methods
3. Programs using constructors and this keyword
4. Programs using Encapsulation
5. Programs using Inheritance
6. Programs using Polymorphism

UNIT - III	EXCEPTION HANDLING & STRING HANDLING	10+10

Exception – Try – Throw – Catch –Finally – User defined Exception – throws- String Constructors – Character extraction – String Comparison – Searching strings

List of Experiments:

1. Programs using Exceptions
2. Programs using String

Total: 30 + 30 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Understand the Object oriented features of Java [Understand]
- Apply Java code for various applications [Apply]
- Analyze the suitable object oriented methodology for solving a complex engineering problem [Analyze]
- Design various real time java applications [Design]
- Use modern tools to implement coding [Evaluate]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation - [Apply]

TEXT BOOKS :

1. Cay S. Horstmann "Core Java Volume I—Fundamentals", Pearson Publishers, Eleventh Edition, 2018

REFERENCES BOOKS :

1. Infosys Offered Course (https://infyspringboard.onwingspan.com/)
2. Herbert Schildt“ The Complete Reference Java “, McGraw Hill , Eleventh Edition , 2018

Course Code	Course Name	L	T	P	C
21UITVG64	AGILE SOFTWARE DEVELOPMENT	3	0	0	3

Course Objectives:

- To discuss how to start developing a software incrementally regardless of existing engineering practices or methodologies
- To elucidate the theoretical underpinnings of Agile processes
- To explain how to simplify XP implementation through a Scrum wrapper
- To demonstrate the Agile testing methodologies

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, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

UNIT - II	AGILE SCRUM FRAMEWORK	10

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, Burn down 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 TESTING	8

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - 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	INDUSTRY TRENDS	9

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

Total: 45 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Understand the background and driving forces for taking an Agile approach to software development [Understand]
- Apply agile principles and refactoring to achieve Agility development [Apply]
- Analyze tools and techniques needed for Agile implementation [Analyze]
- Design solution for complex information and communication engineering problems using agile Principles [Design]
- Function effectively as an individual and as a member or leader in agile framework [Evaluate]

Work individually or in teams and demonstrate the solutions to the given exercises through presentation - [Apply]

TEXT BOOKS :

1. Ken Schawber, Mike Beedle, " Agile Software Development with Scrum ", Pearson , 2002.
2. Robert C. Martin , Micha Martin, " Agile Software Development, Principles, Patterns and Practices ", Pearson, , 2007

REFERENCES BOOKS :

1. Lisa Crispin, Janet Gregory," Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley, 2008.
2. Alistair Cockburn, " Agile Software Development: The Cooperative Game ", Addison Wesley, 2006
3. Mike Cohn, " User Stories Applied: For Agile Software", Addison Wesley , 1st Edition
4. Kent Beck, "Test Driven Development: By Example", Addison Wesley, 2002
5. http://www.eecs.yorku.ca/course_archive/2003-04/W/3311/sectionM/ case_studies / money/KentBeck_TDD_byexample.pdf
6. http://martinfowler.com/agile.html
7. www.it-ebooks.info/tag/agile
8. http://www.scrumguides.org/scrum-guide.html#theory

Course Code	Course Name	L	T	P	C
21UITVG65	DATABASE AND DATA ANALYTICS	3	0	0	3

PRE-REQUISITE:

COURSE OBJECTIVES :

- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand bigdata and NOSQL
- To learn map reduce analytics using Hadoop and related tools.
- To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I	RELATIONAL DATABASES	9
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		

UNIT II	DATABASE DESIGN	9
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		

UNIT III	UNDERSTANDING BIG DATA AND NOSQL	9
Introduction to big data – convergence of key trends– unstructured data– industry examples ofbig data –big data applications– big data technologies – introduction to Hadoop – Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients		

UNIT IV	MAP REDUCE APPLICATIONS	9
MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats		
UNIT V	**BASICSOFHADOOP AND RELATED TOOLS**	**9**
Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow –Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra –Hadoop integration. Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts.		

TOTAL : 45 Periods

COURSE OUTCOMES :

After the successful completion of this course, the student will be able to

- Construct SQL Queries using relational algebra(Understand)
- Design database using ER model and normalize the database (Apply)
- Analyze the sustainable Hadoop development and design methodology for a given real world scenario. (Analyze)
- Perform map-reduce analytics using Hadoop (Create)
- Use Hadoop-related tools such as HBase, Cassandra,Pig,andHivefor big data analytics. (Modern Tool Usage)
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation (Affective Domain)

TEXT BOOKS :

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2020.
2. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: EmergingBusiness Intelligenceand Analytic TrendsforToday's Businesses",Wiley,2013.
3. EricSammer,"HadoopOperations",O'Reilley,2012.

4. Sadalage,PramodJ.“NoSQLdistilled”,2013

REFERENCE BOOKS :

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. EbenHewitt,"Cassandra:TheDefinitiveGuide",O'Reilley, 2010.
3. AlanGates,"ProgrammingPig",O'Reilley,2011Web Applications : Concepts and Real World Design, Knuckles, Wiley- India

Course Code	Course Name	L	T	P	C
21UITVG66	NETWORKING AND DATA COMMUNICATION	3	0	0	3

COURSE DESIGNATION:

PRE-REQUISTIES:

COURSEOBJECTIVES:

- To describe the general principles of network and data communication components
- To describe the various functionalities of the different layers of the network
- To familiarize the transmission of data and the quality of service in the network
- To acquire the knowledge on the applications of the different protocols.

UNITI	FUNDAMENTALS OF DATA COMMUNICATIONS AND COMPUTER NETWORKS	9

Process of data communication and its components: Transmitter, Receiver, Medium, Message and Protocol. Protocols, Standards, Standard organizations. Bandwidth, Data Transmission Rate, Baud Rate and Bits per second. Modes of Communication (Simplex, Half Duplex, Full Duplex). Classification of Network: LAN, WAN, MAN. Network Architecture: Peer to Peer, Client Server Network.

UNITII	TRANSMISSION MEDIA AND SWITCHING	9

Communication Media: Guided Transmission Media Twisted – Pair Cable, Coaxial Cable, and Fibre – Optic Cable. Unguided Transmission Media Radio Waves, Microwaves, Infrared, Satellite. Multiplexing: Frequency – Division Multiplexing Time - Division Multiplexing. Switching: Circuit – switched networks, Packet – switched networks.

UNITIII	ERROR DETECTION , ERROR CORRECTION AND WIRELESS COMMUNICATION	9

Types of Errors: Single Bit Error and Burst Error, Redundancy. Error Detection: Longitudinal Redundancy Check (LRC), Vertical Redundancy Check (VRC) , Cyclic Redundancy Check (CRC). Error Correction: Forward Error Correction. Wireless Lans, Bluetooth Architecture: Piconet, Scatternet. Mobile Generations: 1G, 2G, 3G, 4G and 5G

UNITIV	NETWORK TOPOLOGIES AND NETWORK DEVICES	9
Network Topologies : Introduction , Definition , Selection , Criteria , Types of Topology - Bus ,Ring, Star, Mesh ,Tree , Hybrid. Network Connecting Devices: Hub , Switch , Router , Repeater , Bridge , Gateway , Modem , Wireless infrastructure components		
UNITV	**REFERENCE MODELS**	**9**
OSI Reference Model: Layered Architecture , Peer –to – Peer Processes – Interfaces between Layer , Protocols , Organization of the Layers, Encapsulation Layers of the OSI Reference Model. TCP /IP Model , Network simulator and Analyzer		
		Total:45Periods

COURSEOUTCOMES :

After the successful completion of this course, the student will be able to :

- Explain the functioning of data communication and computer network [understand]
- Apply suitable switching techniques and transmission media [Apply]
- Analyze the transmission errors with respect to IEEE standards [Analyze]
- Design simple network with various Network Devices.[Modern tool usage]
- Analyze packets in TCP/IP services [Analyze]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation (Affective Domain)

TEXT BOOKS :

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition TMH, 2013.
2. Andrew S Tanenbaum, “Computer Networks”, PHI, 2010.
3. Walliam Stallings , “Data and Computer Communications”, PHI,2002

REFERENCES BOOKS :

1 James F. Kuross, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Addison Wesley, Third Edition, 2004.

2 Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

3 Andrew S Tanenbaum, “Computer Networks”, PHI, 2010.
4 Nader F. Mir, “Computer and Communication Networks”, Pearson Education, 2007.
5 Comer, “Computer Networks and Internets with Internet Applications”, Pearson Education, Fourth Edition, 2007.
6 Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

Course Code	Course Name	L	T	P	C
21UITVG67	Application Development (Full Stack) (Offered By Infosys Springboard)	2	0	2	3

Course Objectives:

- To Design and Develop websites and platforms.
- To introduce about the language briefly as Front-end, Back-end and Database Management Systems.
- Front-end : HTML, CSS, JavaScript,
- Back-end : NodeJS, ExpressJS, Django, Flask, C++
- Database Management Systems : MySQL, SQL SERVER and PostgreSQL, MongoDB, and Oracle Database.

UNIT - I	Full stack Development Introduction	9

Full stack Development-Introduction-Overview-HTML-CSS-Programming-Javascript-NodeJS Development- Mongo DB.

Program:

1. Write a program to create a simple calculator Application using HTML.
2. Write a program to create a voting application using HTML.

UNIT - II	HTML & CSS	9

Introduction to HTML-Browsers and HTML-Editor's Offline and Online-Tags, Attribute and Elements-Doc type Element-Comments-Headings, Paragraphs, and Formatting Text-Lists and Links-Images and Tables-Introduction CSS-Applying CSS to HTML-Selectors, Properties and Values-CSS Colors and Backgrounds-CSS Box Model-CSS Margins, Padding, and Borders-CSS Text and Font Properties-CSS General Topics.

Program:

1. Write a program to create a simple webpage using HTML.
2. Write a program to create a website using HTML CSS and JavaScript.
3. Write a program to build a Chat module using HTML CSS and JavaScript.

UNIT - III	NODE.js	9

Node.js: Why and What Node.js - How to use Node.js - Overview- Basics and Setup-Console-Command Utilities-Modules-Concepts-Events-Express js-Database Access-Create a web server in Node.js - Node Package Manager - Modular programming in Node.js - Restarting Node Application -

File Operations.

Program:

1.Write a program to create a simple calculator Application using Node js

2.Write a program to create a voting application using Node js

3.Write a program to create and Build a Password Strength Check using Node js

4.Write a program to create and Build a star rating system using Node js

5.Create a Simple Login form using Node js

UNIT - IV	JavaScript & React.js	9

Introduction to JavaScript-Applying JavaScript (internal and external)-Understanding JS Syntax-Introduction to Document and Window Object-Variables and Operators-Data Types and Num Type Conversion-Math and String Manipulation

Program:

1. Write a program to create a website using JavaScript.

2. Write a program to build a Chat module using JavaScript.

3. Write a program to create a simple calculator Application using ReactJS.

4. Write a program to create a voting application using React JS.

UNIT - V	Mongo DB	9

Mongo DB: Introduction Module Overview- Document Database Overview- Mongo DB Structure and Architecture- Mongo DB Remote Management- Installing Mongo DB on the local computer (Mac or Windows)- Introduction to Mongo DB Cloud- Install and Configure Mongo DB- Introduction to the Mongo DB Shell- Introduction to the Mongo DB Data Types- Introduction to the CRUD Operations.

Program:

1. Create a project on Grocery delivery application by using Mongo DB.

2. Connecting our TO DO Mongo DB Projectwith Firebase.

Total: 45 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Understand the website platforms [Understand]
- Write the code for Node.js and run the program [Apply]
- Analyze the suitable method of schema using advanced queries. [Analyze]
- Create Angular forms and bind them with model data using data binding. [Create] `

- USE THE MODERN TOOLS given code with original for logical and syntactical errors [Modern Tool Usage]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation [Affective Domain]

TEXT BOOKS :

1. https://infytq.onwingspan.com/
2. Nader Dabit,"Full Stack Serverless: Modern Application Development with React, AWS, and GraphQL",O′Reilly,2020.
3. ShamaHoque ,"Full-Stack React Projects: Learn Mern Stack Development",Packt Publishing Limited,2nd Edition,2020.
4. JuhaHinkula,"Hands-On Full Stack Development with Spring Boot 2 and React",Packt Publishing,2nd Edition,2019.

REFERENCES BOOKS :

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker (First Edition), By Frank Zammetti.
2. Full Stack Serverless: Modern Application Development with React, AWS, and Graph QL (First Edition), BY Nader Dabit.
3. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer (First Edition), By Chris Northw.
4. Full Stack Web Development with Backbone.js: Scalable Application Design with 100% JavaScript (First Edition) ,By Patrick Mulder.

WEBSITE :

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_20858515543254600000_shared/overview (Angular)
https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

Course Code	Course Name	L	T	P	C
21UITVG68	MACHINE LEARNING	3	0	0	3

Course Objectives:

- To Impart basic concepts and techniques in Machine Learning.
- To Familiarize the concepts of Supervised and Unsupervised learning techniques
- To Introduce the Classification and Regression Techniques in Supervised Learning

UNIT - I	INTRODUCTION TO MACHINE LEARNING	9
What is Machine Learning-Types of Machine Learning-Application of Machine Learning-Languages/Tools in machine Learning-Basic Types of Data in Machine Learning-Structure of data-Data quality and Remediation-Data Pre Processing.		
UNIT - II	**MODELLING AND EVALUATION**	**9**
Selecting a model-Training a model-Model representation and Interpretability-Evaluating Performance of a model-Introduction to feature engineering-Feature transformation.		
UNIT - III	**SUPERVISED LEARNING CLASSIFICATION**	**9**
Introduction-Example of Supervised Learning-Classification Model- Classification Learning Steps-Common Classification Algorithms.		
UNIT - IV	**SUPERVISED LEARNING REGRESSION**	**9**
Introduction-Example of Regression-Common Regression algorithms: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression Model, Logistic Regression, Main Problems in Regression Analysis.		
UNIT - V	**UNSUPERVISED LEARNING**	**9**
Introduction-Unsupervised vs. Supervised Learning-Applications of Unsupervised Learning-Clustering: Different Types, Partitioning Methods, K-Medoids, Hierarchical Clustering, Density based Methods.		
		Total: 45 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Explain the concepts and algorithms of machine learning [Understand]
- Apply Machine Learning algorithms to solve real time applications [Apply]

- Identify the suitable Machine learning algorithms for an application to reach a best solution
- [Analyze]
- Design a solution for a given problem using modern tools [Design]
- Present the conclusion of a given problem through presentation in teams or individually [Affective Domain]

TEXT BOOKS:

1. SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning,Pearson,2019.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective" 2nd Edition, CRC Press, 2015

REFERENCES BOOKS:

1. Hastie, Trevor, Tibshirani, Robert, Friedman, Jerome, The Elements of Statistical Learning. Data Mining, Inference, and Prediction, Second Edition,February 2009, Springer.
2. Christopher M. Bishop,Pattern Recognition and Machine Learning, Springer.
3. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
4. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
5. EthemAlpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Mach Learning Series), Third Edition, MIT Press, 2014

Course Code	Course Name	L	T	P	C
21UITVG69	CYBER SECURITY ESSENTIALS	3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of Cyber security and issues and challenges associated with it.
- To understand the cybercrimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.
- To appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.
- To E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.
- To understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

UNIT - I	INTRODUCTION TO CYBER SECURITY	9
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.		
UNIT - II	**CYBER CRIME AND CYBER LAW**	**9**
Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies		
UNIT - III	**SOCIAL MEDIA OVERVIEW AND SECURITY**	**9**
Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges,		

opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case study

UNIT - IV	COMMERCE AND DIGITAL PAYMENTS	9

Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in un-authorised banking transactions. Relevant provisions of Payament Settlement Act,2007.

UNIT - V	DIGITAL DEVICES SECURITY, TOOLS AND TECHNOLOGIES FOR CYBER SECURITY	9

End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions

Total: 45 Periods

COURSE OUTCOMES :

At the end of the course the student will be able to

- Understand the fundamentals and advanced concepts of cyber security, cyber crimes , privacy and security concerns on online social media , E-Commerce and digital payments and cyber space on web Technology.[[Understand]
- Solve the key challenges in the cyber security legal aspects of social media platform, computer and web technology and legal perspective of cyber crime.[Apply]
- Analyze the technologies and platform related to cyber security, cyber crimes , E-commerce and digital payments and protection of computer and mobile.[Analyze]
- Examine the various security related platforms and procedures, best practies of social media platforms and RBI guidelines and preventive measures against digital payment frauds.[Evaluate]
- Develop a procedures relatedprivacy and securityforcybercrime, cyber security, on

online social media, digital payments and mobile and web based technologies.[Create]

- Use modern tools to implement the cyber security and cybercrime related application.[Apply]

REFERENCES BOOKS:

1. An Overview on Cybercrime & Security, Volume – I, By Akash Kamal Mishra · 2020
2. Crime Impact in the New Millennium, by R. C Mishra ,Auther Press. Edition 2010.
3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
4. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
5. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
6. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
7. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
8. Fundamentals of Network Security by E. Maiwald, McGraw Hill.

LIST OF OPEN ELECTIVES

OFFERED BY IT TO OTHER DEPARTMENTS

Course Code	Course Title	L	T	P	C
21UIT971	Animation Technology	3	0	0	3
21UIT972	Basics of Arduino and Raspberry Pi	3	0	0	3
21UIT973	Cyber Forensics and Malware	3	0	0	3
21UIT974	Fundamentals of Database Management Systems	3	0	0	3
21UIT975	Introduction to 3D Animation	3	0	0	3
21UIT976	Learning IT Essentials by Doing	3	0	0	3
21UIT977	Introduction to Logics of Programming	3	0	0	3
21UIT978	Essentials of UI Design	3	0	0	3
21UIT979	Website Designing	3	0	0	3

21UIT971	ANIMATION TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Acquire skills in generating computer graphics and animated pictures
- To impart skills and mastery in the use of different software producing graphics and animation.
- To Impart real-life advertisement exposure in an organization

UNIT I	FUNDAMENTALS	9

History of Animation, Introduction to Animation, Terms used in Animation, Types of Animation – Skills for Animation Artist - Basic Principles of Animation - Animator's Drawing Tools - Rapid Sketching & Drawing.

UNIT II	ANIMATION	9

Developing Animation Character-Anatomy & Body Language- Introduction to equipment required for animation - Developing the characters with computer animation, D virtual drawing for animation, sequential movement drawing-Thumbnails, motion studies, drawing for motion -Essentials &qualities of good animation characters.

UNIT III	2DANIMATION	9

Overview ofFlash-Introduction to the flashinterface –Settingstage dimensions,workingwithpanels, panel layouts - Introduction to drawing and drawing tools in Flash - Panels - Description,modifying,Saving&deletingapanel-Layers&Views.

UNIT IV	3DANIMATION	9

Introduction-Context for 3D Studio Max-Exploring the Max Interface – Controlling & Configuring the viewports-Working with Files, importing exporting-Creating & editing primitive objects.

UNIT V	MODELING	9

Accessing sub objects and using modeling helpers - Introduction to modifier & using modifier stack - Drawing& Editing2DSpines& shapes-Modeling with polygon &Patch-Using the Graphic Modeling &

Painting with objects.

TOTAL PERIODS:45Periods

COURSEOUTCOMES

After thesuccessfulcompletion ofthiscourse,thestudentwillbeable to :

- Applytheknowledgeofprinciplesofanimationandtechniquestocreatetheownvideoand PPTcreation.
- Applytheknowledgeofcomputeranimationto developthecharacters.
- Selectand applytheappropriatetechniquestoimplement the2DAnimation.
- Selectand apply theappropriatetechniquestoimplement the3DAnimation.
- Applytheknowledgeof modeling tasktodesign anapplication.

TEXTBOOKS

1. Chris Patmore," The Complete Animation course", Barons Educational Series, June 2010.
2. Robert R, Snow D, "FlashCS4 Professional Bible", Wiley Publication,4th Edition,2009.

REFERENCEBOOKS

1. AlinGales,"FLASHMX For PC/Mac", Firewall Media, 2011.
2. Fred Halsall., "Multimedia Communications - Applications, Networks, Protocols & Standards", Pearson Education, 2009.
3. Kelly L.Murdock, "3dsMax-Bible", Wiley Publication, 3rd Edition, 2011.
4. RajeshMaurya, “ComputerGraphics”, Wiley Publications,2nd Edition,2010.

21UIT972	BASICS OF ARDUINO AND RASPBERRY Pi	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- This course elucidates concepts related to Internet of Things. The students will get hands on experience in working with Raspberry Pi and Arduino.

UNIT I	Introduction Arduino	9

Introduction to the Arduino, Creating an Arduino programming Environment, Using the Arduino IDE, Creating an Arduino program, Using Libraries, Working with Digital Interfaces, Interfacing with Analog devices, Adding Interrupts, Communicating with devices, Using sensors, Working with Motors, Using an LCD.

UNIT II	Arduino Programming Basics	9

Embedded C -Arduino programming Structure-Control Structure in Arduino -Work in Arduino IDE-Work in Proteus Software-Digital input and output Handling-LCD Interfacing-Serial Communication-Automation using Arduino

UNIT III	Raspberry Pi	9

Introduction to Raspberry Pi -Comparison of various Raspberry Pi -Models Understanding SoC architecture and SoCs used in Raspberry Pi -Pin description of Raspberry Pi -On-board components of Raspberry Pi and their functions- Projects using Raspberry Pi

UNIT IV	Basic operations of the Raspberry Pi	9

Concept of users and the login process- Viewing and modifying the file system- Files and their permissions- The nature of processes and their management- Pin numbering Formats - The Voltage hazard Information. - The LED Interfacing - The First Button Interface with Raspberry Pi - General information on other pins and their functionality.-UART example.

UNIT V	Raspberry Pi for Applications	9

Web Browser Experience. - Mp3 Player. - Video Player - Online Video Streaming - Remote Computing Basics - Connecting Raspberry Pi to a Remote Access Client. - Using Raspberry Pi Remotely.

TOTAL PERIODS:45Periods

COURSEOUTCOMES:

TEXTBOOKS:

1. Richard Blum,Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Education, 2017.

2. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2016.

REFERENCEBOOKS:

1. Donald Norris, Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle Bone Black, 1st Edition, McGraw-Hill,2015.

2. AdealJaved Lake Zurich, Illinois, Building Arduino Projects for the Internet: Experiments with Real-World Applications, 1st Edition, USA, A press,2016

3. Dr. Rajesh Singh, Dr. Anita Gehlot, Dr. Lovi Raj Gupta, NavjotRathour, Mahendra Swain, Bhupendra Singh, IoT based Projects Realization with Raspberry Pi, NodeMCU and Arduino, 1 st Edition, BPB Publications, 2020.

21UIT973	CYBER FORENSICS AND MALWARE	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To set high forensics and ethical standards for cyber security, digital and computer forensics
- To know the hackers and the counter measures against malicious attacks
- To know the malware functionality and detection

UNIT I	INTRODUCTION TO CYBER FORENSICS	9

Introduction: Information Security Investigations – Corporate Cyber Forensics – Scientific method inforensic analysis – Investigating large scale Data breach cases- Types of Computer Forensics Technology–TypesofMilitaryComputerForensicTechnology–BusinessComputerForensic Technology–InternetTracingMethods–OverviewofCyberCrime–TypesofCyberCrime.

UNIT II	NETWORK FORENSIC INVESTIGATION	9

Networkforensicandinvestigation-Logfileasevidence—NetworkTrafficinvestigation—DNS Poisoning Techniques – Evidence Gathering from ARP Table – Evidence Gathering at the Data Link Layer:DHC PDatabase–RouterForensics–InvestigatingDoSAttacks–TypesofDoSAttacks – TechniquestoDetectDoSAttacks–ChallengesinInvestigatingDoSAttacks.

UNIT III	INTERNET AND EMAIL CRIME INVESTIGATION	9

Web Attacks Investigation–Types of Web Attacks –Investigating Web Attack–Investigating FTP Servers , IISlogs ,Apache Logs – Investigating Static and Dynamic IP Addresses—Tools for Locating IP Addresses —Security Strategies for Web Applications. Internet Crime Investigation – Goals of Investigation – Steps for Investigating Internet Crime.

UNIT IV	MOBILE FORENSICS	9
MobileForensicschallenges—CellPhoneCrime—SIMSecurity—Mobilephoneevidence extraction process– Mobile phones Potential evidence – Android security – Android Forensic Setup–AndroidDataExtractionTechniques–AndroidDataRecoveryTechniques.		
UNIT V	**MALWARE**	**9**
Malware Functionality: Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods		
TOTAL PERIODS:45Periods		

COURSEOUTCOMES

After the successful completion of this course, the student will be able to :

- Understand the fundamentals of cyber Forensics technology and its types
- Apply the network components for forensic investigation
- Analyze the malware functionality and detection techniques
- Use the modern Tool to Discover the Cyber Forensics

TEXTBOOKS

1. Dave Gaza, Mathew Kane, "Computer Forensic Investigation Network Intrusions and Cyber Crime", EC-Council Press, USA, 1st Edition, 2010.
2. John R. Vacca, "Computer Forensic: Crime Scene Investigation", Charles River Media, USA, 2nd Edition, 2005.

REFERENCEBOOKS

1. Dr.Darren,R.Heyes,"APracticalGuidetoComputerForensicsInvestigations",Pearson, USA, 1st Edition, 2014
2. Elogan Casey,"HandbookofDigital Forensics andInvestigation",Elsevier,USA, 1st Edition, 2009.
3. Satish Bommisetty, RohiTamma, Heather Mahalik, "Practical Mobile Forensics", PacktPublishing, UK, 1st Edition, 2014.
4. Ryder,RodneyD,"GuidetoCyberLaw",WadhwaPublishing,India,3rdEdition,2007.
5. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006
6. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010

21UIT974	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To impart the knowledge in Relational Database Management Systems.
- To learn SQL and Normalization techniques.
- To familiarize in transaction management.
- To understand the storage and retrieval mechanisms in Databases.

UNIT I	FUNDAMENTALS AND ENTITY-RELATIONSHIP MODEL	9

Introductory concepts of DBMS: Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture-levels, Mappings, Database, users and DBA

Entity-Relationship model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features –generalization, specialization, aggregation, reduction to E-R database schema.

UNIT II	RELATIONAL MODEL AND SQL	9

Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus.

SQL Concepts : Basics of SQL, DDL,DML,DCL, structure –creation, alteration, defining constraints –Primary key, foreign key, unique, not null, check, IN operator, Functions -aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands –Commit, Rollback, Save point.

UNIT III	PL/SQL AND RELATIONAL DATABASE DESIGN	9

PL/SQL Concepts: Cursors, Stored Procedures, Stored Function, Database Triggers.**Relational Database design:** Functional Dependency –definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization –1Nf, 2NF, 3NF, Decomposition using FD-dependency preservation, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF.

UNIT IV	TRANSACTION PROCESSING AND CONCURRENCY CONTROL	9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery

UNIT V	IMPLEMENTATION TECHNIQUES	9

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 – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

TOTAL PERIODS:45Periods

COURSEOUTCOMES

- Understand the basic concepts of DBMS, SQL, Transaction and storage mechanisms.(Understand)
- Apply the Conceptual model of a database using ER modeling, construct queries in relational algebra, and also transaction management concepts used to solve the complex engineering problems of various real time applications.(Apply)
- Analyze various database design techniques to develop a database application for a given scenario.(Analyze)
- Evaluate various storage and query evaluation plans to optimize query cost(Evaluate)
- Design Database for a given real life scenario using the concepts of Relational model and ER diagrams(Create)
- Workindividuallyorinteamsanddemonstratethesolutionstothegivenexercisesthroughpresentation (Affective Domain)

TEXTBOOKS

1. Abraham Silberschatz, Henry F. Korth, Sudharshan.S,"Database System Concepts", Tata McGraw Hill, 5thEd., 2010.
2. Date.C.J, Kannan.A, Swamynathan.S," An Introduction to Database Systems", Pearson Education, 8th Ed., 2006.

REFERENCEBOOKS

1. RamezElmasri, Shamkant B. Navathe," Fundamentals of Database Systems", Pearson Addision Wesley, 4th Ed., 2007.

2. Raghu Ramakrishnan," Database Management Systems", Tata McGraw Hill, 3rd Ed.
3. Singh.S.K," Database Systems Concepts, Design and Applications", Pearson Education, 1st Ed., 2006.

21UIT975	INTRODUCTION TO 3D ANIMATION	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To understand 3D animation principles , modeling
- To Learn essential 3D modeling techniques, polygonal modeling
- To explore different logical constructs used in programming languages.
- To practice writing clear and concise code based on logical principles.

UNIT I	BASIC 3D MODELING TECHNIQUES	9

Overview of 3D animation concepts- Model with Primitives Reference Coordinate Systems - Applying Transforms -Sub-Object Mode, Cloning and Grouping -Poly Modeling -Creating Shapes with Splines- Editing Meshes and Creating Complex Objects

UNIT II	ENHANCING MODELS WITH MATERIALS	9

Understanding Bitmap Texture Maps- Adding Materials to Objects & Material Libraries,-Editing Materials & Map scalar Modifiers-Modeling with displacement Maps - Polygonal modeling techniques- UV mapping

UNIT III	INTRODUCTION TO ANIMATION	9

Copying Key frames, Path Animation and Trax Editor, Anticipation and Momentum in Knife Throwing, Setting Up the Scene and Beginning the Soldier Model

UNIT IV	CHARACTER ANIMATION	9

Character Modelling and Texturing, Skeleton and lks and Keys, Export the character and its animations, Load the Character in Virtools, Material & texture tuning, Merge animations & add behaviors

UNIT V	ANIMATION PRINCIPLES	9

Fundamentals of animation principles- Keyframe animation techniques- Blocking and refining animation- lighting principles-Basic creation and manipulation of light sources- Rendering basics

TOTAL PERIODS:45Periods

COURSEOUTCOMES

After the successful completion of this course, the student will be able to :

- Summarize the basic functionalities and interface of industry-standard 3D animation software.(Understand)
- Apply animation principles to animate characters and objects, demonstrating an understanding of movement and expression.(Apply)
- Analyze the effectiveness of different animation techniques and their applications in storytelling and character development.(Analyze)
- Assess the success of their own animations in conveying narratives and emotions, reflecting on ways to enhance their work.**(**Evaluate)
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation.(Affective Domain)

TEXTBOOKS

1. David Smith, "3D Animation: Foundations and Techniques", Animation Publications,2023.
2. Jeffrey M. Harper, “Mastering Autodesk 3ds Max 2013”, John wiley, 2020.
3. Randi L. Derakshani, “DariushDerakhshani Autodesk® 3ds Max”, 2019.

REFERENCEBOOKS

1. John Smith, "Introduction to 3D Animation: Principles and Techniques", Animation Press 2023
2. Rachel Johnson, "Foundations of 3D Animation: From Theory to Practice", Creative Publishing,2022
3. Michael Thompson, "3D Animation Essentials: A Comprehensive Guide for Beginners", Animation Publishing House,2022

21UIT976	LEARNING IT ESSENTIALS BY DOING	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To provide foundational understanding of essential concepts in Information technology.
- To familiarize with various hardware and software components of computers.
- To enable install, configure, and troubleshoot operating systems.

UNIT I	Introduction to IT Essentials	9

Overview of IT fundamentals-Introduction to hardware and software-Understanding computer components and peripherals-Basic troubleshooting techniques.

UNIT II	Operating Systems	9

Introduction to operating systems (Windows, Linux, macOS)-Installation and configuration of operating systems-File system management-User account management-Basic command-line operations.

UNIT III	Networking Fundamentals	9

Introduction to computer networks - OSI and TCP/IP models - Network devices (router, switch, and modem) - IP addressing and subnetting - Basic network troubleshooting.

UNIT IV	Introduction to Cyber security	9

Understanding cyber security fundamentals - Common cyber threats and attack vectors - Introduction to encryption and cryptography - Basic security best practices - Introduction to antivirus software And firewalls.

UNIT V	Hardware and Software Maintenance	9

Basic hardware maintenance techniques (cleaning, upgrading) - Software installation and updates Disk management and optimization - Backup and recovery procedures.

Total:45Periods

COURSEOUTCOMES

After the successful completion of this course, the student will be able to:

- Demonstrate a basic understanding of IT fundamentals, including hardware, software, and troubleshooting techniques. [Understand]
- Apply basic cyber security principles to assess the security posture of a given system or network and recommend appropriate security measures to mitigate vulnerabilities.[Apply]
- Analyze network traffic logs to identify patterns of suspicious activity and determine potential security threats to the network. [Analyze]
- Use modern tools for the TCP/IP and OSI Models using Network Analysis Tools.[Modern Tool]

TEXTBOOKS

1. "CompTIA IT Fundamentals (ITF+) Study Guide: Exam FC0-U61" by Quentin Docter and Emmett

   Dulaney - This book covers a broad range of IT fundamentals, including hardware, software, Networking, security, and troubleshooting.
2. "Networking Essentials: A CompTIA Network+ N10-008 Textbook" by Jeffrey Beasley and PiyasatNilkaew - This textbook provides a thorough introduction to networking fundamentals, including Network protocols, devices, topologies, and troubleshooting techniques.

REFERENCEBOOKS

1."UNIX and Linux System Administration Handbook" by Evi Nemeth, Garth Snyder, Trent R. Hein, and BenWhaley - This reference book offers comprehensive coverage of Unix and Linux operating Systems, including system administration tasks, command-line operations, and troubleshooting Techniques.

2."Computer Security: Principles and Practice" by William Stallings and Lawrie Brown - This reference book covers the principles and practices of computer security, including cryptography, Access control, security policies, and incident response.

3."Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross - This reference book provides a detailed exploration of networking concepts from both a theoretical and Practical perspective, covering topics such as network protocols, applications, and network security.

21UIT977	INTRODUCTION TO LOGICS OF PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the foundational principles of logic in programming.
- To learn how to apply logical thinking in program design and analysis.
- To develop skills in formal reasoning and verification techniques.
- To explore different logical constructs used in programming languages.
- To practice writing clear and concise code based on logical principles.

UNIT I	FOUNDATIONS OF PROGRAMMING LOGIC	9

Introduction - Importance of logic in programming – Simple program logic – Basics of Algorithmic thinking – Program Development cycle - Pseudo statements and flow charts - Evolution of Programming models – Debugging coded program – Leveraging sentinel values

UNIT II	BASIC PROGRAMMING CONSTRUCTS	9

Declaring & using variables, Datatypes – Performing arithmetic operations – Structure - Control structures : selection –iteration – sequence – Looping- stacking – Nesting – Priming input to structure a program

UNIT III	DECISION MAKING PROGRAMMING	9

Boolean expression & selection statements - The relation comparison operators- AND logic- OR logic- NOT logic – Making selection within range – Logical operator precedence in combining AND or OR

UNIT IV	MODULAR PROGRAMMING	9

Functions – Modularization – Advantages of Modularization – Modularizing a program – Hierarchy Charts- features of good program – Structuring and modularizing unstructured logic

UNIT V	ADVANCED DATAHANDLING CONCEPTS	9

Sorting – Bubble sort – sorting multified records – Insertion sort algorithm – Multidimensional arrays – Indexed files and linked list

TOTAL PERIODS:45Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to :

- Understand the foundational principles of logic in programming to grasp essential concepts for software development.(Understand)
- Apply logical thinking to design and analyze programs effectively, translating abstract logic into practical solutions.(Apply)
- Analyze program logic and structure to identify inefficiencies and errors, enhancing performance through debugging and optimization techniques.(Analyze)
- Apply modern tools like IDEs, debugging tools, and version control systems to streamline development processes.(Apply)
- Work teams or individual to solve the solution to the given exercise in logical problem solving programming(Evaluate)

TEXT BOOKS

1. "Programming Logic and Design" by Joyce Farrell
2. “Foundations of Logic Programming" by J. W. Lloyd
3. “Structure and Interpretation of Computer Programs" by Harold Abelson, Gerald Jay Sussman, and Julie Sussman

REFERENCE BOOKS

1. “Logic in Computer Science: Modelling and Reasoning about Systems" by Michael Huth and Mark Ryan"
2. “Logic for Computer Scientists" by Uwe Schöning
3. “Programming Language Pragmatics" by Michael L. Scott

21UIT978	ESSENTIALS OF UI DESIGN	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- Understand iterative user-centered design of graphical user interfaces
- Apply the user Interfaces to different devices and requirements,
- Create high quality professional documents and artifacts related to the design process.

UNIT I	INTRODUCTION TO USER INTERFACE	9

Defining the User Interface – Importance and Benefits of Good Design - Graphical User Interface –Direct Manipulation - Characteristics of Graphical User Interface- Characteristics of Web User Interface Principles of User Interface Design.

UNIT II	HUMAN COMPUTER INTERACTION	9

Human Characteristics in Design-Human Considerations in Design-Human Interaction Speeds. Business Functions: Business Definition and Requirement Analysis-Determining Basic Business Functions-Design Standards or Style Guides.

UNIT III	MENUS AND WINDOWS	9

Menus: Structures and Functions-Content, Formatting, Phrasing the menu, Selection and Navigation of menus-Graphical Menus. Windows: Characteristics- Components-Presentation Styles- Types Organizations – Web Systems-Characteristics of Device-Based-Controls - Screen based controls: Buttons Text Boxes-Selection Controls-Presentation Controls. Case Study: Improper and proper presentation of Command buttons, Menu bars and pull-down.

UNIT IV	MULTIMEDIA	9

Text for web pages- Effective Feedback– Guidance and Assistance– Internationalization– Accessibility-Icons and Multimedia-Choosing colors for textual and statistical graphics screens-Choosing colors for web pages. Case Study: Voice UI.

UNIT V	WINDOWS LAYOUT– TEST	9
Organizing and Laying out Screens-Prototypes – Kinds of Tests-Developing and Conducting a Test Analyze, Modify and Retest-Evaluate the Working System. Case Study: Mobile UI.		
		TOTAL PERIODS:45Periods

COURSEOUTCOMES:

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

- Explain the characteristics of graphical and web user interface indesigning a user interface for an application[Understand]
- Demonstrate the use of multimedia system components in creating text,graphics, icons, images and video for web pages.[Apply]
- Develop system menus, navigation schemes, windows, buttons, textboxes, selection controls and presentation controls for a user interface.[Analyze]
- Develop test cases and evaluate the working system of windows layoutfor a mobile user interface.[Evaluate]
- Design an effective user interface considering human characteristics, interaction speeds and business functions in relevance to design standards and guidelines.[Create]
- Work individually or in teams and demonstrate the solutions to the real time applications.[Affective]

TEXTBOOKS:

1. Wilbert O. Galitz , "The Essential Guide to User Interface Design - An Introduction to GUI Design Principles and Techniques", Second Edition, John Wiley & Sons, Inc.,2018.
2. Soren Lauesen, "User Interface Design: A Software Engineering Perspective", Pearson/AddisonWesley, 2005.

REFERENCEBOOKS:

1. Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd.,2002.
2. Avram Joel Spolsky, "User Interface Design for Programmers", Apress, 2001.

OTHER REFERENCES

1. https://en.wikipedia.org/wiki/User_interface_design
2. https://www.tutorialspoint.com/software_engineering/software_user_interface_design.html

21UIT979	WEBSITE DESIGNING	L	T	P	C
		3	0	0	3

COURSEDESIGNATION:

PRE-REQUISTIES:

COURSEOBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To Understand the responsive design and development
- To Design a Website with HTML, JS, CSS

UNIT I	INTERNET CONCEPTS	9

Fundamental of Web ,History of Web, Web development overview, Domain Name System (DNS), DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture and protocol (IP) ,Web Browser and Web Server.

UNIT II	WEB DESIGN - HTML MARKUP FOR STRUCTURE	9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT III	CSS AND JAVASCRIPT	9

CSS - Formatting text - Colours and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Javascript - Using Java Script.

UNIT IV	RESPONSIVE WEB DESIGN	9

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design

UNIT V	WEB PROJECT MANAGEMENT	9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development , Communicaton, Documentation - QA and testing -Deployment - Support and operations

TOTAL PERIODS:45Periods

COURSEOUTCOMES

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture (CO1-U)
- Apply various web markups and languages work together to create graphic and interactive web page elements.(CO2-AP).
- Analyze various techniques of responsive web design, including media queries. (CO3-AN)
- Apply appropriate techniques and modern IT tools with an understanding of the Limitations in website designing. (Modern Tool Usage)
- Devise multiple solutions to web development problems and analyze the advantages and disadvantages of each.(CO5-CREATE)

TEXTBOOKS

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

REFERENCEBOOKS

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript &JQuery: Interactive Front-End Web Development", JohnWileyandSons
3. Uttam K. Roy “Web Technologies" Oxford University Press.

ONE CREDIT COURSES

Course Code	Course Title	L	T	P	C
21UIT861	IT-Infrastructure Management Service	1	0	0	1
21UIT862	Fundamentals of 3DAnimation	1	0	0	1
21UIT863	Dart Programming	1	0	0	1
21UIT864	Software development using CASE Tool	0	0	2	1
21UIT865	Essentials of Tableau	0	0	2	1
21UIT866	Microsoft Power BI	1	0	0	1
21UIT867	Logics of Programming	0	0	2	1
21UIT868	ChatBot using Dialog flow	0	0	2	1
21UIT869	Kotlin Programming	0	0	2	1
21UIT870	Blender for Beginners	0	0	2	1
21UIT871	Essentials of Emotional Intelligence	1	0	0	1
21UIT872	UI Design	0	0	2	1
21UIT873	Green Computing	1	0	0	1

21UIT861	IT-Infrastructure Management Service	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To familiarize the students with the characteristics of IT IMS
- To learn the Technology drivers of infrastructure evolution

UNIT I	INTRODUCTION	5

IT IMS-operation and management of an enterprise IT environment. Hardware, Software, network resource, servers, data centers and required for the existence. This discipline of managing & maintaining hardware, network systems and applications and is commonly referred as infrastructure management services (IMS).

UNIT II	INFORMATION TECHNOLOGY ESSENTIALS	5

Information Technology has become critical in every business, right from banking, finance, insurance, automobile, aviation, media, and entertainment and so on. Usage of computers, hardware devices and network is rapidly growing. For businesses, it is becoming very vital to keep the hardware, networks and applications functionally up to date and running in 24 X 7 mode.

UNIT III	IT INFRASTRUCTURE	5

Today it is one of the most rapidly growing disciplines in information technology arena and it is being seen as the third wave in Indian IT industry. Introduction evolution of IT infrastructure. IT IMS market size. Recent trends in IT infrastructure management. Infrastructure components. Technology drivers of infrastructure evolution. IT IMS-industries expectation from an engineer. Employability skills essential for an engineer to be part of the domain — IMS. IT IMS Indian scenario job role & opportunities in IT IMS industry.

TOTAL: 15 PERIODS

COURSE OUTCOMES :

After the successful completion of this course, the student will be able to

- Explain the Infrastructure management service [Understand]
- Apply the employability skills essential for an engineer to be part of the domain – IMS

[Apply]

- Analyze the need of Hardware and Network in a business [Analyse]

TEXT BOOKS

1. Manoj Kumar Choubey, Saurabh Singhal "IT Infrastructure and Management", Pearson,2012
2. Phalguni Gupta," It Infrastructure & Its Management", McGraw-Hill Education (India) Pvt Limited, 2010

21UIT862	FUNDAMENTALS OF 3DANIMATION	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others

UNIT I	BASIC 3D MODELING TECHNIQUES	4

Model with Primitives Reference Coordinate Systems and, Applying Transforms and Sub-Object Mode, Cloning and Grouping and Poly Modeling, Creating Shapes with Splines, Editing Meshes and Creating Complex Objects

UNIT II	ENHANCING MODELS WITH MATERIALS	4

Understanding Bitmap Texture Maps, Adding Materials to Objects & Material Libraries, Editing Materials & Map scalar Modifiers, Modeling with displacement Maps

UNIT III	INTRODUCTION TO ANIMATION	3

Copying Key frames, Path Animation and Trax Editor, Anticipation and Momentum in Knife Throwing,Setting Up the Scene and Beginning the Soldier Model

UNIT IV	CHARACTER ANIMATION	4

Character Modelling and Texturing, Skeleton and lks and Keys, Export the character and its animations, Load the Character in Virtools, Material & texture tuning, Merge animations & add behaviors.

Total: 15 Periods

COURSE OUTCOMES:

After successful completion of the course the student will able to

- Discuss the principles of narrative and timing in relation to 3D animation
- Select and apply the appropriate techniques to implement the 3D Animation
- Create texture, illuminate and render images and backgrounds in the production of simple 3D animation sequences, using 3D animation software

TEXT BOOKS

- Jeffrey M. Harper, “Mastering Autodesk 3ds Max 2013”, John wiley, 2013
- Randi L. Derakshani, “DariushDerakhshani Autodesk® 3ds Max”, 2014.

21UIT863	DART PROGRAMMING	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To introduce the fundamentals of Dart programming language and its syntax.
- To enable learners to build basic applications using Dart.
- To prepare learners for advanced topics like Flutter development.

UNIT I	INTRODUCTION	5

Overview of Dart - Installing Dart SDK and Setup - Dart Tools -Writing and Running Dart Programs - Variables and Data Types - Operators and Expressions

Control Flow Statements: Conditional Statements (if, else, switch)-Loops (for, while, do-while)-Break and Continue Statements.

UNIT II	FUNCTIONS	4

Function Definition and Invocation - Parameters and Return Types - Named and Optional Parameters - Anonymous and Arrow Functions - Higher-Order Functions

UNIT III	OBJECT ORIENTED PROGRAMMING	7

Classes and Objects - Constructors and Named Constructors - Inheritance and Polymorphism - Abstract Classes and Interfaces - Mixins and Extension Methods. **Collections and Generics:** Lists, Sets, and Maps - Iterators and Looping through Collections - Generics in Dart - Collection Manipulation.

Total: 15 Periods

COURSE OUTCOMES:

After successful completion of the course the student will able to

1. Understand the object-oriented programming (OOP) principles in Dart. (Understand)
2. Apply Dart programs using its core features and syntax. (Apply)
3. Analyze and debug Dart programs to fix errors and improve performance.(Analyze)

TEXT BOOKS

1) Dart: Up and Running – Kathy Walrath, Seth Ladd
2) Beginning Flutter with Dart – Rap Payne

REFERENCE BOOKS

1.Dart Programming Language – Gilad Bracha
2.Flutter and Dart: The Complete Guide – Academind by Maximilian Schwarzmüller
3.Dart for Absolute Beginners – David Kopec
4.Flutter in Action – Eric Windmill

21UIT864	Software development using CASE Tool	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To develop skills to perform automated testing using CASE tools like Selenium, JUnit, and QTP.
- To understand how to capture, analyze, and manage software requirements using CASE tools.

LIST OF EXPERIMENTS

1. Implement Automation Testing Approach.
2. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
3. Develop a test suite for any two web sites.
4. Install Selenium server and demonstrate it using a script in Java.
5. Write and test a program to login on any web page.
6. Write and test a program to update N student records in any file.
7. Write and test a program to categorize a set of students based on the performance grading system.
8. Write and test a program to provide total number of objects available on a web page.
9. Write and test a program to get the number of items listed in a combo box on a web page.
10. Write and test a program to count number of check boxes on any web page.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After successful completion of the course the student will able to

- Understand the Software Development Life Cycle (SDLC) and the Role of CASE Tools [Understand]
- Develop Proficiency in Requirement Engineering Using CASE Tools [Apply]
- Master System Design and Modeling Using CASE Tools [Analyse]

HARDWARE AND SOFTWARE REQUIRMENTS :

HARDWARE REQUIREMENTS :

Processor:

- Minimum: Intel Core i5 (or equivalent AMD processor)

- Recommended: Intel Core i7 or higher for better performance.

RAM:

- Minimum: 8 GB
- Recommended: 16 GB or more, especially if running multiple CASE tools or virtual environments.

Operating System:

- Windows 10/11 (64-bit)
- macOS (if the tools are compatible)
- Linux (depending on tool support, especially open-source tools).

SOFTWARE REQUIREMENTS

Modeling Tools: Rational Rose, Enterprise Architect, Visual Paradigm, ArgoUML, or StarUML.
Requirement Analysis Tools: IBM DOORS, RequisitePro.
Project Management Tools: Microsoft Project, Jira, Trello.
Code Generation Tools: Eclipse, IntelliJ IDEA, or Visual Studio.
Testing Tools: Selenium, JUnit, or LoadRunner.

21UIT865	Essentials of Tableau	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To demonstrate the *fundamentals* of analyzing your data in *Tableau*.
- To demonstrate the data exploration, analysis, and visualization using *Tableau's* tools and features.
- To demonstrate the basic visualization

List of Experiments:

1. Introduction to Tableau and Installation
2. Connecting to Data and preparing data for visualization in Tableau
3. Data aggregation and statistical functions
4. Data Visualization in Tableau
5. Basic Dashboards in Tableau
6. Manipulation of data using Tableau
7. R and Tableau Connectivity
8. Data exploration using Tableau Tools

TOTAL: 30 PERIODS

COURSE OUTCOMES :

- Demonstrate familiarity with the Tableau interface, including menus, shelves, and toolbars.[Understand]
- Apply tableau to various data sources, including spreadsheets, databases, and cloud services.[Apply]
- Analyze data using Tableau's built-in functions and tools, including trend lines, forecasting, and aggregations.[Analysis]
- Create a variety of basic visualizations, such as bar charts, line graphs, and scatter plots, to effectively represent data[Design]
- Use modern tools to implement coding[Modern Tool Usage]

21UIT866	MICROSOFT POWER BI	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To recognize and use the key data analysis components of Microsoft Power BI. .
- To describe the different stages in the data analysis process that result in data-driven decisions .

UNIT I	INTRODUCTION	5

Roles of a Data Analyst – Roles working with Data –Essential Data Analyst skills - Introduction to Power BI - Analyzing data with Power BI - Data analysis in business

UNIT II	WORKING WITH POWER BI	5

Power BI datasets - locate your downloaded files - Using data to solve a business problem- Tasks of a data analyst - Sharing data insights- Stakeholder experience

UNIT III	EVALUATION OF DATA	5

The ETL (Extract, Transform, Load) process - Ingesting and gathering data - Storing and managing data- Transforming and cleaning data- Dataset - Cleaning at source in Excel- Data transformed in Power BI- Evaluating data for transformation

TOTAL:15 PERIODS

COURSE OUTCOMES:

- To understand how data is produced and gathered in businesses and organizations [UNDERSTAND]
- To apply key stages in the data analysis process[APPLY]
- To analyze the tasks performed by a Power BI Data Analyst [ANALYSE]

TEXT BOOK

1. Mastering Microsoft Power BI by Brett Powell, Packt publishing, March 2018
2. Beginning Power BI by Dan Clark, A press, Third Edition.

Weblink:

1.https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_014222754400985088251 8

21UIT867	LOGICS OF PROGRAMMING	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To provide exposure to problem-solving through programming
- It Involves a lab component which is designed to give the student hands-on experience with the concepts.

List of Experiments:

1. Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work for fractional part of an hour.
2. At a football match, tickets are sold in three categories: reserved, stands, and grounds. For each of these categories, you are given the ticket price and the number of tickets sold. Write a program to prompt for these values and print the amount of money collected from each category of tickets. Also print the total number of tickets sold and the total amount of money collected
3. Ten numbers are entered from the keyboard into an array. The number to be searched is entered through the keyboard by the user. Write a program to find if the number to be searched is presentin the array and if it is present, display the number of times it appears in the array.
4. Write a program which to find the grace marks for a student using switch. The user should enterthe class obtained by the student and the number of subjects he has failed in.
    - If the student gets first class and the number of subjects he failed is greater than 3, then he does not get any grace. If the number of subjects he failed is less than or equal to 3 then thegrace is of 5 marks per subject.
    - If the student gets second class and the number of subjects he failed is greater than 2, then he does not get any grace. If the number of subjects he failed is less than or equal to 2 thenthe grace is of 4 marks per subject.
    - If the student gets third class and the number of subjects he failed is greater than 1, then he does not get any grace. If the number of subjects he failed is equal to 1 then the grace is of 5marks per subject
5. The user inputs a number and then enters a series of numbers from 1 to that number. Your

program should determine which number (or numbers) is missing or duplicated in the series, if any. For example, if the user entered 5 as the initial number and then entered the following sequences, the results should be as shown.

```
Input Sequence      Output
----------------    --------------
1 2 3 4 5           Nothing bad
```

However, if 7 were the highest number, the user would see the results on the right for the following number entries:

```
Input Sequence          Output
----------------        --------------
1 3 2 4 5               Missing 6
                        Missing 7
```

If 10 were the highest number and the user entered the numbers shown on the left, note the list of missing and duplicate numbers:

```
Input Sequence          Output
----------------------  --------------
1 2 4 7 4 4 5 10 8 2 6  Duplicate 2 (2 times)
                        Missing 3
                        Duplicate 4 (3 times)
                        Missing 9
```

The program should check the highest number that the user inputs to ensure that it does not exceed the size of any array you might be using for storage.

. 6. Write a program to calculate the volume of the following shapes: Cube, Cuboid, Sphere, Cylinder and Cone. Ask the user which one s/he wants to calculate, and take the appropriate required inputs. Then print the result. The input should be taken in the main function and calculations for every solid should be done in a separate function by passing appropriate arguments.

Example:

If the user chooses the option for cube, only one input is required i.e., the side. The volume is thencalculated and printed.

If the user chooses the option for cuboid, only three inputs are required i.e., length, breadth and height. The volume is then calculated and printed

7. An Electricity board charges the following rates for use of electricity.For the First 200 units : Rs 1 per unit

For the next 100 units : Rs 1.5 per unit

Beyond 300 units : Rs 2 Per unit.

Write a Program to read no of unit consumed and print out total charge amount.

8. Create a program that will compute the net salary based on the number of hours worked and their respective rate. If there is overtime, net salary is computed as salary plus overtime pay. Overtime pay is computed based on the number of hours' overtime and their respective overtime rate.

9. Write a guessing game where the user has to guess a secret number. After every guess the program tells the user whether their number was too large or too small. At the end the number of tries needed should be printed. It counts only as one try if they input the same number multiple times consecutively.

10. Write a program that takes the duration of a year (in fractional days) for an imaginary planet as aninput and produces a leap-year rule that minimizes the difference to the planet's solar year.

Note: The students can choose any programming language paradigm.

TOTAL:30 PERIODS

COURSE OUTCOMES:

After Successful completion of the course the student will able to:

- To apply good programming principles to the design and implementation [Apply]
- Analyze different logical structures and formal methods used in programming [Analyse]
- To design, implement, debug and test programs using the fundamental elements [Create]

21UIT868	CHATBOT USING DIALOGFLOW	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To ensure that students gain practical experience and can build, deploy, and test a chatbot using Dialogflow in a structured, hands-on environment.
- To enhance their knowledge and master tools producing good industry standard designs.

LIST OF EXPERIMENTS

1. .How to create chatbots using Google's Dialogflow platform
2. Create an agent for a chatbot in Dialogflow.
3. Create a chatbot to help students learn geography.
4. How to train a bot to wish with a card or image
5. Create custom intents and responses, integrate the chatbot with various platforms.
6. Build a chatbot that can translate text in multiple Languages.
7. Build a chatbot that can detect user sentiment
8. Build a customer support chatbot that can create support tickets.
9. Create a bot that can administer quizzes or trivia games.
10. 10. Design a chatbot with a specific personality (e.g., friendly, formal, humorous)..

TOTAL PERIODS:30 Periods

COURSE OUTCOMES:

After the successful completion of the course, the students will be able to

- Identify the components of Dialogflow's user interface and explain their functionality.[Understand]
- Create and configure basic chatbots using Dialogflow, including defining intents, entities, and basic responses.[Apply]

- Analyze user queries and refine chatbot behavior by adding intents, entities, and context handling to improve accuracy.[Analyse]
- Design and implement a sophisticated chatbot solution that incorporates advanced features such as API integration, webhook fulfillment, and multi-turn conversations.[Design]
- Work individually and as a member in multidisciplinary teams. [Individual/Team work]
  Communicate effectively with the team.[Communication]

21UIT869	KOTLIN PROGRAMMING	L	T	P	C
		0	0	2	1

COURSEOBJECTIVES:

- To understand the fundamentals of Kotlin programming and its syntax.
- To apply Kotlin programming concepts to build robust and interactive applications.
- To analyze Kotlin features like null safety, coroutines, and interoperability with Java for modern application development.

LIST OF EXPERIMENTS

1. Installing and setting up Kotlin programming environment.
2. Writing basic Kotlin programs for input/output operations.
3. Exploring Kotlin data types and control flow constructs.
4. Implementing functions and lambda expressions in Kotlin.
5. Working with collections and data structures in Kotlin.
6. Creating classes, objects, and implementing inheritance.
7. Exploring Kotlin's null safety feature with real-time examples.
8. Implementing coroutines for asynchronous programming.
9. Interoperability between Kotlin and Java in a project.
10. Building a basic Android application using Kotlin.

TOTAL:30 PERIODS

COURSE OUTCOMES:

After the successful completion of the course, the students will be able to

- Understand Kotlin programming fundamentals and its practical applications.[Understand]
- Develop interactive applications using Kotlin programming techniques.[Apply]
- Analyze and utilize Kotlin features for efficient and modern application development.[Analyse]

HARDWARE AND SOFTWARE REQUIRMENTS :

HARDWARE REQUIREMENTS :

1. A computer with at least 8 GB RAM and an Intel i5 processor (or equivalent).
2. SSD for better performance.
3. Android smartphones for testing Kotlin-based Android applications.

SOFTWARE REQUIREMENTS:

1. IntelliJ IDEA or Android Studio as the Integrated Development Environment (IDE).
2. JDK 8 or higher.
3. Kotlin compiler (bundled with IntelliJ IDEA/Android Studio).

21UIT870	BLENDER FOR BEGINNERS	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To introduce students to the fundamentals of Blender, including its interface, tools, and navigation.
- To enable students to apply textures, materials, and lighting to enhance the visual appeal of 3D objects.

LIST OF EXPERIMENTS

1. Installation and configuration of Blender 3.6
2. Simple Cube Animation on Blender 3.6
3. Sword Modeling in Blender 3.6
4. Adding Color to Sword in Blender 3.6
5. Brick Well Modeling in Blender 3.6
6. Modeling a Car in Blender 3.6
7. Animating and making moving gesture on modeled car
8. Adding Color to a Modeled Car in Blender 3.6

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After successful completion of the course the student will able to

- Explain the basic interface, tools, and functionalities of Blender [Understand]
- Apply basic animations using key frame techniques[Apply]
- Examine different modeling techniques to determine the most efficient approach for a given design [Analyse]

HARDWARE AND SOFTWARE REQUIRMENTS :

HARDWARE REQUIREMENTS:

Personal Computer with 8gb RAM, 500GB Hard Disk, Monitor, Mouse, Keyboard

SOFTWAREREQUIREMENTS:

Blender 3.6

21UIT871	ESSENTIALS OF EMOTIONAL INTELLIGENCE	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To introduce emotional intelligence concepts and frameworks
- To learn the core skills required to practice emotional intelligence
- To implement these concepts and techniques in the workplace

UNIT I	INTRODUCTION TO EMOTIONAL INTELLIGENCE	5

Concept of Emotional Intelligence - Contributors to Emotional Intelligence - Science of EmotionalIntelligence - EQ and IQ - Scope of Emotional Intelligence.

UNIT II	COMPONENTS OF EMOTIONAL INTELLIGENCE	5

Self-awareness - Self-regulation — Motivation — Empathy - Social skills. Emotional Intelligence Competencies - Elements of Emotional Intelligence - Models of Emotional Intelligence: The Ability- based Model - The Trait Model of Emotional Intelligence - Mixed Models of Emotional Intelligence.

UNIT III	EMOTIONAL INTELLIGENCE AT WORK PLACE	5

Importance of Emotional Intelligence at Work place - Emotionally Intelligent Leaders - Case Studies Measuring Emotional Intelligence: Emotionally Intelligence Tests - Research on Emotional Intelligence - Developing Emotional Intelligence.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

After successful completion of the course the student will able to

- Analyze various principles of emotional intelligence in different contexts of life.
- Create an emotional intelligence and optimum potentials for better performance

TEXT BOOKS:

1. Joshua Lombard ,"Emotional Intelligence: A Mastery Guide to Controlling Your Emotions andSocial Skills for a Better Life and Boosting Your EQ",2020

2. Liz Wilson, Stephen Neale & Lisa Spencer-Arnell (2020). Emotional Intelligence Coaching.Kogan Page India Private Limited

21UIT872	UI DESIGN	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To know about various techniques of Graphic Design and UI/UX and will develop skills to become a professional designer.
- To enhance their knowledge and master tools producing good industry standard designs.
- Students will be able to work on advertisements, website, and app designs

LIST OF EXPERIMENTS

11. Create a mobile home screen in Figma with its components and create prototype.
12. Create an alarm app screen in Figma with its components and create prototype.
13. Create a Music Player app screen in Figma with its components and create prototype.
14. Create a Calendar app screen in Figma with its components and create prototype.
15. Create an Online shopping app screen in Figma with its components and create prototype.
16. Create a Food app screen in Figma with its components and create prototype.
17. Create a Social media app Login screen in Figma with its components and create prototype.
18. Create a News Blog app screen in Figma with its components and create prototype.
19. Create a Chat app screen in Figma with its components and create prototype.
20. Create a Movie streaming app screen in Figma with its components and create prototype.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After the successful completion of the course, the students will be able to

- Apply a user centered design process in the creation of basic to complex software applications.[Apply]
- Apply the user Interfaces to different devices and requirements[Apply]
- Analyze the functionality of different design related software[Analyze]
- Develop ideas and app designs for various website pages.[Design]
- Design and develop responsive layouts for multi-device and multi-channel applications. [Design]

- Produce prototypes for software applications using industry standard design tools.[Create]

HARDWARE AND SOFTWARE REQUIRMENTS :

HARDWARE REQUIREMENTS :
Computer required: 60 No's
Minimum Requirement: Processor: Processor: Pentium IV, Ram: 1GB, Hard Disk: 80GB

SOFTWARE REQUIREMENTS :
Operating System: Linux (Ubuntu / Fedora / Debian / Mint OS) / Windows Figma Tool.

21UIT873	GREEN COMPUTING	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To learn the fundamentals of Green Computing
- To analyze the Green computing Grid Framework
- To understand the issues related with Green compliance
- To study and develop various case studies.

UNIT I	SUSTAINABLE IT-STRATEGIES AND PRACTICES FOR A GREENER FUTURE	5

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II	GRID FRAMEWORK	5

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT III	GREEN COMPLIANCE	5

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

After the successful completion of the course, the students will be able to

- Explain the green computing practices to minimize negative impacts on the environment.[Understand]
- Apply sustainable IT practices to enhance IT systems and operations[Apply]
- Analyze Green IT challenges and strategies in various industries, evaluating their effectiveness and future potential.[Analyse]

TEXT BOOK

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.

REFERENCE BOOK

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey, Shroff/IBM rebook, 2011
2. John Lamb, ―The Greening of IT, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry, Lulu.com, 2008
4. Carl speshocky, ―Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), ―Green computing: Large Scale energy efficiency, CRC Press

LIST OF COURSES OFFERED BY IT TO OTHER DEPARTMENTS

Course Code	Course Title	L	T	P	C	Offered Dept
21UIT326	Fundamentals of C Programming (Integrated Course)	2	0	2	3	ECE
21UIT327	Data Structure using C (Integrated Course)	3	0	2	4	EEE
21UIT426	Data structures using object oriented programming (Integrated Course)	3	0	2	4	Bio-Medical
21UIT427	Python Object Oriented Programming	3	0	0	3	AGRI
21UIT428	Python Object Oriented Programming Laboratory	0	0	3	1.5	AGRI
21UIT429	Introduction to Data Structures and Algorithms (Integrated Course)	2	0	2	3	ECE

21UIT326	Fundamentals of C Programming (Integrated Course) Offered to ECE	L	T	P	C
		2	0	2	3

COURSEOBJECTIVES:

- To develop C Programs using basic programming constructs
- To develop C programs using functions, array and string
- To develop applications in C using pointers and structures

UNITI	Basics of C, Decision Control and Looping Statements	10+10

Introduction to C - Introduction, Structure of C program, Writing simple C Program, Input and Output statements, Conditional Branching Statements - Iterative Statements, Nested Loops, Break and Continue Statements, goto Statement.

List of Experiments:

1. Implement Simple C Programs
2. Implement C programs using Operators
3. Implement C Programs using Decision Controlstatements

Implement C Programs using Loopingstatements

UNITII	Arrays, Strings and Function	10+10

Arrays – Introduction, Declaration of Arrays, Accessing the Elements of an Array, Operations on Arrays, Passing Arrays to functions, Two dimensional Arrays, Multidimensional Arrays, Strings – Introduction, Operations on Strings, Arrays of Strings.
Function: Introduction, function declaration and definition, function call, return statement, Passing parameter to function, Storage classes, Recursive function.

List of Experiments:

1. Implement C Programs using Arrays
2. Implement C Programs using Strings

Implement C Programs using Function

UNITIII	Pointers and Structures	10+10

Pointers - Introduction to Pointers - Declaring Pointer Variables, Pointers and Arrays, Pointers to Pointers, Dynamic memory allocation, Structure - Introduction, Nested Structures, Arrays of Structures, Structures and Functions.

List of Experiments:

1. Implement C Programs using Pointers
2. Implement C Programs using array of Pointers

Implement C Programs using Structures

Lecture: 30, Practical: 30, Total: 60 Periods

COURSEOUTCOMES

Afterthesuccessfulcompletion ofthiscourse,thestudentwillbeable to :

- Infer the Knowledge of fundamental C programming concepts [Understand]
- Apply various concepts of C program for solving problems [Apply]
- Analyze different features of C program for a given scenario [Analysis]
- Design a solution without anomalies using C programming concept for the given applications [Create]
- Select and apply appropriate tools to implement any few concepts of C programming [Modern Tool Usage]
- Identify the requirement and take further preparation in order to adopt Technological change [Lifelong learning / Communication]

TEXTBOOKS

1. ReemaThareja,"Programming in C", 2nd Edition, Oxford university press, 2015.
2. Yashavant P. Kanetkar,"Let us C", 5th Edition, BPB Publications, 2004.

REFERENCEBOOKS

1. Brian.K.Kernighan,Dennis.M.Ritchie,"The C Programming Language",2nd Edition,Pearson,
2. PradipDey,ManasGhosh, "Computer fundamentals and programming in C",2nd Edition,Oxford university press,2013.
3. Noel Kalicharan,"Learn to program with C", Apress, 2015.

21UIT327	Data Structure using C (Integrated Course) Offered to EEE	L	T	P	C
		3	0	2	4

COURSEOBJECTIVES:

- To develop C Programs using Basic Programming Constructs.
- To develop C Program using Array,Function, Pointer,Structures
- To learn the linear and non-linear data structures
- To learn to represent data using graph data structure

UNITI	C PROGRAMMING BASICS	9+6

Structure of a C program – Data Types - Variables -Constants — Expressions using operators in C – Decision Making and Branching – Looping statements. Arrays – Introduction-Types of Array – One Dimensional Array - Two Dimensional Array.

List of Experiments:

1. Program to Implement Decision Control Statements
2. Program to Implement using Looping Statements
3. Program to Implement using Arrays

Case study:

1. The marks obtained by a student in 5 different subjects are input through the keyboard. The student gets a grade as per the following rules:

   Percentage above or equal to 60 - First grade
   Percentage between 50 and 59 - Second grade
   Percentage between 40 and 49 - Third grade
   Percentage less than 40 - Fail

   Write a program to calculate the grade obtained by the student with the use of logical operators

2. Write a program to pick up the largest number from any 5 row by 5 column matrix.

UNITII	FUNCTIONS, POINTERS, STRUCTURES AND UNIONS	9+6

Function: Introduction, Elements of Function - Pass by value – Pass by reference – Pointers - Definition – Declaration of Pointers – Initialization of Pointers-Dynamic Memory Allocation- Structure – Definition and Declaration – Nested Structure – Union.

List of Experiments:

1. Program to Implement using Function
2. Program to Implement using Pointers
3. Program to Implement using Structure

Case study:

1. Write a C program to read and display student details using structure.
2. An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.
   (a) Specify a structure to store information corresponding to a part.
   (b) Write a program to retrieve information on parts with serial numbers between BB1 and CC6.

A record contains name of cricketer, his age and number of test matches that he has played and the average runs that he has scored in each test match. Create an array of structure to hold records of 20 such cricketer and then write a program to read these records and arrange them in ascending order by average runs. Use the quicksort( ) standard library function.

UNITIII	LINEAR DATA STRUCTURES(STACK, QUEUE, LIST)	9+6

Abstract Data Type- Arrays and its representations – lists – Types of list— Singly linked lists - Operation of List- implementation of List using ADT- Stacks and Queue – implementation of Stacks and Queues using ADT

List of Experiments:

1. Program to Implement Stack ADT using Array and Singly Linked List
2. Program to Implement Queue ADT using Array and Singly Linked List
3. Program to Implement Insertion and Deletion using Singly Linked List

Case study:

. Design, develop and Implement a Program for the following operations on STACK of Characters (Array Implementation of STACK with maximum size MAX)

a. Push an Element on to STACK
b. Pop an Element from STACK
c. Demonstrate STACK FULL and STACK EMPTY situations on STACK Display the status
d. Exit.

UNITIV	NON-LINEAR DATA STRUCTURES (TREE, GRAPH)	10 + 6

Trees – Binary Trees – Binary tree representation and traversals — Applications of trees. Graph and its representations – Graph Traversals- Minimum Spanning Trees – Prim's and Kruskal's Algorithm Shortest path algorithm –Dijkstr'salgorithm

List of Experiments:

1. Program to Implement Prim's Algorithm to find MST of an undirected graph.
2. Program to Implement Kruskal's Algorithm to find MST of an undirected graph.

Case study:

Design, Develop and Implement a Program for the following operations on Binary Tree of Integers

a. Create a Binary Tree of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2
b. Traverse the Binary Tree in Inorder, Preorder and Post Order
c. Search the Binary Tree for a given element (KEY) and report the appropriate message

Exit

UNITV	SORTING	8 + 6

Sorting - Bubble Sort, Selection Sort, Insertion sort – Merge sort – Quick sort – Hashing- Hash tables.

List of Experiments:

1. Program to Implement Bubble sort and Selection sort
2. Program to Implement Quick sort
3. Program to Implement Hashing

Case study:

1. Create a text file containing the name, height, weight of the students in a class. Perform Quick sort and Merge sort on this data and store the resultant data in two separate files. Also write the time taken by the two sorting methods into the respective files.

   Eg. Sony Mathew 5.5 60
   ArunSajeev 5.7 58
   Rajesh Kumar 6.1 70

2. Write a program to perform the sort of an array of numbers in descending order using Selection sort. and then show the iterations of the sorting process 42, 34, 75, 23, 21, 18, 90, 67, 78

TOTAL PERIODS:45Periods

COURSEOUTCOMES

- Infer the Knowledge of Basics of C Programming Concepts[Understand]
- Apply various Concepts of C program for solving problems[Apply]
- Compare and contrast alternative data structure applications to select the best process [Analyze]
- Design and develop efficient linear, non-linear, sorting, searching and hashing data structure algorithms to solve problems. [Create]
- Evaluate the problems and find solutions using linear, non-linear applications, searching, sorting and hashing algorithms.[Evaluate]
- Select and apply appropriate data structures to design algorithms using modern tool.[Apply]

TEXTBOOKS

1. Yashavant P. Kanetkar,"Let us C", 5th Edition, BPB Publications, 2004.
2. ReemaThareja,"Data Structures Using C", Oxford University Press, Second Edition, 2014

REFERENCEBOOKS

1. Brian.K.Kernighan,Dennis.M.Ritchie,"The C Programming Language", 2nd Edition, Pearson
2. Weiss. M.A, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2012
3. Aaron M.Tenenbaum, YedidyahLangsam, Moshe J.Augenstein, "Data Structures using C", Pearson Education India, 7th Edition, New Delhi, 2009.
4. Aho.V, Hopcroft.J.E, Ullman.J.D, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006

21UIT426	DATA STRUCTURESUSING OBJECT ORIENTED PROGRAMMING (**INTEGRATED COURSE**)	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

COURSEOBJECTIVES:

- To describe the principles of object oriented programming
- To elucidate the systematic way of solving problems using various linear and non-linear data structures
- To demonstrate the different linear and non-linear data structures

UNITI	**Principles of Object Oriented Programming**	**9+6**

Introduction – Tokens – Expressions- Control structures-Functions in C++, Classes and Objects, Constructors and Destructors, Operator overloading.

Experiments:

1. Program to implement operator overloading
2. Program to implement constructor, destructor and copy constructor

UNITII	**Advanced Object Oriented Programming**	**9+6**

Inheritance-Extending classes, pointers, virtual functions and polymorphism, File handling, Templates, Manipulating strings, Exception handling.

Experiments:

1. Program to implement inheritance concepts
2. Program to implement templates and manipulating string

UNITIII	**Linear Data Structures**	**9+6**

Abstract Data Types (ADTs)- ListADT –Array based implementation - Linked list implementation - Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications, Stack ADT – Operations – Applications, Queue ADT – Operations- Applications.

Experiments:

1. Program to implement stack ADT using array and linked list
2. Program to implement queue ADT using array and linked list.

UNITIV	**Non-Linear Data Structures**	**9+6**

Tree – Tree Traversal – Binary Trees – Binary Search Tree – AVL Tree - Priority Queues - Binary Heaps, Graph – Representation of Graphs – Topological Sort – Shortest Path Algorithms - Minimum Spanning Tree.

Experiments:

1. Program to implement binary search tree.
2. Program to implement insertion and deletion in AVL trees

UNITV	Sorting and Hashing Techniques	9+6

Sorting – Bubble sort, Insertion sort, Selection sort, Shell sort, Merge sort, Quick sort, Hashing – Hash Functions – Separate Chaining – Open Addressing.

Experiments:

1. Program to implement merge sort
2. Program to implement quick sort

Lecture: 45, Practical: 30, Total: 75 Periods

Course Outcomes

At the end of the course the student will be able to

- Understand the use of linear, non-linear data structures and object oriented approaches to solve the problems in real time applications.[Understand]
- Apply the linear, non-linear data structures and object oriented approachesto solve variety of computational problems.[Apply]
- Analyze the efficiency of various algorithmic approach through object oriented programming to solve real world applications with approach[Analysis]
- Design and develop efficient and effective algorithms to solve problems[Create]
- Evaluate the problems and find solutions using various linear and non-linear applications.[Evaluate]
- Select and apply appropriate data structures to design algorithms using modern tool.[Apply]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation.[Affective Domain]

HARDWARE/SOFTWARE REQUIREMENTS

Hardware Requirements:

Computer Required: 30 No's

Minimum Requirement: Processor- Pentium IV, Ram: 1 GB, Hard Disk: 80 GB

Software Requirements

Operating System: Linux (Ubuntu) / Windows

Turbo C Version 3 or GCC Version 4 / Built in Linux / DEVC++

TEXT BOOKS

1. E.Balagurusamy,"Object Oriented Programming with C++", Tata McGrawHill, 6th Edition, 2013.
2. Weiss. M.A,"Data Structures and Algorithm Analysis in C++", Pearson Education, 4th Edition,2014.

REFERENCES

1. BhusanTrivedi,"Programming with ANSI C++ - A Step by Step Approach", Oxford University Press, 2nd Edition, 2014.
2. Stroustrup B,"The C++ Programming Language", Pearson Education, 4th Edition,2013.
3. Aho V, Hopcroft J E, Ullman.J.D,"Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006.
4. Gilberg R F, Forouzan.B.A,"DataStructures:APseudocode Approach with C++", Thomson IndiaEducation, 2nd Edition,2005

21UIT427	Python Object Oriented Programming Offered to AGRI	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To acquire programming skills in core python
- To learn about the usage of python shell for running programs
- To understand the different data types available in python.
- To acquire object oriented skills in python
- To understand the creation and usage of various modules and packages

UNITI	Fundamentals of python programming	9

Introduction – Data types – variables –Basic I/O operations – Decision Making – Loops – Modules and packages – Organizing modules –Third party libraries

UNITII	Python Data structures	9

Python Data structures – Tuples and named tuples – Dictionaries – counters – Lists – Sorting lists – Sets – Extending built-ins – Queues – FIFO Queue – LIFO Queue – priority queue

UNITIII	Object oriented programming methodologies	9

Object oriented programming – creating python classes – Initializing objects — Python object recognition – Data and behavior – Wrapping data in behavior using properties – Objects and classes - Abstraction – overview of inheritance and its types

UNITIV	Inheritance and polymorphism	9

Python built-in functions – Default arguments – variable arguments – Lists – unpacking arguments – Basic inheritance – Extending built-ins – Overriding and super – Multiple inheritance – polymorphism – Abstract base classes

UNITV	Python Strings and Exception Handling	9

Strings – String manipulation – String formatting – Escaping braces – Keyword arguments – Container lookups - object lookups – Exception handling – Raising exception – Effects of exception – Handling the exception - Exception hierarchy – Creating our own exceptions – case study.

TOTAL PERIODS:45Periods

COURSEOUTCOMES:

At the end of the course the student will be able to

- Understand the principles of object-oriented problem solving and programming and Outline the essential features and elements of the C++ programming language.[Understand]
- Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism to solve the complex engineering problems.[Apply]
- Analyze problems and implement simple python applications using an object-oriented software engineering approach.[Analysis]
- Design user interface using Tkinter and turtle graphics for application development.[Design]
- Use modern tools for the creation of various application software using python modules.[Modern Tool Usage]
- Function effectively as a member or leader in a team by participating in the development of software Project.[Individual and Team Member]

TEXTBOOKS

1. Python 3 Object Oriented Programming - Second Edition by Dusty Phillips

REFERENCEBOOKS

1. Python crash course – 2nd Edition, "A hands-on project based introduction to programming" by Eric matthes.
2. Learning Python – 5th Edition by mark lutz – O'Reilly media
3. Introduction to python, Kenneth A. Lambert, Cengage.

21UIT428	Python Object Oriented Programming Laboratory (Offered to AGRI)	L	T	P	C
		0	0	3	1.5

COURSEDESIGNATION:

PRE-REQUISTIES:

COURSEOBJECTIVES:

- To interpret the use of procedural statements like assignments, conditional statements, loops and function calls.
- To infer the supported data structures like lists, dictionaries and tuples in Python.
- To understand the need for Object-oriented programming concepts in Python.

LIST OF EXPERIMENTS

1. Develop a program to implement basic I/O operations in python.
2. Develop a program to demonstrate decision making and loops in python.
3. Develop a python program to demonstrate lists, tuples and dictionary
4. Develop a python program to demonstrate sets and queues.
5. Develop a python program to demonstrate object initialization.
6. Develop a python program to demonstrate wrapper behavior using properties.
7. Develop a python program to implement single and multiple inheritance.
8. Develop a python program to implement single and multiple polymorphism and abstract classes.
9. Develop a python program to implement string handling and string formatting.
10. Develop a python program to implement Exception handling.

TOTAL PERIODS:30Periods

COURSEOUTCOMES

At the end of the course the student will be able to

- Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics, science, and games.[Remember/Understaand]

- Implement the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.[Apply]
- Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.[Analysis]
- Design user interface using various inbuilt-modules and packages in python[Design]
- Select and apply appropriate tools to implement the advanced concepts of python programming[Modern Tool Usage]
- Work in a diversified team.[Individual and Team Member]

21UIT429	Introduction to Data Structures and Algorithms (Integrated Course)	L	T	P	C
		2	0	2	3

COURSEOBJECTIVES:

1. To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
2. To impart a thorough understanding of linear non-linear data structures such as list, stacks, queues, trees, graphs and their applications.

UNITI	LINEAR DATA STRUCUTRE – ARRAYS, LIST	10+8

Abstract Data Type – Approaches to design an Algorithm – Complexity – Arrays: Accessing Elements – Operations – List ADT: Memory Allocation and De-allocation – Singly linked lists – Circular linked lists – Doubly linked lists – Applications of lists – Polynomial Manipulation

EXPERIMENTS:

1. Program to implement Arrays.
2. Program to implement Singly Linked List ADT
3. Program to implement Doubly Linked List

UNITII	LINEAR DATA STRUCUTRE – STACK, QUEUE	10+12

Stack ADT: Array & Linked Representation – Applications of Stack – Balancing Parenthesis – Arithmetic expressions (Conversion & Evaluation) – Recursion - Queue ADT: Array & Linked Representation – Circular Queue – Applications of Queue.

EXPERIMENTS:

1. Program to implement stack ADT using array and linked list
2. Program to implement stack and use it to Evaluate postfix expression
3. Program to implement queue ADT use array and linked list

UNITIII	NON-**LINEAR DATA STRUCUTRE – TREE, GRAPH**	10+10

Tree – Basic Terminology – Traversal – Operations: Binary trees – Expression Tree – Binary Search tree – AVL tree – Graph Terminology – Representation of Graphs – Graph Traversal – Topological sort – Minimum Spanning Tree – Shortest path algorithm.

EXPERIMENTS:

1. Program to implement insertion and deletion in AVL trees
2. Program to implement Prim's /Kruskal'salgorithm using priority queues to find MST of an undirected graph.

TOTAL PERIODS: 30+30Periods

COURSE OUTCOMES:

At the end of the course the student will be able to

- Understand the basic concepts of various linear and non-linear data structures.[Understand]
- Apply linear and non-linear data structure algorithms to find solutions to solve complex engineering problems.[Apply]
- Analyze different programs for different data structure algorithms and calculate the efficiency of the algorithms.[Analyze]
- Evaluate the problems and find solutions using various linear and non-linear applications.[Evaluate]
- Design and develop efficient linear, non-linear, data structure algorithms to solve problems.[Create]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation.[Value]

TEXT BOOKS

1. ReemaThareja, “Data Structures Using C”, Oxford University Press, Second Edition, 2014.
2. Weiss. M.A, “Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2012

REFERENCE BOOKS:

3. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, ”Data Structures using C”, Pearson Education Asia, 2004
4. Aho.V, Hopcroft.J.E, Ullman.J.D, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006.
5. Gilberg.R.F, Forouzan.B.A, "Data Structures", Thomson India Education, 2nd Edition, 2005.
6. Sara Baase and A.VanGelder, "Computer Algorithms", Pearson Education, 3rd Edition, 2005.
7. Cormen.T.H, C.A.Leiserson.B.A, R.L.Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2009.