SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS 2020
(R - 2020)

CURRICULUM

Dr.K.PREMKUMAR
Professor & Head
Dept. of Computer Science and Engg.
Sri Manakula Vinayagar Engg. College
[An Autonomous Institution]

23 years of ACADEMIC EXCELLENCE

COLLEGE VISION AND MISSION

VISION

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

MISSION

M1: Quality Education : To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation : To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship : To inculcate the employability and entrepreneurial skills through value and skill-based training.

M4: Ethical Values : To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

VISION

To create a productive learning and research environment for graduates to become highly dynamic, competent, ethically responsible, professionally knowledgeable in the field of computer science and engineering to meet the industrial needs on par with global standards.

MISSION

M1: Quality Education: Empowering the students with the necessary technical skills through quality education to grow professionally.

M2: Innovative Research: Advocating the innovative research ideas by incorporating with industries for developing products and services.

M3: Placement and Entrepreneurship: Advancing the education by strengthening the Industry-academic relationship through hands-on training to seek placement in the top most industries or to develop a start-ups.

M4: Ethics and Social Responsibilities: Stimulating professional behaviour and good ethical values to improve the leadership skills and social responsibilities.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

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

PO2: Problem analysis:

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

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:**

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Competitive Platform: To create a competitive platform for solving critical problems in a wide variety of fields.

PEO2: Exploration: Enthusiastic participation in learning, understanding, designing and applying new innovative research ideas as the field evolves.

PEO3: Career: Applying cutting-edge technology that improves knowledge and to commit students for life-long learning to reach the leading positions in the career.

PEO4: Professional Values: Simulate the graduates to hold the responsibilities in the context of technology, ethics, society and humanity.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Computational Skills: Graduates with the ability to apply basic knowledge of Computer Science in solving the critical problems.

PSO2: Studious Research: Ability to convert innovative ideas into research or society oriented projects through current trending technologies.

PSO3: Employability: Acquire placement in highly reputed industries or accomplish new technical business skills with the contemporary trends in the industry.

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl.No.	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	7
2	Basic Sciences(BS)	16
3	Engineering Sciences (ES)	31
4	Professional Core (PC)	71
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Project Work and Internship	12
8	Employability Enhancement Courses (EEC)	-
9	Mandatory courses (MC)	-
Total		**164**

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

Sl.No	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	-	-	1	1	-	3	1	1	07
2	Basic Sciences(BS)	3	3	4	3	3	-	-	-	16
3	Engineering Sciences (ES)	15	4	8	4	-	-	-	-	31
4	Professional Core (PC)	-	14	10	8	12	15	9	3	71
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	3	3	-	3	-	09
7	Project Work and Internship	-	-	-	-	-	-	4	8	12
8	Employability Enhancement Courses (EEC)*	-	-	-	-	-	-	-	-	-
9	Mandatory Courses (MC)*	-	-	-	-	-	-	-	-	-
Total		**18**	**21**	**23**	**22**	**21**	**21**	**20**	**18**	**164**

**** EEC and MC are not included for CGPA calculation***

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST101	Engineering Mathematics – I (Calculus and Linear Algebra)	BS	2	2	0	3	25	75	100
2	U20EST106	Introduction to Engineering: Distinction, Principles and Application	ES	3	0	0	3	25	75	100
3	U20EST107	Micro Electronics and Digital System Design	ES	2	2	0	3	25	75	100
4	U20EST109	Problem Solving Approach	ES	3	0	0	3	25	75	100
5	U20EST110	Programming in Python	ES	3	0	0	3	25	75	100
Practical										
6	U20ESP108	Micro Electronics and Digital System Design Laboratory	ES	0	0	2	1	50	50	100
7	U20ESP111	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
8	U20ESP112	Engineering Graphics Using AutoCAD	ES	0	0	2	1	50	50	100
Employability Enhancement Course										
9	U20CSC1XX	Certification Course - I	EEC	0	0	4	-	100	-	100
Mandatory Course										
10	U20CSM101	Induction Program	MC	3 Weeks			-	-	-	-
							18	375	525	900

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST215	Engineering Mathematics – II (Multiple Integrals and Transforms)	BS	2	2	0	3	25	75	100
2	U20EST201	Programming in C	ES	3	0	0	3	25	75	100
3	U20CST201	Microprocessors and Microcontrollers	PC	3	0	0	3	25	75	100
4	U20CST202	Front-End Web Development	PC	3	0	0	3	25	75	100
5	U20CST203	Computer Organization and Architecture	PC	3	0	0	3	25	75	100
6	U20CST204	Computer Graphics	PC	3	0	0	3	25	75	100
Practical										
7	U20ESP202	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U20CSP201	Microprocessors and Microcontrollers Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP202	Front-End Web Development Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC2XX	Certification Course - II	EEC	0	0	4	-	100	-	100
11	U20CSS201	Skill Development Course 1*	EEC	0	0	2	-	100	-	100
Mandatory Course										
12	U20CSM202	Environmental Science	MC	2	0	0	-	100	-	100
							21	600	600	1200

**** Skill Development Courses (1, 2 and 3) are to be selected from the list given in Annexure IV***

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST322	Numerical Methods	BS	2	2	0	3	25	75	100
2	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
3	U20EST359	Programming in C++	ES	3	0	0	3	25	75	100
4	U20CST305	Automata and Compiler Design	PC	2	2	0	3	25	75	100
5	U20CST306	Operating Systems	PC	3	0	0	3	25	75	100
6	U20CST307	Data Communications and Computer Networks	PC	3	0	0	3	25	75	100
Practical										
7	U20HSP301	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U20BSP323	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
9	U20ESP357	Data Structures Laboratory	ES	0	0	2	1	50	50	100
10	U20ESP360	Programming in C++ Laboratory	ES	0	0	2	1	50	50	100
11	U20CSP303	Linux Internals Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
12	U20CSC3XX	Certification Course - III	EEC	0	0	4	-	100	-	100
13	U20CSS302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20CSM303	Physical Education	MC	0	0	2	-	100	-	100
							23	700	700	1400

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST432	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U20EST467	Programming in Java	ES	3	0	0	3	25	75	100
3	U20CST408	Database Management Systems	PC	3	0	0	3	25	75	100
4	U20CST409	Design and Analysis of Algorithms	PC	2	2	0	3	25	75	100
5	U20CSE4XX	Professional Elective - I	PE	3	0	0	3	25	75	100
6	U20XXO4XX	Open Elective - I	OE	3	0	0	3	25	75	100
Practical										
7	U20HSP402	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U20ESP468	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
9	U20CSP404	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
10	U20CSP405	Design and Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CSC4XX	Certification Course - IV	EEC	0	0	4	-	100	-	100
12	U20CSS403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CSM404	NSS	MC	0	0	2	-	100	-	100
							22	650	650	1300

**** Skill Development Courses (1, 2 and 3) are to be selected from the list given in Annexure IV***

SEMESTER – V										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST546	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U20CST510	Handheld Computing: Design and Application Development	PC	3	0	0	3	25	75	100
3	U20CST511	Programming in PHP	PC	3	0	0	3	25	75	100
4	U20CST512	Software Engineering and Testing	PC	3	0	0	3	25	75	100
5	U20CSE5XX	Professional Elective - II	PE	3	0	0	3	25	75	100
6	U20XXO5XX	Open Elective – II	OE	3	0	0	3	25	75	100
Practical										
7	U20CSP506	Handheld Computing Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP507	Programming in PHP Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP508	Software Testing Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC5XX	Certification Course - V	EEC	0	0	4	-	100	-	100
11	U20CSS504	Skill Development Course 4: Foreign Language/ IELTS – I/Career and Professional Skill Development Program - I	EEC	0	0	2	-	100	-	100
12	U20CSS505	Skill Development Course 5: Presentation Skills using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CSM505	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	1300

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CST613	Artificial Intelligence and Expert Systems	PC	2	2	0	3	25	75	100
2	U20CSCM02	C# and .Net Programming	PC	3	0	0	3	25	75	100
3	U20CST615	Cloud Computing and Big Data	PC	3	0	0	3	25	75	100
4	U20CST616	Animation and Visual Effects	PC	3	0	0	3	25	75	100
5	U20CSE6XX	Professional Elective - III	PE	3	0	0	3	25	75	100
6	U20XXO6XX	Open Elective - III	HS	3	0	0	3	25	75	100
Practical										
7	U20CSP609	Artificial Intelligence and Expert Systems Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP610	C# and .Net Programming Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP611	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC6XX	Certification Course - VI	EEC	0	0	4	-	100	-	100
11	U20CSS606	Skill Development Course 6: Foreign Language / IELTS – II/Career and Professional Skill Development Program -II	EEC	0	0	2	-	100	-	100
12	U20CSS607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
13	U20CSS608	Skill Development Course 8: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U20CSM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	800	600	1400

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20ITCM03	IoT and Edge Computing	PC	3	0	0	3	25	75	100
2	U20CST718	Data Science and Digital Marketing Analytics	PC	3	0	0	3	25	75	100
3	U20CSE7XX	Professional Elective – IV	PE	3	0	0	3	25	75	100
4	U20XXO7XX	Open Elective – IV	OE	3	0	0	3	25	75	100
Practical										
5	U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U20CSP712	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
7	U20CSP713	Data Science and Digital Marketing Analytics Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP714	Comprehensive Viva-Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20CSW701	Project phase – I	PW	0	0	4	2	50	50	100
10	U20CSW702	Internship / Inplant Training	PW	0	0	0	2	100	-	100
Mandatory Course										
11	U20CSM707	Professional Ethics	MC	2	0	0	-	100	-	100
							20	600	500	1100

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20ADCM02	Block chain and Cryptography	PC	3	0	0	3	25	75	100
2	U20CSE8XX	Professional Elective – V	PE	3	0	0	3	25	75	100
3	U20CSE8XX	Professional Elective – VI	PE	3	0	0	3	25	75	100
Practical										
4	U20HSP804	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U20CSW803	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U20CSS809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							18	315	285	600

ANNEXURE - I
PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE401	Database Administration
2.	U20CSE402	E-Business
3.	U20CSE403	Object Oriented Analysis And Design
4.	U20CSE404	Scripting Languages
5.	U20CSE405	Fundamentals of Programming Languages
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE506	Enterprise Solutions
2.	U20CSE507	Game Development using Unity
3.	U20CSE508	Functional Programming
4.	U20ITCM04	Robotics Process Automation
5.	U20CSCM01	Software Project Management
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSCM03	Augmented Reality
2.	U20CSE612	Service Oriented Architecture
3.	U20CSE613	Agile Development
4.	U20CSE614	Embedded Systems
5.	U20CSE615	Assistive Technology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20ITCM01	Network Security
2.	U20CSE717	Data Mining and Warehousing
3.	U20CSCM04	Virtual Reality
4.	U20CSE719	Robotics
5.	U20CSE720	Haptic Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE821	Ethical Hacking
2.	U20ITCM09	Deep Learning
3.	U20ITCM02	Mobile Computing
4.	U20CSE824	Pervasive Computing
5.	U20CSE825	Cyber Security and Digital Forensics
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE826	Quantum Computing
2.	U20CSE827	Trust Computing
3.	U20CSE828	Client Server Computing
4.	U20CSCM05	Human Computer Interaction
5.	U20CSE830	Natural Language Processing

ANNEXURE - II
OPEN ELECTIVE COURSES (R-2020)

S.No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U20EEO401	Solar Photovoltaic Fundamental and applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE
2	U20EEO402	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT
3	U20ECO401	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U20ECO402	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U20CSO401	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U20CSO402	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U20ITO401	Database System: Design & Development	IT	EEE, ECE, ICE, CCE, BME
8	U20ITO402	R programming	IT	EEE, ECE, ICE, CCE, BME, MECH, Mechatronics
9	U20ICO401	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT
10	U20ICO402	Industrial Safety Management	ICE	CSE, IT, MECH, CCE, AI&DS
11	U20MEO401	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
12	U20MEO402	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
13	U20MEO403	Industrial Engineering for Textile	MECH	FT
14	U20CEO401	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, FT
15	U20CEO402	Building Science and Engineering	CIVIL	EEE, MECH, BME
16	U20BMO401	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS
17	U20BMO402	Telemedicine	BME	EEE, ECE, CSE, IT, ICE, CCE, AI&DS
18	U20CCO401	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20CCO402	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
20	U20ADO401	Knowledge Representation and Reasoning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20ADO402	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

Open Elective – II / Open Elective – III				
1	U20HSO501/ U20HSO601	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics, AI&DS**)
2	U20HSO502/ U20HSO602	Intellectual Property and Rights	MBA	
3	U20HSO503/ U20HSO603	Marketing Management and Research	MBA	
4	U20HSO504/ U20HSO604	Project Management for Engineers	MBA	
5	U20HSO505/ U20HSO605	Finance for Engineers	MBA	
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics, AI&DS**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**)				
1	U20EEO503 / U20EEO603	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS, FT
2	U20EEO504 / U20EEO604	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics, AI&DS
3	U20ECO503/ U20ECO603	Electronic Product Design and Packaging	ECE	EEE, CSE, IT, ICE, MECH, CCE, BME, Mechatronics
4	U20ECO504/ U20ECO604	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U20CSO503/ U20CSO603	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
6	U20CSO504/ U20CSO604	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, FT
7	U20ITO503/ U20ITO603	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U20ITO504/ U20ITO604	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
9	U20ICCM01	Fuzzy logic and neural networks	ICE	EEE, ECE, CCE, CSE, IT, CIVIL, BME, AI&DS
10	U20ICO504/ U20ICO604	Measurement and Instrumentation	ICE	ECE, Mechatronics
11	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
13	U20CEO503/ U20CEO603	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
14	U20CEO504/ U20CEO604	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20BMO503/ U20BMO603	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics
16	U20BMO504/ U20BMO604	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL , Mechatronics

17	U20CCO503/ U20CCO603	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
18	U20CCO504/ U20CCO604	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
20	U20ADO504/ U20ADO604	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20MCO501/ U20MCO601	Industrial Automation for Textile	Mechatronics	FT
Open Elective – IV (Offered in Semester VII)				
1	U20EEO705	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U20EEO706	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS
3	U20ECO705	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, FT
4	U20ECO706	Sensor for Industrial applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U20CSO705	Artificial Intelligence	CSE	EEE, ICE, CIVIL, CCE, MECH, FT
6	U20CSO706	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, CCE, BME, Mechatronics
7	U20ITCM08	Automation Techniques & Tools- DevOps	IT	EEE, ECE, ICE, IT, CSE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS,CSBS
8	U20ITO706	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, CCE, BME
9	U20ICO705	Industrial Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
10	U20ICO706	Ultrasonic Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U20MEO706	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO707	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U20CEO705	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U20CEO706	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20MCO702	Building Automation	Mechatronics	MECH, CIVIL
16	U20MCO703	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL

17	U20BMO705	Internet of Things for Healthcare	BME	EEE, ECE, ICE, CCE
18	U20BMO706	Telehealth Technology	BME	EEE, ECE, ICE, CCE
19	U20CCO705	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U20CCO706	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
21	U20ADO705	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics.
22	U20ADO706	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME
23	U20HSO706	Industrial Safety and Human Resource Management	MBA	FT
24	U20HSO707	Operation Research in Textile Industry	MBA	FT
25	U20HSO708	Global marketing and Sourcing Strategies	MBA	FT
26	U20HSO709	Fashion Advertising and sales promotions	MBA	FT
27	U20HSO710	Luxury Brand management	MBA	FT
28	U20HSO711	Fashion Retail Store Operations	MBA	FT

ANNEXURE - III

EMPLOYABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

Sl. No.	Course Code	Course Title
1	U20CSCX01	3ds Max
2	U20CSCX02	Advance Structural Analysis of Building using ETABS
3	U20CSCX03	Advanced Java Programming
4	U20CSCX04	Advanced Python Programming
5	U20CSCX05	Analog System Lab Kit
6	U20CSCX06	Android Medical App Development
7	U20CSCX07	Android Programming
8	U20CSCX08	ANSYS -Multiphysics
9	U20CSCX09	Artificial Intelligence
10	U20CSCX10	Artificial Intelligence and Edge Computing
11	U20CSCX11	Artificial Intelligence in Medicines
12	U20CSCX12	AutoCAD for Architecture
13	U20CSCX13	AutoCAD for Civil
14	U20CSCX14	AutoCAD for Electrical
15	U20CSCX15	AutoCAD for Mechanical
16	U20CSCX16	Azure DevOps

17	U20CSCX17	Basic Course on ePLAN
18	U20CSCX18	Basic Electro Pneumatics
19	U20CSCX19	Basic Hydraulics
20	U20CSCX20	Bio Signal and Image Processing Development System
21	U20CSCX21	Blockchain
22	U20CSCX22	Bridge Analysis
23	U20CSCX23	Building Analysis and Construction Management
24	U20CSCX24	Building Design and Analysis Using AECO Sim Building Designer
25	U20CSCX25	CATIA
26	U20CSCX26	CCNA (Routing and Switching)
27	U20CSCX27	CCNA (Wireless)
28	U20CSCX28	Cloud Computing
29	U20CSCX29	Computer Programming for Medical Equipments
30	U20CSCX30	Corel Draw
31	U20CSCX31	Creo (Modeling and Simulation)
32	U20CSCX32	Cyber Security
33	U20CSCX33	Data Science and Data Analytics
34	U20CSCX34	Data Science using Python
35	U20CSCX35	Data Science using R
36	U20CSCX36	Deep Learning
37	U20CSCX37	Design and Documentation using ePLAN Electric P8
38	U20CSCX38	Design of Biomedical Devices and Systems
39	U20CSCX39	Digital Marketing
40	U20CSCX40	Digital Signal Processing Development System
41	U20CSCX41	DigSILENT Power Factory
42	U20CSCX42	Electro Hydraulic Automation with PLC
43	U20CSCX43	Embedded System using Arduino
44	U20CSCX44	Embedded System using C
45	U20CSCX45	Embedded System with IoT
46	U20CSCX46	ePLAN Data Portal
47	U20CSCX47	ePLAN Electric P8
48	U20CSCX48	ePLAN Fluid
49	U20CSCX49	ePLAN PPE
50	U20CSCX50	Fusion 360
51	U20CSCX51	Fuzzy Logic and Neural Networks
52	U20CSCX52	Google Analytics
53	U20CSCX53	Hydraulic Automation
54	U20CSCX54	Industrial Automation
55	U20CSCX55	Industry 4.0
56	U20CSCX56	Internet of Things
57	U20CSCX57	Introduction to C Programming
58	U20CSCX58	Introduction to C++ Programming
59	U20CSCX59	IoT using Python
60	U20CSCX60	Java Programming
61	U20CSCX61	Machine Learning
62	U20CSCX62	Machine Learning and Deep Learning

63	U20CSCX63	Machine Learning for Medical Diagnosis
64	U20CSCX64	Mechatronics
65	U20CSCX65	Medical Robotics
66	U20CSCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20CSCX67	Mobile Edge Computing
68	U20CSCX68	Modeling and Visualization using Micro station
69	U20CSCX69	MX Road
70	U20CSCX70	Photoshop
71	U20CSCX71	PLC
72	U20CSCX72	Pneumatics Automation
73	U20CSCX73	Project Management
74	U20CSCX74	Python Programming
75	U20CSCX75	Revit Architecture
76	U20CSCX76	Revit Inventor
77	U20CSCX77	Revit MEP
78	U20CSCX78	Robotics
79	U20CSCX79	Search Engine Optimization
80	U20CSCX80	Software Testing
81	U20CSCX81	Solar and Smart Energy System with IoT
82	U20CSCX82	Solid Works
83	U20CSCX83	Solid Works with Electrical Schematics
84	U20CSCX84	Speech Processing
85	U20CSCX85	STAAD PRO V8i
86	U20CSCX86	Structural Design and Analysis using Bentley
87	U20CSCX87	Total Station
88	U20CSCX88	Video and Image Processing Development System
89	U20CSCX89	VLSI Design
90	U20CSCX90	Web Programming - I
91	U20CSCX91	Web Programming - II

ANNEXURE - IV

EMPLOYABILITY ENHANCEMENT COURSES - (B) SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1.	U20CSS201	Skill Development Course 1 :Demonstration of Workshop Practices
2.	U20CSS302	Skill Development Course 2 *
		1) Computer Assembly and Troubleshooting
		2) Aptitude - I
		3) Electronic Devices and Circuits
3.	U20CSS403	Skill Development Course 3 *
		1) Exploring Photoshop
		2) Aptitude - II
		3) Office Automation
4.	U20CSS504	Skill Development Course 4 : Foreign Language/ IELTS –I/Career and Professional Skill development Program -I
5.	U20CSS505	Skill Development Course 5 : Presentation Skills using ICT
6.	U20CSS606	Skill Development Course 6 : Foreign Language/ IELTS – II/Career and Professional Skill development Program -II

7.	U20CSS607	Skill Development Course 7 : Technical Seminar
8.	U20CSS608	Skill Development Course 8 : NPTEL / MOOC - I
9.	U20CSS809	Skill Development Course 9 : NPTEL / MOOC-II

**** Any one course to be selected from the list***

SEMESTER I

		L	T	P	C	Hrs
U20BST101	**ENGINEERING MATHEMATICS – I** **CALCULUS AND LINEAR ALGEBRA** (Common to all branches except CSBS)	2	2	0	3	60

Course Objectives

- To familiarize the concept of matrices.
- To introduce mathematical tools to solve first order differential equations.
- To learn linear differential equations of higher order with constant coefficients.
- To understand the concept of partial differentiation.
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus.

Course Outcomes

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

CO1 – Understand the concept of Eigen values and Eigen vectors, Diagonalization of a matrix. **(K2)**
CO2 – Solve differential equations**. (K3)**
CO3 – Solve higher order differential equations.**(K3)**
CO4 – Solve different types of partial differential equation. **(K3)**
CO5 – Understand the use of vector calculus. **(K2)**

UNIT I MATRICES (12Hrs)

Rank of a Matrix – Consistency of system of equations. Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors. Cayley – Hamilton Theorem – Diagonalization of matrices.

UNIT II DIFFERENTIAL EQUATIONS (12 Hrs)

Exact equations – First order linear equations – Bernoulli's equation. Equations not of first degree: Equations solvable for p –Equations solvable for y –Equations solvable for x and Clairaut's type.

UNIT III DIFFERENTIAL EQUATIONS (HIGHER ORDER) (12 Hrs)

Linear differential equations of higher order with constant coefficients –The operator D – Euler's linear equation of higher order with variable coefficients – Solution by variation of parameter method.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS (12 Hrs)

Partial derivatives – Total derivatives – Differentiation of implicit functions – Maxima and Minima of two variables. Partial differential equations of higher order with constant coefficients.

UNIT V VECTOR CALCULUS (12 Hrs)

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Gauss Divergence Theorem and Stokes Theorem.

Text Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, 10th Edition, 2019.
2. B.V.Ramana, "Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition 2018.
3. N.P. Bali and Manish Goyal,"A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018.

Reference Books

1. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rdEdition, 2019.
2. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, 2019.
3. Dr. G Balaji, "Engineering Mathematics – I", G. Balaji publishers, 2017
4. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, 2016.
5. S. Narayanan and Manicavachagom T.K. Pillay," Differential Equations and Its Applications", Paperback, Viswanathan.S, Printers & Publishers Pvt Ltd, 2009.

Web Resources

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides-Systemsofquation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/122/104/122104017/
4. https://nptel.ac.in/courses/111/106/111106051/
5. https://nptel.ac.in/courses/111/108/111108081/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	-	-	-	-	1	3	2	1
2	3	2	1	1	-	1	1	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	1	-	-	-		1	3	2	1
4	3	2	1	1	-	1	1	-	-	-	-	1	3	2	1
5	2	1	-	-	-	-	1	-	-		-	1	3	2	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20EST106	**INTRODUCTION TO ENGINEERING: DISTINCTION, PRINCIPLES AND APPLICATION**	**3**	**0**	**0**	**3**	**45**

(Common to CSE and IT)

Course Objectives

- To understand the basics of Engineering Disciplines and Design concepts.
- To understand the various strategies used in solution design.
- To understand about the testing, product evaluation and report writing.
- To know about the project management skills ethics in project development.
- To understand about ethics in project development.

Course Outcomes

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

CO1 - Explain technological & engineering development, change and impacts of engineering.**(K2)**

CO2 - Infer problem, list criteria and constraints, brainstorm potential solutions and document the ideas.**(K2)**

CO3 - Exemplify possible solutions through drawings, testing and prepare project report.**(K3)**

CO4 - Use project management skills and ethics in doing projects.**(K3)**

CO5 - Employ ethics in engineering.**(K3)**

UNITI INTRODUCTION TO ENGINEERING (9Hrs)

Engineering: Engineering Defined – Careers in Engineering Fields – Engineering Disciplines. Engineering as a Profession: Functions of Engineers – Teamwork – Engineering Profession – Engineering Impacts – Future of Engineering. Engineering Design: Engineering Design – Engineering Design Process – Engineering Notebooks.

UNIT II PROBLEMS AND BRAINSTORMING (9Hrs)

Defining Problems and Brainstorming: Defining the Problem – Brainstorming – Initial Outcomes Researching Designs: Sketches – Researching Ideas – Trade-offs – Selecting the Best Approach.

UNIT III COMMUNICATION SOLUTONS (9Hrs)

Communication Solutions: Engineering Drawings – Working Drawings – Drawing Classifications – Drawing Guidelines and Industry Guidelines. Modeling – Testing and Final Outputs: Modeling – Testing – Predictive Analysis – Testing – Engineering Economics – Final Outputs – Design Improvement – Final Project Report.

UNIT IV PROJECT MANAGEMENT (9Hrs)

Project Management: Introduction to Agile Practices – Significance of team work – Importance of communication in engineering profession – Project Management tools: Checklist – Timeline – Gantt Chart – Significance of Documentation.

UNIT V ENGINEERING ETHICS (9 Hrs)

Engineering Ethics: Introduction to ethics – Identifying engineering as a profession – Code of conduct for Engineers – Risk – Safety and Accidents – Rights and Responsibilities of Engineers – Ethical Issues in Engineering Practice.

Text Books

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: “Engineering Fundamentals: Design, Principles, and Careers”, Goodheart-Willcox Publisher, Second Edition, 2018.

2. Charles D.Fleddermann, “Engineering Ethics”, Pearson, education, Fourth Edition, 2014.
3. Saeed Moaveni, “Engineering Fundamentals: An Introduction to Engineering”, Cengage learning, Fourth Edition, 2011.

Reference Books

1. Mike W. Martin, Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi,2005

Web Resources

1. https://nptel.ac.in/courses/110106124/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
3	2	1	-	-	-	-	-	-	-	3	-	-	3	-	-
4	3	2	1	1	-	-	-	-	-	-	3	-	3	-	-
5	3	2	1	1	-	-	-	3	-	-	-	-	3	-	-

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20EST107	MICROELECTRONICS AND DIGITAL SYSTEM DESIGN	L	T	P	C	Hrs
		2	2	0	3	60

(Common to CSE and IT)

Course Objectives

- To understand the theory of diodes and applications.
- To acquire an in-depth knowledge and apply the characteristics of transistors in realizing them as basic building blocks of logic gates.
- To Gain knowledge on Boolean algebra and various simplifications of Boolean functions.
- To acquire the ability to develop any combinational logic functions and design combinational circuit.
- To understand the behavior of sequential circuits.

Course Outcomes

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

CO1 - Explain various diodes and interpret its applications. **(K2)**

CO2 - Demonstrate and Experiment the transistors and its types.**(K3)**

CO3 - Review the knowledge of Number systems and simplifications of Boolean functions.**(K2)**

CO4 - Understand and experiment the various combinational logic circuits.**(K3)**

CO5 - Understand and experiment the various sequential circuits.**(K3)**

UNIT I SEMICONDUCTOR DIODES AND SPECIALPURPOSEDIODES (12Hrs)

Introduction to Semiconductor Materials – Doping-Intrinsic and Extrinsic Semiconductor –PN junction diode, structure, VI characteristics–Diffusion and Depletion capacitance–Rectifier, Half wave and Full wave rectifier – Zener Diode – Reverse Characteristic of a Zener Diode – Light Emitting Diode (LED) – Liquid Crystals Displays (LCD) – Photo Diodes.

UNIT II TRANSISTORSANDAPPLICATIONS (12 Hrs)

Introduction to BJT – Construction of BJT – BJT Circuit configurations: CB, CE,CC – Current Gain of a BJT in CB, CE, CC – Transistors as switch, Amplifier and Buffer – Logic gates using transistors – Operational Amplifiers – Inverting and Non-Inverting Op-Amps –Voltage follower– Summing amplifiers and Differential amplifiers.

UNIT III REVIEW OFNUMBERSYSTEMS (12Hrs)

Review of Number systems – Conversion of Number systems – Binary addition and subtractions – Binary representation: Signed magnitude representation and Compliment representations – Binary codes – Boolean Algebra – Boolean functions – Canonical forms – Simplifications of Boolean function: Theorems and laws, Karnaugh Map and Quine McCluskey method.

UNIT IV COMBINATIONALLOGICDESIGN (12 Hrs)

Introduction to combinational circuits – Design procedures of Combinational circuits – Adders – Subtractors – Binary parallel Adder – BCD Adder – Carry look ahead adder – Decoder – Encoder – Priority Encoder – Multiplexer – Design and Implementations of combinational circuits using Multiplexer – Demultiplexer – Parity Generator and checker.

UNIT V SEQUENTIALLOGICDESIGN (12Hrs)

Introduction to Sequential Circuits – Latches – Types of Latches: SR Latch and D Latch – Flip-Flop – Types of Flip-Flops: RS, JK, D,T Flip-Flops – Excitation table of Flip-Flops – Counters: Asynchronous Counters – Synchronous counters – MOD counters – Shift registers – Types of Shift registers: SISO,SIPO,PISO,PIPO and Universal Shift registers – Ripple counter and Johnson counter.

Text Books

1. M. Morris Mano and Michael Ciletti, "Digital Design", Pearson India Education Services, Sixth Edition, 2018.
2. J. Millman, C. Halkias and Satyabrata, "Electronic Devices and Circuits", McGraw Hill, Third Edition,2010.
3. R.S.Sedha, "Applied Electronics", S.Chand & Company Ltd., Third Edition,2008.

Reference Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, Eleventh Edition,2015.
2. Thomas L. Floyd, "Electronic Devices", Pearson Education,Ninth Edition, 2012.
3. Adel. S. Sedra, Kenneth C. Smith, "Micro Electronic circuits", Oxford University Press, Sixth Edition,2010.
4. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford Press,Fifth Edition, 2009.
5. Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Tenth Edition, 2009.

Web Resources

1. https://nptel.ac.in/courses/117106114/
2. https://nptel.ac.in/courses/117106086/
3. http://www.electronics-tutorials.ws
4. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
2	3	2	1	1	-	-	-	-	-	-	-	-	3	1	1
3	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
4	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20EST109	PROBLEM SOLVING APPROACH	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE, IT and CCE)

Course Objectives

- To identify the key concepts of computational thinking and problem solving.
- To know the basics of algorithm and data organization.
- To understand the fundamental algorithms and factoring methods.
- To know the basic concepts of array and problem solving techniques.
- To familiarize the concepts of text processing, pattern searching and recursive algorithms.

Course Outcomes

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

CO1 - Explain the basic concepts of computational thinking and problem solving.**(K2)**
CO2 - Explain basic concepts of algorithm and data organization.**(K2)**
CO3 - Illustrate algorithmic solution to problem solving.**(K3)**
CO4 - Explain the concepts of array, merging, sorting & searching.**(K2)**
CO5 - Implement recursive algorithm to solve problems.**(K3)**

UNITI INTRODUCTION (9Hrs)

Computational Thinking - Information and Data - Converting Information into Data – Data Capacity – Data Types and Encoding – Logic-Solving Problems – Limits of Computation – Pseudocode and FlowChart.

UNIT II ALGORITHMIC THINKING &DATA ORGANIZATION (9 Hrs)

Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns– Pseudocode and FlowChart.

UNIT III FUNDAMENTAL ALGORITHMS & FACTORING METHODS (9 Hrs)

Fundamental Algorithms: Exchanging – Counting – Summing – Factorial Computation – Fibonacci Sequence – Reversing the Digit-Base Conversion – Character to number conversion. Factoring Methods: Finding Square Root – Greatest Common Divisor – Prime Number – Prime Factor –Pseudocode and FlowChart.

UNIT IV ARRAY, MERGING, SORTINGANDSEARCHING (9 Hrs)

Array Techniques: Introduction – Array order reversal – Array Counting or Histogramming – Maximum and Minimum of a Set – Removal of Duplicate – Partitioning – Longest monotone.Sorting and searching: Sorting by Bubble, Selection, Insertion. Searching: Linear, Binary – Pseudocode and FlowChart.

UNIT V TEXT PROCESSING, PATTERN SEARCHING &RECURSIVEALGORITHM (9 Hrs)

Key word Searching – Text Line Adjustment – Linear Pattern Search – Sub Linear Pattern Search. Recursion:Towers of Hanoi – Sample Generation – Combination Generation – Permutation Generation – Pseudocode and FlowChart.

Text Books

1. David Riley and Kenny Hunt, “Computational Thinking for Modern Problem Solver”, Chapman & Hall / CRC Textbooks in Computing,2014.
2. R. G.Dromey, “How to solve it by Computer”, PHI,2008.
3. Vickers Paul, “How to Think like a Programmer: Problem Solving for the Bewildered”, Cengage Learning EMEA, 2008.

Reference Books

1. Kathryn Rentz, Paula Lentz, “A Problem-solving Approach “, McGraw-Hill Education, 2018. ·
2. Don McAdam, Roger Winn,” A Problem-Solving Approach”, Prentice Hall Canada; 2nd Edition, 2017.
3. V. Anton Spraul, “Think Like a Programmer: An Introduction to Creative Problem Solving”, Cengage
Learning EMEA, 2012.
4. Sham Tickoo “A Problem-solving Approach”, Delmar/Cengage Learning, 2009.
5. Harold Abelson & Gerald Jay Sussman, “Structure and Interpretation of Computer Programs”, McGraw- HillBook Company, 1997.

Web Resources

1. https://www.edx.org/learn/problem-solving
2. https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html
3. https://www.classcentral.com/course/problem-solving-skills-6687

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	1	-	-	-	1	-	-	1	3	2	3
2	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
3	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
4	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
5	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20EST110	PROGRAMMING IN PYTHON (Common to CSE, IT, CCE and FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To acquire programming skill in core python.
- To learn the basic Syntax and Semantics of Python Programming.
- To learn how to design python program and applications.
- To acquire object oriented skills in python.
- To develop the skill of designing applications using modules and packages

Course Outcomes

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

CO1 - Define the structure and components of a python program. **(K1)**

CO2 - Illustrate the concepts of Python decision statements.**(K2)**

CO3 - Interpret the use of loops and functions to facilitate code reuse.**(K3)**

CO4 - Use list, tuple, Set and dictionary in python program.**(K3)**

CO5 - Read/ write data from/to files and structure a program using Exceptions and Modules.**(K3)**

UNIT I INTRODUCTION TO PYTHON PROGRAMMING LANGUAGE (9 Hrs)

Introduction to Python Language**–** Strengths and Weaknesses**–** IDLE**–** Visual Source Code – Arithmetic Operators – Arithmetic Expressions **–** Dynamic Types **–** Naming Conventions**–** String Values**–** String Operations**–** String Slices **–** String Operators**–** Numeric Data Types**–** Conversions

UNIT II DECISION MAKING (9 Hrs)

Control Flow: Introduction – Control Flow and Syntax – Indenting –Relational Operators – Relational Expressions– Logical – Operators – Logical Expressions –If Statement –If else –Elif – Nested if.

UNIT III LOOPING (9 Hrs)

Loop: The while Loop –Break and continue – Nested while Loop – For Loop – Nested for Loop. Functions: parameters –Return values –Local and global scope –Function composition – Recursion and lambda functions.

UNIT IV LIST, TUPLE, SET,DICTIONARY,ARRAYS (9 Hrs)

Lists: List operations –List slices –List methods –List loop – Mutability – Aliasing –Cloning lists –List parameters – Tuples: Tuple assignment –Tuple as return value – Advanced list processing – List comprehension – Sets – Dictionaries: Operations and methods – Arrays.

UNIT V FILES, EXCEPTIONS, MODULES,ANDPACKAGES (9 Hrs)

Built In Functions. Files and Exception: Text Files –Reading and writing files –Format operator –Command line arguments – Errors and exceptions – Handling exceptions – Modules– Standard modules – Packages–Bit Wise Operators.

Text Books

1. Martin C Brown, “Python The Complete Reference”, McGraw-Hill Education, 4th Edition,2018
2. Reema Thareja, “Python Programming Using Problem Solving Approach”, ISBN:9780199480173,Oxford University Press, First edition, 2017
3. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist‘‘, Shroff/O‘Reilly Publishers,2nd edition, 2016(http://greenteapress.com/wp/thinkpython/).

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Reference Books

1. Robert Sedgewick, “Kevin Wayne, Robert Dondero – Introduction to Programming inPython: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. 2016.
2. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,2015.
3. Ben Stephenson, “The Python Workbook A Brief Introduction with Exercises and Solutions”, Springer International Publishing, Switzerland2014.
4. John V Guttag, “Introduction to Computation and Programming Using Python’’, MIT Press, Revised and expanded Edition,2013.
5. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.

Web Resources

1. https://www.learnpython.org/
2. https://pythonprogramming.net/introduction-learn-python-3-tutorials/
3. https://www.codecademy.com/learn/learn-python
4. https://nptel.ac.in/courses/106/106/106106182/

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	1	-	-	-	-	-	-	-	3	1	3
2	2	1	-	-	1	-	-	-	-	-	-	-	3	1	3
3	2	1	-	-	1	-	-	-	-	-	-	-	3	1	3
4	3	2	1	1	1	-	-	-	-	-	-	-	3	1	3
5	3	2	1	1	1	-	-	-	-	-	-	-	3	1	3

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20ESP108	MICRO ELECTRONICS AND DIGITAL SYSTEM DESIGN LABORATORY	0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To provide the basic operation and applications of electronic devices.
- To design and implementations of the digital combinational circuits.
- To develop the circuit for amplifier.
- To design and implementations of the digital sequential circuits.
- To design and implement various kinds of registers.

Course Outcomes

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

CO1 -Familiar about electronic components and able to apply in rectifier and amplifiers circuits.**(K3)**

CO2 -Analyze and construct the combinational logic circuits.**(K3)**

CO3 -Analyze and construct the sequential logic circuits.**(K3)**

CO4 -Illustrate the use of Flip-Flops.**(K3)**

CO5 -Experiment shift registers and counters.**(K3)**

List of Exercises

1. Verification of Kirchhoff's Laws and Network Theorems.(Hardware and simulation)
2. Characteristics of PN junction diode and Half and Full wave Rectifier.
3. Characteristics of Zener diode, design and implementation of Zener diode voltage regulator
4. Characteristics of BJT
5. Characteristics of FET
6. Frequency Response of RC Coupled Amplifiers
7. Simplification of Boolean expression using Karnaugh map and Quine McCluskey Methods
8. Design and Implementation of adder and subtractor using logic gates
9. Design and Implementation of code converters
10. Design and Implementation of 3 bit odd/even parity generator/checker
11. Design and Implementation of Multiplexer and De-multiplexer Circuits
12. Design and Implementation of Encoders and Decoders
13. Study ofFlip-flops
14. Design and implementations of shift registers.
15. Design and Implementation of 4 bit counters.

Reference Books

1. M. Morris Mano, "Digital Design", Pearson Education, 6thEdition,2017.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Eleventh Edition,2015.
3. J. Millman, C. Halkias and Satyabrata, Electronic devices and Circuits, Third Edition, McGraw Hill,2010.
4. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press,2009.
5. Thomas L. Floyd, "Digital Fundamentals", Tenth Edition, Pearson Education, New Delhi,2009.

Web Resources

1. https://nptel.ac.in/courses/117106114/
2. https://nptel.ac.in/courses/117106086/
3. http://www.electronics-tutorials.ws
4. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20ESP111	PROGRAMMING IN PYTHON LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE, IT, CCE and FT)

Course Objectives

- To acquire programming skill in core python.
- To learn how to design python program and applications.
- To acquire object oriented skills in python.
- To design and implement modules and packages.
- To develop the skill of designing applications.

Course Outcomes

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

CO1 - Examine Python syntax and semantics.**(K3)**
CO2 - Demonstrate proficiency in handling Strings and File Systems.**(K3)**
CO3 - Compile, run and manipulate Python Programs using core data structures.**(K3)**
CO4 - Interpret the concepts of Object-Oriented Programming as used in Python.**(K3)**
CO5 - Implement exemplary applications related to modules and packages in Python.**(K3)**

List of Exercises

1. Develop simple programs using python syntax and semantics.
2. Demonstrate python program using Arithmetic expressions.
3. Demonstrate python program using Strings.
4. Demonstrate python program using relational expressions.
5. Understand the decision making statement.
6. Illustrate Conditional statements with real time problems.
7. Write Python Functions to facilitate code reuse.
8. Basic python applications using List, Tuples,Sets.
9. Implementation of searching.
10. Implementation of sorting.
11. Implement python programs using Dictionaries
12. Illustrate file concepts with real time problems
13. Use Exception handling in python applications for error handling.
14. Implement simple applications using Modules
15. Implement simple applications using Packages
16. Develop Real time application like Number guessing, Dice rolling simulator, Mobile contacts,etc

Reference Books

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press; First edition,2017.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter- disciplinary Approach”, Pearson India Education Services Pvt.,2016.
3. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,2015.
4. Ben Stephenson, “The Python Workbook A Brief Introduction with Exercises and Solutions”, Springer International Publishing, 2014.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Pragmatic Programmers,LLC,Second edition, 2013.

Web Resources

1. https://nptel.ac.in/courses/106/106/106106182/
2. https://www.learnpython.org/
3. https://pythonprogramming.net/introduction-learn-python-3-tutorials/
4. https://www.codecademy.com/learn/learn-python

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20ESP112	**ENGINEERING GRAPHICS USING AUTO CAD** (Common to ECE, IT, CSE, ICE, MECH, BME,CSBS and Mechatronics)	**0**	**0**	**2**	**1**	**30**

Course Objectives

- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to standardized technical drawings
- To extend the skill to use software for creating 2D and 3D models
- To draw a simple steel truss.
- To develop the isometric projection of simple objects.

Course Outcomes

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

CO1 - Familiarize with the fundamentals and standards of engineering graphics. **(K2)**

CO2 - Perform freehand sketching of basic geometrical constructions and multiple views of objects. **(K3)**

CO3 - Visualize the project isometric and perspective sections of simple solids and to be familiar on software packages for drafting and modelling. **(K3)**

CO4 - Connect side view associate on front view.**(K4)**

CO5 - Correlate sectional views of prism, pyramid, cylinder and cone. **(K4)**

List of Exercises

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3Dmodel.

Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.

Reference Books

1. James D. Bethune, “Engineering Graphics with AutoCAD 2020 (A Spectrum book), Macromedia Press, Pearson,1st Edition, 2020.
2. Bhatt N.D and Panchal V.M, “Engineering Drawing: Plane and Solid Geometry”, Charotar Publishing House, 2017.
3. Jeyapoovan T, “Engineering Drawing and Graphics Using AutoCAD”, Vikas Publishing, 7th Edition, 2016.
4. Dhananjay A. Jolhe, “Engineering Drawing: With an Introduction To CAD”,McGraw Hill, 2016.
5. James Leach, “AutoCAD 2017 Instructor”, SDC Publications, 2016.
6. NS Parthasarathy and Vela Murali, “Engineering Drawing”, Oxford university press, 2015.
7. M.B Shah, “Engineering Graphics”, ITL Education Solutions Limited, Pearson Education Publication, 2011.

Web Resources

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php
2. http://www.nptelvideos.in/2012/12/computer-aided-design.html
3. https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/
4. https://autocadtutorials.com
5. https://dwgmodels.com

CO/PO/PSO Mapping

COs	Program Outcomes												Program Specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
2	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
3	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
4	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
5	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-

Correlation Level: 1 – Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSC1XX	**CERTIFICATION COURSE - I**	**0**	**0**	**4**	**-**	**50**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSM101 INDUCTION PROGRAM

Induction program for students to be offered right at the start of the first year

Duration of the Program	3 Weeks
Induction program	• Physical Activity • Creative Arts and Culture • Mentoring & Universal Human Values • Familiarization with College, Dept./Branch • Literary Activity • Proficiency Modules • Lectures & Workshops by Eminent People • Visits in Local Area • Extra-Curricular Activities in College

1. **Physical Activity**

This would involve a daily routine of physical activity with games and sports. There would be games in the evening or at other suitable times according to the local climate. These would help develop team work besides health. Each student could pick one game and learn it for the duration of the induction program and hopefully, continue with it later.

2. Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

3. Mentoring and Universal Human Values

Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring takes place in the context and setting of Universal Human Values. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and take decisions with courage, be aware of relationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity. Need for character building has been underlined by many thinkers, universal human values provide the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but by getting the students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

4. Other Activity

Activities that are not there on a daily basis, but are conducted for 3-4 days (typically in the afternoons) and change thereafter.

4.1. Familiarization with College, Department/Branch

The incoming students should be told about the credit and grading system, and about the examinations. They should be informed about how study in college differs from study in school. They should also be taken on a tour of the college and shown important points such as library, canteen, and other facilities. They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society, and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard. They should also be shown the laboratories, workshops and other facilities. The above should be done right in the first two days, and then over the afternoons thereafter, as appropriate.

4.2. Literary Activity

Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

4.3. Proficiency Modules

The induction program period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

4.4. Lectures & Workshops by Eminent People

Lectures by eminent people should be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well. Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekanand Kendras, S-VYASA, etc. may be organized. Workshops which rejuvenate or bring relief to students would also be welcome, such as, Art of Living workshops (3 sessions, 9 hours).

4.5. Visits in Local Area

A couple of visits to the local landmarks including historical monuments should be organized. This would familiarize the students with the area together with bonding with each other, like in a picnic. Visits should also be organized to a hospital, orphanage or a village. These would expose them to people in suffering or to different lifestyles. This might also sensitize them to engineering needs in these areas.

4.6. Extra-Curricular Activities in College

The new students should be introduced to the extra-curricular activities at the college/university. They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

SEMESTER II

ENGINEERING MATHEMATICS II

U20BST215 MULTIPLE INTEGRALS AND TRANSFORMS L T P C Hrs

(Common to all branches except CSBS) **2 2 0 3 60**

Course Objectives

- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To equip the students familiar with Laplace, transform and solve the differential equations using Laplace transform techniques.
- To enable the students to expand functions into Fourier series using change of intervals.
- To gain good knowledge in application of Fourier transform.
- To inculcate the computational knowledge in Z-transforms.

Course Outcomes

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

CO1 - Understand the concept of double and triple integrals. **(K2)**

CO2 - Apply Laplace transform and inverse Laplace transform of simple functions**. (K3)**

CO3 - Convert a periodic function into series form. **(K3)**

CO4 - Compute Fourier transforms of various functions. **(K3)**

CO5 - Solve difference equations using Z – transforms. **(K3)**

UNIT I MULTIPLE INTEGRALS (12 Hrs)

Multiple Integrals – Change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT II LAPLACE TRANSFORMS AND INVERSE LAPLACE TRANSFORMS (12 Hrs)

Definition– Transforms of elementary functions – Properties. Transform of derivatives and integrals. Multiplication by t and Division by t. Transform of unit step function–Transform of periodic functions. Initial and final value theorems– Methods for determining inverse Laplace Transforms– Convolution theorem– Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT III FOURIER SERIES (12 Hrs)

Dirichlet's conditions – General Fourier series – Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

UNIT IV FOURIER TRANSFORMS (12 Hrs)

Fourier Integral theorem Fourier transform and its inverse, properties. Fourier sine and cosine transforms their properties, Convolution and Parseval's identity.

UNIT V Z – TRANSFORMS (12 Hrs)

Difference equations, basic definition, z – transform - definition, Standard z – transforms, Damping rule, Shifting rule, Initial value and final value theorems and problems, Inverse z – transform. Applications of z – transforms to solve difference equations.

Text Books

1. M.D.Petale, "A text book on Z- Transforms (Engineering Mathematics)", Bames and Noble, NewEdition, 2020.
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearsons, 2017.
3. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", Tata McGraw Hill, 1st Edition, 2016.

Reference Books

1. H.K. Dass, “Advanced Engineering Mathematics”, S. Chand & Co, 2019.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 10th Edition 2019.
3. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill, 2018.
4. C. B. Gupta, Shree Ram Singh, M. Kumar, “Engineering Mathematics for semester I & II”, Tata McGraw Hill, 2016.
5. N.P. Bali and Dr. Manish Goyal, “Engineering Mathematics”, Lakshmi Publications, 9th Edition, 2015.

Web Resources

1. https://nptel.ac.in/courses/111105121**/**
2. https://nptel.ac.in/courses/111105035/
3. https://nptel.ac.in/courses/111107119/
4. https://swayam.gov.in/nd1_noc20_ma17/preview
5. https://nptel.ac.in/courses/111/103/111103021/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	1	1	2	1
2	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20EST201 **PROGRAMMING IN C**

L	T	P	C	Hrs
3	0	0	3	45

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL,BME,MECHTRONICS,CCE)

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study about the programs using Control structures
- To understand the programs using looping and arrays
- To understand the concepts of Functions and Pointers.
- To study about Structure, Union and File Management Operations in C.

Course Outcomes

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

CO1 - Comprehend the basic constructs of C programming.**(K2)**
CO2 - Illustrate the concepts of sequential, selection and repetition control structures in C program.**(K2)**
CO3 - Implement simple programs using looping structure and arrays.**(K3)**
CO4 - Demonstrate programs using Functions and Pointers.**(K3)**
CO5 - Build programs using Structure, Union and understand the concept of File management Operations.**(K3)**

UNIT I INTRODUCTIONTO C (9 Hrs)

C programming: Overview of C – Visual Studio code-Constants – Compiling a C Program – Variables and Data Types – Technical Difference between Keywords and Identifiers – Types of C Qualifiers and format specifies – Operators and Expressions – Operators Precedence – Type conversion – Input-Output Statements.

UNIT II DECISION MAKING (9 Hrs)

Decision Making and Branching – Relational operators – Logical operators– If – If else – If else If – Nested if.Switch-case.

UNIT III LOOPING AND ARRAYS (9 Hrs)

Looping: while - do while – for – break – continue - nested loop Arrays: One Dimensional Arrays-Two-Dimensional Arrays-Multi-Dimensional Array-Dynamic arrays-Character Arrays and String-Sorting - Searching.

UNIT IV FUNCTIONS, POINTERS (9 Hrs)

Functions: Introduction - Definition – Declaration – Categories of Functions - Nesting of Functions, Recursive functions - Passing Arrays to Functions - Strings – String library function. Pointers: Introduction - Declaring Pointer Variables - Initialization of Pointer Variables - Accessing the address of a variable - Accessing a variable thorough Pointer - Chain of Pointers - Pointer Expressions - Pointers and arrays – Pointers and functions – Call by Reference - Pointers and character strings - Array of Pointers - Pointers and Structures.

UNIT V STRUCTURES AND UNIONS, FILE MANAGEMENT (9 Hrs)

User defined data types: Introduction – Structure: definition - declaration - Arrays of Structures – Nested structures – Passing structures to functions –– Union - Enumeration and Typedef. Introduction to File Handling in C, Input and Output operations on a file – Error Handling - Random access to files – command line arguments. Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, 8thEdition,2019.
2. YashvantKanetkar, “Let us C”, BPB Publications, 16th Edition, 2017.
3. Herbert Schildt,” C: The Complete Reference”, McGraw Hill, FourthEdition,2014.

Reference Books

1. Dr. P. Rizwan Ahmed, “Office Automation”, Margham Publications,2016.
2. Ashok N Kamthane, “Computer Programming”, Pearson education, Second Impression,2012.
3. VikasVerma, “A Workbook on C “, Cengage Learning, Second Edition,2012.
4. P.Visu, R.Srinivasan and S.Koteeswaran, “Fundamentals of Computing and Programming”, Fourth Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, “Programming in C”, Second Edition, Oxford University Press, 2011.

Web Resources

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
3. https://www.tutorialspoint.com/cprogramming
4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
5. https://nptel.ac.in/courses/106/104/106104128/

COs/POs/PSOs Mapping (CSE)

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CST201	MICROPROCESSORS AND MICROCONTROLLERS (Common to CSE and IT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand and learn the architecture and assembly language program of8085.
- To understand and learn the architecture and assembly language program of8086.
- To explore the interfacing the peripherals and other chips to8086
- To learn and understand the Intel 8051 micro controller architecture.
- To acquire the knowledge of Raspberry Pi and Arduino Processors.

Course Outcomes

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

CO1 - Explain the basic architecture of 8085 microprocessors **(K2)**

CO2 -Articulate the knowledge of the architecture and instruction sets of 8086**(K2)**

CO3 - Summarize the interfacing of various peripherals to various 8086.**(K2)**

CO4 - Illustrate the architecture of the 8051 microcontrollers **(K2)**

CO5 -Exemplify the use of Raspberry and Arduino processors.**(K2)**

UNIT I INTEL8085 MICROPROCESSORS (9 Hrs)

Introduction – Need for Microprocessor – Evolution – 8085 Architecture – Pin diagram - Timing Diagram – Addressing Modes – Instruction Formats – Instruction Set.

UNIT II INTEL8086 MICROPROCESSORS (9 Hrs)

Introduction to 8086 Microprocessor – 8086 Architecture – Pin diagram –I/O & Memory Interfacing – Addressing Modes – Instruction Format – Instruction Set – Interrupts – Assembler Directives – Assembly Language Programming.

UNIT III PERIPHERALS & INTERFACINGTO 8086 (9Hrs)

Parallel Communication Interface (8255) – Serial Communication interface (8251) – D/A and A/D Interface – Programmable Timer Controller (8254) – Keyboard/display controller (8279) – Programmable Interrupt Controller (8259) – DMA controller (8237).

UNIT IV INTEL 8051 MICROCONTROLLERANDINTERFACING (9 Hrs)

Introduction – Architecture – Memory Organization – Special Function Registers – Pins and Signals – Timing and control – Port Operation – Memory and I/O Interfacing – Interrupts – Instruction Set and Programming. Interfacing – LCD & Keyboard Interfacing – RTC and EEPROM interface using I2C protocol – Stepper Motor, Traffic Light Controller.

UNIT V INTRODUCTION TO RASPBERRY PI and ARDUINO (9Hrs)

Raspberry Pi Hardware – Raspberry Pi Software – Programming on Raspberry Pi – Interfacing to Raspberry PiInputs/Outputs–InterfacingtoRaspberryPiBuses–InteractingtoPhysicalEnvironment.– ArduinoBoard– Sketches – Mathematical Operators – Serial Communications – Interfacing with sensors.

Text Books

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design”, Prentice Hall of India, Second Edition, 2015.
2. Ramesh S. Gaonkar, “Microprocessor - Architecture, Programming and Applications with 8085”, Penram International Publications, Sixth Edition, 2013.
3. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education, Second Edition,2011.

Reference Books

1. Jeremy Blum, “Exploring Arduino: Tools and Techniques for Engineering Wizardry”, Wiley, Second Edition, 2019.
2. Rithardblum,ChristileBresnahan, “Programming with Raspberry Pi: Getting Started with Python”, Second Edition, Packet Publisher, 2016.
3. Derek Molloy, “Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux”, Wiley, 1st Edition, 2016.
4. Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and system Design 8085, 8086, 8051, 8096”, PHI,2014.
5. DoughlasV.Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH,2012.

Web Resources

1. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
2. https://www.classcentral.com/course/swayam
3. https://freevideolectures.com/course/3018/microprocessors
4. https://www.arduino.cc/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	2	2
2	2	1	-	-	-	-	-	-	-	-	-	-	3	2	2
3	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
4	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
5	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CST202 **FRONT-END WEB DEVELOPMENT** **3 0 0 3 45**

(Common to CSE and IT)

Course Objectives

- To demonstrate competency in the use of common HTMLcode.
- To understand how CSS will affect web pagecreation.
- To know about how grid work and how to use them in mobile and responsive design inbootstrap
- To understand the role of JavaScript in web page creation
- To develop basic programming skills using jQuery.

Course Outcomes

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

CO1 - Articulate HTML tags and elements. **(K2)**

CO2 - Demonstrate and display website elements.**(K3)**

CO3 - Build responsive websites to fit into large and small screens.**(K3)**

CO4 - Implement client side programming using JavaScript. **(K3)**

CO5 - Use jQuery concepts on website creation.**(K3)**

UNIT I HTML 5 **(9 Hrs)**

HTML Introduction: Visual Studio Code – Basic – Elements – Attributes – Headings – Paragraphs – Styles – Formatting – Comments – Colors – CSS – Links – Images – Tables –Lists – Block & Inline – Classes – Id – Iframes–JavaScript – File Paths – Head – Computer code. HTML Forms: Form Elements – Input Types –Input Attributes – Input Form Attributes. HTML Graphics: Canvas – SVG – Video –Audio.

UNIT II CSS 3 **(9 Hrs)**

Introduction CSS3: Syntax – Selectors – Inline / Internal / External, Comments – Colors – Backgrounds – Borders– Margins – Padding –Height/Width –Box Model – Outline – Text – Fonts –Icons – Links – Lists – Tables – Display – Float – Inline-block – Align – Opacity – Navigation Bar –Dropdowns – Image Gallery – Forms. CSS Advanced: Rounded Corners – Backgrounds –Colors – Gradients – Shadows –Text Effects – Transitions – Animations – Style Images – Buttons –Flexbox. Grid: Container – Grid Item.

UNIT III BOOTSTRAP4 **(9 Hrs)**

Bootstrap 4: – Get Started – Containers – Grid Basic – Typography – Colors – Tables – Images –Jumbotron– Alerts - Buttons – Button Groups – Badges – Progress Bars– Spinners – Pagination – List Groups –Cards – Dropdowns – Collapse –Navs–Navbar–Forms – Inputs – Input Groups – Custom Forms –Carousel – Modal – Tooltip – Popover – Toast –Scrollspy–Flex – Icons – Media Objects – Filters

UNIT IV JAVASCRIPT **(9 Hrs)**

JavaScript Program: Introduction – Output – Statements – Syntax –Comments – Variables –Operators – Arithmetic – Data Types – Functions – Objects –Events – Strings –String Methods – Numbers – Number Methods – Arrays – Array Methods – Array Sort –Dates – Math – Booleans – Comparisons – Conditions – Loop For – Loop While – Break –JSON – Popup Alert. JavaScript Objects: Object Definitions – Object Properties – ObjectMethods– Object Display. JavaScript DOM: Intro – Methods –Document – Elements – HTML – CSS – Animations – Events –Event Listener – Navigation – Nodes – Collections –Node Lists.

UNIT V JQUERY **(9 Hrs)**

jQuery Introduction: Syntax – Selectors – Events. JQuery Effects: Hide/Show – Fade –Slide – Animate –stop()– Callback –Chaining. JQuery HTML: Get/Set – Add – Remove – CSS Classes – Dimensions. JQuery Traversing: Ancestors – Descendants – Siblings – Filtering. JQuery AJAX: Load – Get/Post – Filters.

Text Books

1. Randy Connolly, ”Fundamentals of Web Development”, Paperback, First Edition, 2015.
2. Jon Dukett, ”JavaScript and JQuery: Interactive Front–End Web Development”,Paperback,2014.
3. Deital&Deital, "Internet and World Wide Web-How to Program", Pearson Education, Fifth Edition, 2012.

Reference Books

1. Lyza Danger Gardner,"Java Script on Things: Hacking Hardware for Web Developers",Dreamtech Press,1st edition, 2018.
2. Laura Lemay,Rafe Colburn,"Mastering HTML, CSS &Javascript Web",BPB Publications,First edition,2016.
3. Robert W. Sebasta, “Programming the World Wide Web”, Pearson Education, 8th Edition, 2015.
4. Bassett, Lindsay, “Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
5. Simon Collison,"Beginning CSS Web Development",Apress,2nd edition,2006.

Web Resources

1. https://www.w3schools.com/html/default.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/bootstrap4/default.asp
4. https://www.w3schools.com/js/default.asp
5. https://www.w3schools.com/jquery/default.asp

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	-	1	2
2	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
3	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
4	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
5	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2

Correlation Level: 1 – Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CST203	**COMPUTER ORGANIZATION AND ARCHITECTURE**	**3**	**0**	**0**	**3**	**45**

(Common to CSE and IT)

Course Objectives

- To understand the basic structure and operation of a digital computer
- To learn the fundamentals of organizational and architectural aspects of control unit
- To acquire knowledge about processor and memory design of a digital computer
- To have a broad understanding of various system interfaces and Input output devices
- To obtain knowledge on recent processors.

Course Outcomes

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

CO1 - Identify and explain the basic structure of a computer and instruction sets with addressing modes and discuss the design of ALU.**(K1)**

CO2 - Identify the mechanism in Hardwired control and micro programmed control unit along with concepts of pipelining and applications.**(K1)**

CO3 - Illustrate the memory mapping procedure to enhance the performance of the system.**(K2)**

CO4 - Discuss the standard I/O interfaces and peripheral devices.**(K2)**

CO5 - Outline the advanced concepts of multi-core processors and modern Processors.**(K2)**

UNIT I BASIC COMPUTER ORGANIZATION AND DESIGN (9 Hrs)

Block Diagram of Computer-Instruction Codes – Computer Registers – Instruction Cycle – Memory reference Instructions – Input – Output and Interrupt Design of Basic Computer – ALU design.

UNIT II BASIC PROCESSING UNIT (9 Hrs)

Fundamental concepts-Execution of a complete instruction – Multiple bus organization – Hardwired control –Micro programmed control – Pipelining: Basic concepts – Data hazards-Instruction hazards – Influence on Instruction sets – Data path and control consideration – Super Scalar Processors, VLIW, Parallel and Vector Processors.

UNIT III MEMORY ORGANIZATION (9 Hrs)

Memory hierarchy – main memory – Memory chip Organization- auxiliary memory –Associate memory – Virtual memory – Cache memory – Cache algorithms, Cache Hierarchy, Cache coherence protocols, Performance, Interleaving, On chip Vs Off chip Memories/Caches.

UNIT IV INPUT-OUTPUT ORGANIZATION (9 Hrs)

Input-output interface – asynchronous data transfer – modes of transfer – priority interrupt – DMA –Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).

UNIT V ADVANCED PROCESSOR ARCHITECTURE (9 Hrs)

Parallel processing and its challenges- Instruction level parallelism – Flynn's classification – Hardware multithreading: SISD, MIMD, SIMD, SPMD and Vector multithreading – Multicore processors: Shared memory multiprocessor and cluster multiprocessor.

Text Books

1. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky, “Computer Organization”, McGraw-Hill, 5th edition,2014
2. DavidA.PattersonandJohnL.Henessey,“ComputerOrganisationandDesign”,Morgan Kauffman / Elseveir,Fifthedition,2014.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition,2008.

Reference Books

1. William Stallings, “Computer Organization and Architecture”, Prentice-Hall of India, 7th Edition, 2016.
2. John P.Hayes, “Computer Architecture and Organisation”, McGraw Hill,2012.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition,2008.
4. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Pearson Education,Second Edition, 2005.
5. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", Tata McGraw Hill,First edition, 2005.

Web Resources

1. http://www.inetdaemon.com/tutorials/computers/hardware/cpu/
2. https://inst.eecs.berkeley.edu/~cs152/sp18/
3. http://users.ece.cmu.edu/~jhoe/doku/doku.php?id=18-447_introduction_to_computer_architecture

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-
2	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-
3	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
4	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
5	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CST204 COMPUTER GRAPHICS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the primitives and clipping methods and to explore object construction using primitives.
- To apply transformations and texture on the object.
- To design the 3D geometric transformations.
- To learn and perform modeling
- To acquire the knowledge of advance rendering.

Course Outcomes

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

CO1 – Develop the line, circle and ellipse drawing algorithms. **(K3)**
CO2 – Apply the two dimensional geometric transformations. **(K3)**
CO3 – Apply the three dimensional geometric transformations. (**K3)**
CO4 – Work with color models such as RGN, YIQ, CMY and HSV**. (K3)**
CO5 – Apply different methods for image rendering**. (K3)**

UNIT I INTRODUCTION TO COMPUTER GRAPHICS (9 Hrs)

Introduction – Applications- Graphics Systems – Output Primitives – Representing Image – Straight Line – Line Drawing Algorithms –DDA Algorithms – Bresenhams' Line Algorithms – Circle Algorithms – Bresenhams' Circle Algorithm – Midpoint Circle Algorithm – Ellipse Generating Algorithm – Midpoint Ellipse Algorithm.

UNIT II TWO DIMENSIONAL TRANSFORMATIONS (9 Hrs)

Introduction – Representation of points – Matrix Algebra and Transformation – Transformation of points – Straight lines – Midpoint Transformation – Transformation of parallel lines – Intersecting lines – Rotation – Reflection and scaling of straight lines – Combined Transformations – Translation and Homogeneous Coordinates – Rotation about Arbitrary point – Reflection about Arbitrary line – Windowing and clipping.

UNIT III THREE DIMENSIONAL TRANSFORMATION (9 Hrs)

Introduction–3D Transformation–Rotation about an axis parallel to coordinate Axis–Reflection about an arbitrary axis in space–Reflection through an arbitrary plane–3D modeling schemes – Projection – Orthographic – Isometric – oblique – perspective –3D clipping.

UNIT IV COLOR AND ILLUMINATION MODELS (9 Hrs)

Introduction –colors–Illumination model and light sources–Specular Reflection–Intensity Attenuation – Shadow-Reflectivity and refractivity–Radiosity Model – Texturing – Surface–Bump mapping–Environment Mapping– Shading Methods

UNIT V MODELLING CONCEPTS AND TECHNIQUES (9 Hrs)

Introduction –structures and Hierarchical Modeling–Advanced Modeling Techniques–Procedural Models – Fractals-Grammar based Models–Physical based Modeling – Animation – Devices–Computer assisted–video formats–Frame by Frame animation–Real Time Animation Techniques

Text Books

1. Amarendra N Sinha, Arun D Udai, "Computer Graphics", Tata Mc-Graw Hill ,First Edition, 2008.
2. D Hearn and P M Baker ,"Computer Graphics", Prentice Hall of India Second Edition,2008.
3. Foley, van Dam, Feiner and Hughes ,"Computer Graphics Principles and Practice", Addison Wesley, First Edition, 2004.

Reference Books

1. Foley, Vandam, Feiner, Huges, "Computer Graphics Principles", Pearson Education, 2nd Edition, 2013.
2. Hill, "Computer Graphics using Open GL", Pearson Education, 2007.
3. F .S. Hill, "Computer Graphics using OPENGL", Pearson Education, Second edition 2003.
4. Elsom Cook- "Principles of Interactive Multimedia", McGraw Hill, 2001.

5. Z. Xiang, R. PlastockSchaum's, "Outlines Computer Graphics",TMH, 2nd Edition,2000.

Web Resources

1. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-Graphics-fall-2003/
2. http://www.moshplant.com/direct-or/bezier/
3. http://www.cs.mtu.edu/~shene/COURSES/cs3621/NOTES/spline/B-spline/bspline-curve-rop.html
4. https://nptel.ac.in/courses/106/106/106106090/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	-	-	-	-	-	-	2	1	2
2	3	2	2	1	-	1	-	-	-	-	-	-	1	3	1
3	3	2	-	-	-	2	-	-	-	-	-	-	1	2	1
4	-	2	-	3	-	-	-	-	-	-	-	-	3	3	-
5	3	2	1	-	-	2	-	-	-	-	-	-	2	2	3

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20ESP202	PROGRAMMING IN C LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL,BME,MECHTRONICS, CCE)

Course Objectives

- To practice the fundamental programming methodologies in the C programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To design, implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design modular programming and provide recursive solution to problems.
- To understand the miscellaneous aspects of C and comprehension of file operations.

Course Outcomes

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

CO1 -Implement logical formulations to solve simple problems leading to specific applications. **(K3)**
CO2 - Execute C programs for simple applications making use of basic constructs, arrays and strings. **(K3)**
CO3 - Experiment C programs involving functions, recursion, pointers, and structures.**(K3)**
CO4 - Demonstrate applications using sequential and random access file processing. **(K3)**
CO5 - Build solutions for online coding challenges.**(K3)**

List of Exercises

1. Simple programming exercises to familiarize the basic C language constructs.
2. Develop programs using identifiers and operators.
3. Develop programs using decision-making and looping constructs.
4. Develop programs using functions as mathematical functions.
5. Develop programs with user defined functions – includes parameter passing.
6. Develop program for one dimensional and two dimensional arrays.
7. Develop program for sorting and searching elements.
8. Develop program to illustrate pointers.
9. Develop program with arrays and pointers.
10. Develop program for dynamic memory allocation.
11. Develop programs for file operations.

Reference Books

1. Zed A Shaw,"Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley,2016.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C",Pearson Education,First edition, 2011.
3. Maureen Sprankle,Jim Hubbard," Problem Solving and Programming Concepts," Pearson,9th Edition, 2011.
4. Yashwanth Kanethkar, "Let us C", BPB Publications,13th Edition,2008.
5. B.W.Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2nd Edition, 2006.

Web Resources

1. https://alison.com/course/introduction-to-c-programming
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
4. https://www.tenouk.com/clabworksheet/clabworksheet.html
5. https://fresh2refresh.com/c-programming/

COs/POs/PSOs Mapping (CSE)

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CSP201	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To write assembly language programs using 8085 trainerkit.
- To be familiar with MASM-8086.
- To write basic assembly language programs using 8051 trainerkit.
- To develop simple application using Raspberrypi.
- To build simple systems with Arduino.

Course Outcomes

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

CO1 - Demonstrate simple programs and design interfacing circuits with 8085.**(K3)**

CO2 - Implement assembly language program using MASM.**(K3)**

CO3 - Execute programs in 8051 microcontroller. **(K3)**

CO4 – Build simple applications using Raspberry pi **(K3)**

CO5 - Employ Arduino in simple applications**(K3)**

List of Exercises

1. Simple programming exercises on8085.
2. Simple programming exercises on8086.
3. Codeconversions.
4. String Manipulation – Search, find and replace, copy operations, sorting andsearching.
5. Interfacing with 8086 – Programmable peripherals interface (8255) and Programmable Interval Timer (8253).
6. Interfacing with 8086 - Serial communication Interface(8251).
7. 16 bit Arithmetic operations using8051.
8. Interfacing stepper motor with8086/8051.
9. Interfacing ADC and DAC with8086/8051.
10. Interfacing traffic light controller with8086/8051.
11. Implementation and design of IoT Cloud - Getting Started using Arduino
12. Implementation and design of Temperature Monitoring With DHT22&Arduino
13. Implementation and design of PIR Motion Sensor with RaspberryPi
14. Implementation and design of Raspberry Pi DS18B20 Temperaturesensor
15. Implementation and design of Light Control Using Arduino, RaspberryPi

Reference Books

1. Michael Margolis, “Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects”, O'Reilly Media,3rd Edition,2020.
2. Derek Molloy, “Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux”, Wiley1st Edition, 2016.
3. Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI,2014.
4. Ramesh S.Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, Penram International publishing,2013.
5. A.K. Ray, K.M. Bhurchandi, “Advanced Microprocessor and Peripherals”, Tata McGraw-hill, Second edition, 2010.

Web Resources

1. https://nptel.ac.in/courses/108/103/108103157/
2. https://www.geeksforgeeks.org/microprocessor-tutorials/
3. https://www.arduino.cc/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CSP202	FRONT - END WEB DEVELOPMENT LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To demonstrate competency in the use of common HTML code.
- To understand how CSS will affect web page creation.
- To know how grid work and how to use them in mobile and responsive design in bootstrap
- To understand the role of JavaScript in web page creation
- To develop basic programming skills using jQuery.

Course Outcomes

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

CO1 - Construct websites with HTML tags and elements. **(K3)**

CO2 - Demonstrate and display website elements.**(K3)**

CO3 - Build Responsive website to fit into large and small screens.**(K3)**

CO4 - Implement client side programming using JavaScript**(K3)**

CO5 - Use jQuery concepts on website creation.**(K3)**

List of Exercises

1. HTML: Tags, Links,Images,
2. HTML: tables,list
3. HTML:Forms
4. HTML: Video,Audio
5. Create your address and basic details usingHTML
6. CSS: selectors,Inline / Internal /External
7. CSS:Colour
8. CSS: Margin andPadding
9. CSS: BoxModel,Fonts
10. CSS:Tables
11. CSS: Display - Float -Inline-block
12. CSS: Align-Opacity
13. CSS: Navigation Bar - Dropdowns - Image Gallery –Forms
14. CSS: Transitions –Animations
15. CSS: Flexbox –Grid
16. Create your resume using HTML &CSS
17. Bootstrap: Containers - Grid Basic –Jumbotron
18. Bootstrap: Buttons - Cards –Navbar
19. Bootstrap: Forms - Inputs - InputGroups
20. Bootstrap: Carousel - Modal –Filters.
21. Create a business page of your parents using Bootstrappage
22. JavaScript: Output - Statements - Variables - Operators - Arithmetic – Functions
23. JavaScript: Objects - Events - Strings - String Methods - Numbers - Number Methods - Arrays – Array Methods.
24. JavaScript: Dates - Math - Booleans - Comparisons - Conditions - Loop For - Loop While - Break - JSON.
25. JavaScript: Object Definitions - Object Properties - Object Methods - ObjectDisplay.
26. JavaScript DOM: Methods - Document - Elements - HTML - CSS - Animations - Events - EventListener
27. Find total, result and class of your marks usingJavaScript
28. jQuery: Selectors -Events.

29. jQuery: Effects: Hide/Show - Fade -Slide.
30. jQuery: HTML: Get/Set - Add –Remove

Reference Books

1. Robert W. Sebasta, “Programming the World Wide Web”, Pearson Education, 8th Edition, 2015.
2. Bassett, Lindsay, “Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
3. Laura Lemay,Rafe Colburn,"Mastering HTML, CSS &Javascript Web",BPB Publications,First edition,2016.
4. Simon Collison ,"Beginning CSS Web Development",Apress,2nd Edition,2006.
5. Lyza Danger Gardner,"Java Script on Things: Hacking Hardware for Web Developers",Dreamtech Press,
   1st Edition, 2018.

Web Resources

1. https://www.w3schools.com/html/default.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/bootstrap4/default.asp
4. https://www.w3schools.com/js/default.asp
5. https://www.w3schools.com/jquery/default.asp

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
2	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
3	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
4	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
5	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CSC2XX	CERTIFICATION COURSE - II	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
U20CSS201	**SKILL DEVELOPMENT COURSE 1 DEMONSTRATION OF WORKSHOP PRACTICES**	**0**	**0**	**2**	**0**	**30**

(Common to ECE, CSE, IT, ICE, MECH, BME)

Course Objectives

- To have practical exposure to various welding and joining processes.
- To impart skill in fabricating simple components using sheet metal
- To train the students in metal joining processes like soldering in PCB.
- To understand the working procedure of various Conventional Machines.
- To cultivate safety aspects in handling of tools and equipment.

Course Outcomes

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

CO1 - Identify different prototypes in the carpentry trade such as lap joint, Butt joint. **(K1)**
CO2 - Classify the fabrication of simple sheet metal parts. **(K2)**
CO3 - Interpret the casting preparation. **(K2)**
CO4 - Identify the conventional machine operations. **(K1)**
CO5 - Describe the skills, and modern engineering tools necessary for engineering practice. **(K1)**

DEMONSTRATION OF EXPERIMENTS

1. Welding Exercises
   a. Introduction to BI Standards and reading of welding drawings.
   b. Butt Joint
   c. Lap Joint
   d. Arc Welding
   e. Gas Welding
2. Sheet Metal Exercises
   a. Making of Cube
   b. Making of Cone using development of surface
3. Casting
   a. Green Sand Moulding preparation
4. Demonstration of Conventional Machines.
5. Bosch Tools Demonstration
   a. Demonstration of all Bosch tools.

Reference Books

1. K.C. John, “Mechanical Workshop Practice”, PHI Learning Private Limited, 2010
2. KA Navas, “Electronics Lab Manual”, Fifth edition, PHI Learning Private Limited, 2015
3. S K Hajra, Choudhary and A K Chaoudhary, Workshop Technology I,II,III, by. Media Promoters and Publishers Pvt. Ltd., Bombay
4. T Jeyapoovan, Basic Workshop Practice Manual, Vikas Publishing House (P) Ltd.,New Delhi
5. K Venkata Reddy, KL Narayana, Manual on Workshop Practice, MacMillan India Ltd.

Web Resources

1. https://www.weld.com/
2. https://welding.com/
3. https://sciencing.com/soldering-desoldering-techniques-8288017.html
4. https://nptel.ac.in/courses/112/107/112107084/
5. https://nptel.ac.in/courses/112/106/112106153/

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
2	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
3	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
4	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
5	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1

Correlation Level: 1 – Low, 2 - Medium, 3 - High

U20CSM202	ENVIRONMENTAL SCIENCE	L	T	P	C	Hrs
		2	0	0	-	30

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two types of activities.

(a) Awareness Activities:

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii. Slogan making event
iii. Poster making event
iv. Cycle rally
v. Lectures from experts

(b) Actual Activities:

i. Plantation
ii. Gifting a tree to see its full growth
iii. Cleanliness drive
iv. Drive for segregation of waste
v. To live some big environmentalist for a week or so to understand his work
vi. To work in kitchen garden for mess
vii. To know about the different varieties of plants

Shutting down the fans and ACs of the campus for an hour or so

SEMESTER III

U20BST322	NUMERICAL METHODS (Common to CSE, IT & BME)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To know the solution of algebraic and transcendental equations.
- To learn the techniques of solving simultaneous equations.
- To introduce the numerical techniques of differentiation and integration.
- To solve ordinary differential equations by using numerical methods.
- To know the solution of partial differential equations by using numerical methods.

Course Outcomes

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

CO1 - Use of Numerical techniques to solve algebraic and transcendental equations. **(K2)**

CO2 - Find the solution of simultaneous equations. **(K2)**

CO3 - Apply the knowledge of differentiation and integration by using numerical methods. **(K3)**

CO4 - Solve the ordinary differential equations by using various methods. **(K3)**

CO5 - Solve the partial differential equations by numerical methods. **(K3)**

UNIT I SOLUTION OF ALGEBRAICAND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS (12 Hrs)

Bisection method – Method of false position – Newton Raphson method – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS (12 Hrs)

Solution of linear simultaneous equations and matrix inversion – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT III INTERPOLATION (12 Hrs)

Interpolation: Finite Differences – Relation between operators – Interpolation by Newton's forward and backward difference formula for equal intervals – Newton's divided difference method and Lagrange's method for unequal intervals – Differentiation based on finite differences – Integrations by Trapezoidal and Simpson's rules.

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (12 Hrs)

Single step methods – Taylor series method – Picard's method – Euler and Improved Euler methods – Runge Kutta method of fourth order only.

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (12 Hrs)

Solution of Laplace and Poisson equations – Leibmann's iterative method – Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method – Wave equation: Explicit difference method

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, April 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.

Reference Books

1. C. Xavier, “C Language And Numerical Methods”, New Age International, 2007.
2. P. Siva Ramakrishna Das, “Numerical Analysis”, Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, Fei Xue, “Numerical Analysisan Introduction”, Publisher De Gruyter, 2019.
4. K. Sankara Rao, “Numerical Methods for Scientists and Engineers”, 3rd Edition, PHI Learning Pvt.Ltd, New Delhi, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web Resources

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
2	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20EST356 **DATA STRUCTURES**

L	T	P	C	Hrs
3	0	0	3	45

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS and CCE)

Course Objectives

- To impart the basic concepts of data structures and its terminologies.
- To understand concepts about stack and queue operations.
- To understand basic concepts about linked list and its various operations.
- To understand concepts about Tree and its applications.
- To understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

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

CO1 - Compute time and space complexity for given problems **(K3)**
CO2 - Demonstrate stack, queue and its operation. **(K3)**
CO3 - Illustrate the various operations of linked list. **(K3)**
CO4 - Use the concepts of tree for various applications. **(K3)**
CO5 - Outline the various sorting, hashing and graph techniques. **(K3)**

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES (9 Hrs)

Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS (9 Hrs)

Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.

UNIT III LINKED LIST OPERATIONS (9 Hrs)

Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES (9 Hrs)

Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS (9 Hrs)

Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.

Text Books

1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Balagurusamy, “Data Structures”, Tata McGraw-Hill Education, 2019.
2. D.Samanta, “Classic Data Structures, Prentice-Hall of India, Second Edition, 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in c”, Prentice-Hall of India, Second Edition, 2007.
4. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, Second Edition, 2006.
5. Mark Allen Weiss, ”Algorithms, Data Structures and Problem Solving with C++”, Addison-Wesley Publishing Company, Illustrated Edition, 1995.

Web Resources

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20EST359	PROGRAMMING IN C++	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE, IT, CCE)

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.
- Explain Templates and STL.

Course Outcomes

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

CO1 - Describe the programming elements of C++. **(K1)**
CO2 - Explain the concepts Object oriented approach for finding Solutions **(K2)**
CO3 - Solve various real-world problems using inheritance concept **(K3)**
CO4 - Manipulate programs using concepts of files and streams in C++. **(K3)**
CO5 - Exemplify simple applications using templates. **(K3)**

UNIT I INTRODUCTION TO C++ (9 Hrs)

Basic components of a C++ – Program and program structure – Compiling and Executing C++ Program – Data types – Expression and control statements Iteration statements in C++ – Introduction to Arrays – Multidimensional Arrays – Strings and String related Library Functions – Functions – Passing Data to Functions – Scope and Visibility of variables in Functions.

UNIT II PRINCIPLES OF OBJECT ORIENTED PROGRAMMING AND CONSTRUCTORS (9 Hrs)

Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Classes and Objects: Data members – Member functions – THIS Pointer – Friends – Friend Functions – Friend Classes – Friend Scope – and Static Functions – Constructors and Destructors –Static variables and Functions in class – Operator Overloading in C++ – Overloading Unary Operators – Overloading binary operators.

UNIT III INHERITANCE (9 Hrs)

Inheritance in C++ – Types of Inheritance – Pointers – Objects and Pointers – Multiple Inheritance. Virtual Functions – Polymorphism – Abstract classes. Real time examples in OOPS.

UNIT IV FILES AND STREAMS (9 Hrs)

Exception Handling: Exception – Basics – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing Exception. Standard input and output operations: C++ iostream hierarchy – Standard Input/output Stream Library – Organization Elements of the iostream Library – Programming using Streams – Basic Stream Concepts. File input and output: Reading a File – Managing I/O Streams – Opening a File – Different Methods – Checking for Failure with File Commands – Checking the I/O Status Flags – Dealing with Binary Files – Useful Functions.

UNIT V TEMPLATES AND STL (9 Hrs)

Class templates: Implementing a class template - Implementing class template member functions – Using a class template – Function templates – Implementing function templates – Using template functions – Template instantiation – Class template specialization – Template class partial specialization – Template function specialization – Template parameters – Static members and variables – Templates and friends – Templates and multiple – File projects. Standard Template library: Containers – Iterators and application of container classes.

Text Books

1. Yashavant Kanetkar , " Let Us C++ ",BPB Publications, 2020.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, "C++ - The Complete Reference", McGraw Hill Education, 4th edition, 2017.

Reference Books

1. Bjarne Stroustrup, "A Tour of C++ ", Addison-Wesley Professional; 2nd Edition, 2018.
2. Scott Meyers "Effective Modern C++", Shroff/O'Reilly; First Edition, 2014.
3. Stanley Lippman, Josée Lajoie , Barbara Moo , "C++ Primer", 5th Edition, 2012.
4. Bjarne Stroustrup, "The Design and Evolution of C++", Addison-Wesley, 2005.
5. Alexanderscu "Modern C++ Design" Pearson; 1st Edition, 2004.

Web Resources

1. https://www.tutorialspoint.com/cplusplus/index.htm
2. http://www.cplusplus.com/doc/tutorial/
3. https://www.w3schools.com/cpp/
4. https://www.javatpoint.com/cpp-tutorial
5. https://www.geeksforgeeks.org/cpp-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	3	-	-	-	-	-	-	-	3	-	2
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CST305	AUTOMATA AND COMPILER DESIGN	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To introduce the Finite Automata, NFA and DFA.
- To gain insight into the Context Free Language and Pushdown Automata.
- To understand in depth about Parsing and Turing machine.
- To study about the Lexical Analysis and Syntax Analysis.
- To acquaint the Intermediate Code Generation, Code Optimization and Code Generation.

Course Outcomes

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

CO1 - Understand the concept of Finite Automata, NFA and DFA **(K2)**

CO2 - Understand about Context Free Language and Pushdown Automata. **(K2)**

CO3 - Construct a Turing Machine **(K3)**

CO4 - Explain the concept of Lexical Analysis and Syntax Analysis. **(K3)**

CO5 - Describe the Intermediate code generation, Code Optimization and Code Generation**. (K4)**

UNIT I FINITE AUTOMATA AND REGULAR EXPRESSIONS (12 Hrs)

Introduction: Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Conversion from NFA to DFA – NFA with ε moves. Regular Expression: Conversion from Regular Expression to DFA (Direct / Indirect method) – Two way finite automata – Moore and Mealy Machine – Applications of Finite Automata.

UNIT II CONTEXT-FREE GRAMMAR AND LANGUAGES AND PUSHDOWN AUTOMATA (12 Hrs)

Context – Free Grammar and Languages: Definitions and More Examples – Regular Languages and Regular Grammars – Derivation Trees and Ambiguity – Simplified Forms and Normal Forms – Chomsky Normal Form – Greibach Normal Form. Pushdown Automata: Definitions and Examples – A PDA from a Given CFG – A CFG from a Given PDA. Pumping Lemma.

UNIT III TURING MACHINES (12 Hrs)

Turing Machines: Turing Machines as Language Acceptors – Turing Machines for Accepting Regular Languages – Turing Machine for Addition and Subtraction.

UNIT IV LEXICAL ANALYSIS AND SYNTAX ANALYSIS (12 Hrs)

Compilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Specification of tokens – Recognition of tokens – A language for specifying lexical analyzers – Design of a lexical analyzer. Parser: Top Down Parser – Predictive Parser, Bottom up Parser – SLR Parser.

UNIT V INTERMEDIATE CODE GENERATION, CODE OPTIMIZATION AND CODE GENERATION(12 Hrs)

Intermediate Code Generation: Declarations – Assignment statements – Boolean expressions – Procedure calls. Code Optimization: Principle sources of optimization – Loop Optimization. Code Generation: Issues in the design of code generator – Simple code generator – Basic blocks and flow graphs – The DAG representation of Basic Block – Generating code form DAGs – Peephole optimization.

Text Books

1. Hopcroft, 'Introduction to Automata Theory, Languages, and Computation", Pearson, 3rd Edition, 2008.
2. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley, 2nd Edition, 2007.
3. John C. Martin, "Introduction to Languages and the Theory of Computations", McGraw Hill, 3rd Edition, 2007.

Reference Books

1. Kamala Krithivasan, Rama R, “Introduction to Formal languages Automata Theory and Computation”, Pearson, 2019.
2. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett, 6th Edition, 2016.
3. Anil Malviya, Malabika Datta, “Theory of Computation & Applications - Automata Theory Formal Languages”, BPB publications, 2015.
4. Charles N. Fischer and Richard J. Leblanc, “Crafting a Compiler with C”, Benjamin Cummings, 2009.
5. Mishra K.L.P, "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall India Learning, 1st Edition, 2006.

Web Resources

1. https://www.cse.iitb.ac.in/~akg/courses/2019-cs310/index.html
2. https://www.cse.iitm.ac.in/~krishna/cs3300/
3. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
4. https://www.javatpoint.com/automata-tutorial
5. https://www.tutorialspoint.com/automata_theory/index.htm

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	3	3	1	1	-	2	-	-	-	3	2	2
2	3	3	3	2	3	1	2	-	2	1	-	2	3	2	2
3	2	3	2	3	2	2	-	-	3	-	-	-	3	2	2
4	3	3	2	3	3	1	-	-	2	-	-	-	3	2	2
5	2	3	3	2	2	2	1	-	2	-	-	-	3	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 - High

	L	T	P	C	Hrs
U20CST306 OPERATING SYSTEMS	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To grasp a fundamental understanding of operating systems and processes
- To learn the concepts of CPU scheduling and deadlock
- To understand synchronization and memory management concepts in OS
- To understand the concepts of file systems and secondary storage structure
- To learn the features of commercial operating systems

Course Outcomes

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

CO1 - Define the concepts of operating systems operations, processes and threads **(K2)**
CO2 - Apply the concepts of CPU scheduling and deadlock techniques **(K3)**
CO3 - Simulate the principles of memory management **(K3)**
CO4 - Identify appropriate file system and disk organizations for a variety of computing scenario **(K3)**
CO5 - Examine the features of various open source operating systems **(K4)**

UNIT I INTRODUCTION AND PROCESS MANAGEMENT (9 Hrs)

Operating system structure – Operating system operations – Process management – Memory management – Storage management – Protection and Security – System structures: Operating system services – System calls – Types of system calls -- System programs. Process scheduling – Operations on processes – Inter-process communication. Case study: Linux process management

UNIT II CPU SCHEDULING AND DEADLOCK (9 Hrs)

Overview of threads – Multithreading models – Threading issues – Basic concepts of process scheduling – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling, Dead Lock: Characterization – Prevention Detection – Avoidance and Recovery. Case Study: Linux Scheduling.

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT (9 Hrs)

Process synchronization: The Critical Section Problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors. Memory Management: Swapping – Contiguous memory allocation – Paging – Structure of the Page Table – Segmentation, Demand Paging – Page Replacement – Allocation of Frames – Thrashing. Case Study: Linux Memory Management.

UNIT IV FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE (9 Hrs)

File Concept – Access Methods – Directory structure – File system mounting – File sharing – Protection – File system structure – File system implementation – Directory Implementation – Allocation methods – Free-space management. Disk structure – Disk Scheduling – Disk Management – Swap-Space management. Case Study: Linux file system.

UNIT V CASE STUDY (9 Hrs)

LINUX System: Basic Concepts – System administration – Requirements for Linux System Administrator – Setting up a LINUX multifunction server – Domain Name System – Setting up local network services. Virtualization: Basic concepts – Setting Up Xen – VMware on LINUX Host and adding guest OS. Comparison of LINUX and MICROSOFT Windows operating system concepts.

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons Ninth Edition, 2017.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd Edition, 2015.
3. Gary Nutt, "Operating Systems - A Modern Perspective", Pearson Education, Second Edition, 2013.

Reference Books

1. William Stallings, “Operating System”, Prentice Hall of India, 6th Edition, 2015.
2. Thomas Anderson and Michael Dahlin, “Operating Systems principles and practice”, Wiley, 2nd Edition, 2014.
3. Harvey M. Deitel, “Operating Systems”, Pearson Education, Third Edition, 2013.
4. Silberschatz, Galvin, “Operating System Concepts”, Wiley, Student Edition, 2006.
5. William Stallings, “Operating System: Internals and design Principles”, Old Edition (7), Pearson Education India.

Web Resources

1. https://nptel.ac.in/courses/106108101/
2. http://www.tcyonline.com/tests/operating-system-concepts
3. http://www.galvin.info/history-of-operating-system-concepts-textbook
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
5. https://www.cse.iitk.ac.in/pages/CS330.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	1	1	1	1	-	-	-	-	-	2	1	2
2	-	2	-	2	2	2	2	-	-	-	-	2	2	1	2
3	2	2	2	2	2	-	-	-	-	-	2	-	2	1	2
4	3	3	-	3	3	3	3	3	-	-	3	3	2	1	2
5	3	3	3	3	3	3	3	3	-	3	-	3	2	1	2

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CST307 DATA COMMUNICATIONS AND COMPUTER NETWORKS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To gain and explore the basic concepts of Data Communications.
- To understand the signals and transmission media involved in the physical layer.
- To learn the basic concepts of data link layer services and network layer communication protocols
- To synthesize various load characteristics and network traffic conditions, decide the transport protocols to be used.
- To analyze and compare the different protocols available in the application layer and Network Security.

Course Outcomes

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

CO1 - Analyze the network components and network standards. **(K1)**

CO2 - Determine the Physical layer functionalities, Transmission media and Switching**. (K3)**

CO3 - Analyze the Error correction and detection techniques and determine the proper usage of IP address, subnet mask and default gateway in a routed network **(K3)**

CO4 - Describe, analyze and compare different protocols in transport layer**. (K4)**

CO5 - Analyze the functional working of different protocols of application layer and Network Security**. (K4)**

UNIT I DATA COMMUNICATIONS (9 Hrs)

Overview of Data Communications – Networks and its types – Network topologies – Transmission technologies: Digital signaling – Analog Signaling – Networks Models: Protocol Layering – OSI reference model – TCP/IP Protocol suite.

UNIT II PHYSICAL LAYER AND MEDIA (9 Hrs)

Data and Signals: Analog and digital – Periodic Analog Signals – Digital Signals – Digital Transmission: Digital-to-Digital Conversion – Analog to Digital Conversion – Transmission Media: Guided and unguided media. Switching: Introduction – Circuit Switching – Packet switching.

UNIT III DATA LINK LAYER AND NETWORK LAYER (9 Hrs)

Data link layer design issues – Error Detection and Correction – Sliding window protocols – Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest path algorithm – Distance vector routing – Link state routing, Hierarchical routing – Broadcast, Multicast routing – The Network Layer in the Internet:IPV4 – IPV6.

UNIT IV TRANSPORT LAYER (9 Hrs)

The Transport Service – Elements of Transport Protocols – Transport layer Congestion Control – Transport Layer Protocols: User Datagram Protocol (UDP) – Transmission Control Protocol (TCP):TCP Connection Establishment – TCP Connection Release.

UNIT V APPLICATION LAYER AND NETWORK SECURITY (9 Hrs)

Application Layer Protocols – HTTP – FTP – Telnet – Email Protocols: SMTP – POP3 – IMAP and MIME – DNS – Network Security: Cryptography – Public Key Algorithms – Firewalls.

Text Books

1. Behrouz A. Forouzan, “Data Communications and Networking”, TMH, Fifth Edition, 2013.
2. Larry L. Peterson and Bruce S. Davie, “Computer Networks- A system approach”, Elsevier, 5th edition, 2012.
3. Andrew Tanenbaum and David J. Wetherall “Computer Networks”, Prentice Hall, 5th Edition , 2011

Reference Books

1. Andrew S.Tanenbaum, "Computer Networks", Pearson Publication, 4th Edition, 2018.
2. Pallapamanvi. V , "Data Communications and Computer Networks", PHI, 4th edition, 2014.
3. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach: International Edition”, Pearson Education, Sixth edition, 2013.
4. Stallings, W., “Data and Computer Communications”, Prentice Hall Int. Ed., 10th Edition. 2013.
5. Dayanand Ambawade, Deven Shah, "Advanced Computer Networks", Dreamtech Press, 1st edition, 2011.

Web Resources

1. https://nptel.ac.in/courses/106/105/106105183/
2. https://nptel.ac.in/courses/106/105/106105081/
3. https://www.geeksforgeeks.org/last-minute-notes-computer-network/
4. https://lecturenotes.in
5. https://www.cse.iitk.ac.in/users/dheeraj/cs425/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	2	2	2	2	2	2	-	-	2	-	-	3	2	-
2	2	2	2	2	2	2	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	3	3			3	3	3	3	2	2
4	1	1	1	1	-	-	1	-	-	-	-	-	1	-	1
5	3	3	3	3	3	3	3	-	-	-	3	3	3	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20HSP301	GENERAL PROFICIENCY– I	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To enrich strong vocabulary and decoding skills through comprehension analysis
- To advance communication and leadership skills pragmatically
- To pronounce English sounds in isolation and in connected speech
- To expand effective written communication skills to meet organizational goals
- To extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

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

CO1 - Interpret meaning and apply reading strategies in technical and non-technical context **(K2)**
CO2 - Develop interpersonal communication skills professionally **(K3)**
CO3 - Infer the distinct speech sounds and overcome native language influence **(K2)**
CO4 - Demonstrate various forms of formal writing **(K2)**
CO5 - Apply the techniques of verbal aptitude in competitive exams **(K3)**

UNIT I COMPREHENSION ANALYSIS (6 Hrs)

Listening: Listening Comprehension (IELTS based) – Speaking: Break the iceberg – Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 1 (IELTS: Graph/ Process /Chart Description) Vocabulary: Synonyms (IELTS)

UNIT II PERSONALITY DEVELOPMENT (6 Hrs)

Listening: Interview Videos- Speaking: Extempore& Presentation (Soft Skills) – Reading: British & American Vocabulary, Read and review (Books, Magazines) - Writing: SWOT Analysis Vocabulary: Idioms (IELTS)

UNIT III INFERENTIAL LEARNING (6 Hrs)

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes – Speaking: Interpersonal Interaction & Situational attribution–Reading: Distinguish between facts & opinions – Writing: Writing Conversation to different context Vocabulary: Phrasal Verbs (IELTS)

UNIT IV INTERPRETATION AND FUNCTIONAL WRITING (6 Hrs)

Listening: Group Discussion videos – Speaking: Group Discussion Practice - Reading: Interpretation of data - Graph, table, chart, diagram (IELTS based) – Writing: Writing Task: 2 (IELTS) Vocabulary: Collocations (IELTS)

UNIT V APTITUDE (6 Hrs)

Language Enhancement: Articles, Preposition, Tenses. Verbal Ability Enhancement: Blood Relation, Completing Statements – Cloze test, Spotting Errors – Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(GATE)

Reference Books

1. Jeff Butterfield, “Soft Skills for Everyone”, Cengage Learning, 2012.
2. Aggarwal, R. S, “A Modern Approach to Verbal & Non Verbal Reasoning”, S. Chand, 2010.
3. Wren, Percival Christopher, and Wren Martin, “High School English Grammar and Composition”, S: Chand, 2005.
4. Bailey, Stephen, “Academic writing: A practical guide for students”, Psychology Press, 2003.
5. Mn,Taylor, and Grant Taylor, “English Conversation Practice”, Tata McGraw-Hill Education, 2001.

Web Resources

1. https://www.ielts-exam.net/grammar/
2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5. https://www.examsbook.com/word-analogy-test-questions-with-answers

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 – Low, 2 – Medium, 3 – High

U20BSP323	NUMERICAL METHODS LABORATORY (Common to CSE & IT)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn the techniques of non – linear equation using c program.
- To understand the numerical solution of a matrix by power - method using c program.
- To know the techniques of solving simultaneous equations using c program.
- To introduce the numerical techniques of integration using c programming.
- To study about the numerical solution of parabolic equation.

Course Outcomes

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

CO 1 – Find out the root of the Algebraic and Transcendental equations using C Programming. **(K3)**
CO 2 – Know the concept of matrix by power method using C programming. **(K3)**
CO 3 – Solve the system of simultaneous equations using C programming. **(K3)**
CO 4 – Implement numerical techniques of integration using C programming. **(K3)**
CO 5 – Find the numerical solution of parabolic equation using C programming **(K3)**

List of experiments:

1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Solve the system of linear equations using Gauss - Seidal iteration method.
7. Find the area by using trapezoidal rule.
8. Find the area by using Simpson's 1/3 rule.
9. Find the area by using Simpson's 3/8 rule.
10. Find the numerical solution of heat equation.

Reference Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition,2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web Resources

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 – Low, 2 – Medium, 3 – High

U20ESP357	DATA STRUCTURES LABORATORY (Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS and CCE)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basic concepts of Data Structures.
- To learn about the concepts of Searching Techniques.
- To explore about the concepts of Sorting Techniques.
- To know about the linear Data Structures.
- To study about non-linear Data Structures.

Course Outcomes

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

CO1 - Analyze the algorithm's / program's efficiency in terms of time and space complexity.**(K3)**
CO2 - Solve the given problem by identifying the appropriate Data Structure.**(K3)**
CO3 - Solve the problems of searching and sorting techniques. **(K3)**
CO4 - Solve problems in linear Data Structures.**(K4)**
CO5 - Solve problems in non-linear Data Structures. **(K4)**

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a)Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
   a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.

Web Resources

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 – Low, 2 – Medium, 3 – High

U20ESP360	PROGRAMMING IN C++ LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE, IT, CCE)

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To gain insight into the Functions and Array usages using C++.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.

Course Outcomes

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

CO1 - Implement the Object Oriented concepts in simple applications. **(K3)**
CO2 - Employ the Functions and Arrays in simple programs. **(K3)**
CO3 - Demonstrate simple programs with Classes and Objects. **(K3)**
CO4 - Illustrate Operator overloading and Inheritance concepts. **(K3)**
CO5 - Develop programs using Files and Exception Handling concepts. **(K3)**

List of Exercises

1. Control Structures and Looping Structures.
2. Array Usages.
3. Class Declarations, Definition, and Accessing Class Members.
4. Constructor, parameterized constructor and copy constructors.
5. Friend Function and Friend Class.
6. Function Overloading and Constructor Overloading.
7. Operator Overloading.
8. Access Members of a Class Using Pointer to Object Members.
9. Single Inheritance and Multiple Inheritances.
10. Multilevel inheritance, Hierarchical Inheritance and Hybrid Inheritance.
11. Virtual Classes and Abstract Classes.
12. Exception Handling.
13. IOStream, IStream, Ostream classes and their usages.
14. FileStream Operations.
15. Template based program to sort the given list of elements.
16. Real world examples

Reference Books

1. Yashavant Kanetkar, “Let Us C++ “, BPB Publications, 2020.
2. E. Balagurusamy, “Object Oriented Programming with C++”, McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, “C++ - The Complete Reference”, McGraw Hill Education, 4th Edition, 2017.
4. Stanley B. Lippman, Stanley Lippman, Barbara Moo, “C++ Primer”, Addison-Wesley Professional, 5th edition 2012.
5. Herbert Schildt, “C++ - From the Ground Up”, McGraw Hill Education, 2nd edition, 2010.

Web Resources

1. http://www.cplusplus.com/doc/tutorial/
2. https://www.tutorialspoint.com/cplusplus/index.htm
3. https://www.w3schools.com/cpp/
4. https://www.javatpoint.com/cpp-tutorial
5. https://www.geeksforgeeks.org/cpp-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1

Correlation Level: 1 – Low, 2 – Medium, 3 – High

U20CSP303 LINUX INTERNALS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives
- To learn basic UNIX / LINUX commands
- To develop programs in Linux environment using system calls.
- To implement the CPU scheduling algorithms.
- To implement Deadlock handling algorithm.
- To develop solutions for synchronization problems using semaphores

Course Outcomes
After completion of the course, the students will be able to
CO1 - Understand the basic commands for Linux. **(K2)**
CO2 - Develop simple shell programs**. (K2)**
CO3 - Implement different Scheduling Algorithms **(K5)**
CO4 - Apply the basic concepts of Deadlock Handling procedures. **(K4)**
CO5 - Simulate Critical Section problem using Semaphore **(K4)**

List of Exercises
1. Study of basic UNIX/Linux commands
2. Shell Programming - I
    (a) To Write a Shell program to count the number of words in a file.
    (b) To Write a Shell program to calculate the factorial of a given number.
    (c) To write a Shell program to generate Fibonacci series.
    (d) Write a Shell Program to wish the user based on the login time.
3. Shell Programming - II
    (a) Loops
    (b) Patterns
    (c) Expansions
    (d) Substitutions
4. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, open dir, read dir.
5. To write a program to simulate cat command.
6. To write a program to simulate head and tail commands.
7. Simulate UNIX commands like ls, grep.
8. Process Scheduling- FCFS, SJF, Priority and Round robin.
9. Implementation of Banker's algorithm.
10. Write a C program to simulate producer and consumer problem using semaphores

Reference Books
1. William Stallings, "Operating System", Pearson Education, Sixth edition, 2015.
2. Andrew S. Tanenbaum, Modern Operating Systems,3rd edition Prentice Hall of India Pvt. Ltd, 2015.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt, Third Edition, 2013
4. William Stallings, "Operating System: Internals and design Principles", Pearson Education, Old Edition (7), 2013.
5. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.

Web Resources
1. https://www.geeksforgeeks.org
2. http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html
3. https://www.programming9.com/programs/c-programs/285-page-replacement-programs-in-c

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	1	1	1	1	-	-	-	-	-	-	-	2
2	-	2	-	2	2	2	2	-	-	-	-	2	-	-	2
3	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
4	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
5	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CSC3XX	CERTIFICATION COURSE - III	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSS302	SKILL DEVELOPMENT COURSE 2	L	T	P	C	Hrs
		0	0	2	0	30

COMPUTER ASSEMBLY AND TROUBLESHOOTING

Course Objectives

- Demonstrate Computer assembly and parts identification.
- Inculcate how to install Operating system.
- Understand how to setup PC in a network
- Understand the troubleshooting of printers
- Troubleshooting of PC related problems

Course Outcomes

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

CO1 - Acquire knowledge to assemble PCs.**(K3)**

CO2 - Understand to install operating system in a PC. **(K3)**

CO3 - Design a simple LAN network. **(K3)**

CO4 - Apply troubleshooting methods in printers. **(K3)**

CO5 - Apply troubleshooting approaches in PC. **(K3)**

List of Exercises

1. Assembling of a Personal Computer:
   a) Identifying parts of mother board, power connections and locating other connectors.
   b) Interconnection of disk drive units, keyboard, mouse and monitor.
2. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager.
3. Installation of Windows.
4. Install and Configure Dual OS Installation.
5. Networking PCs: setting up Wired/ Wireless LANs and troubleshooting.
6. Identify, install and manage network connections Configuring IP address and Domain name system.
7. Networking of devices using Bluetooth interface.
8. Installation Antivirus and configure the antivirus.
9. Installation of printer and scanner software.
10. Trouble shooting and Managing Systems.
11. Serial Communication: To establish serial communication (RS232C) between a pair of PCs.

Reference Books

1. Peter Norton, “Introduction to Computers”, Mc Graw Hill Publishers, 7th Edition, 2017.
2. David Anfinson and Ken Quamme, “IT Essentials PC Hardware and Software Companion Guide”, Pearson Education, Third Edition, 2010
3. Vikas Gupta, “Comdex Information Technology course tool kit”, WILEY Dreamtech, 2009
4. Scott Muller, “Upgrading and Repairing PC’s”, Pearson Education, 18th Edition, 2007.
5. Kate J. Chase, “PC Hardware and A+Handbook”, PHI (Microsoft), 2004.

Web Resources

1. https://www.instructables.com/Computer-Assembly/
2. https://www.instructables.com/id/How-To-Assemble-A-Basic-Desktop-PC/
3. https://www.coursera.org/lecture/system-administration-it-infrastructure-services/troubleshooting-and-managing-issues-ks1P1.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
2	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
3	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
4	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
5	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CSS302	SKILL DEVELOPMENT COURSE 2 APTITUDE - I	L	T	P	C	Hrs
		0	0	2	0	30

Course Contents

- Number System - Basics, Properties & Type of Numbers - Divisibility Rules.
- LCM & HCF - Unit Digit Concept [Cyclicity Method].
- Decimals, Simplification. Ratio & Proportion - Compounded & Duplicate Ratio - Inverse Ratio - Shortcut to Find Ratio - Continuous Proportion - Mean & Divisibility Proportion.
- Ages - Both Data is in Ratio or Time Format - One Data in Ratio or Time Format & Other Data in Sum, Difference or Product.
- Logical [Puzzles] Method.
- Average - Basics & Finding Average in Complex - Replacement & Alteration Method - Average Speed Finding Problems.
- Allegation & Mixtures.
- Ratio of Mixture - Finding the Kilogram through Ratio.
- Mean Value Method.
- Ratio Mixture [Fraction Method] - Iteration Method.

U20CSS302	SKILL DEVELOPMENT COURSE 2 ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C	Hrs
		0	0	2	0	30

Course Objectives

- To provide the basic operation and applications of electronic devices.
- To provide working knowledge of the working of analogue electronic circuits.
- To provide the basic knowledge of design and implementation of amplifier.
- To provide the basic knowledge of design and implementation of diodes and transistors.
- To provide experience in design and implementation of analogue circuits using discrete electronic components.

Course Outcomes

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

CO1 - Student should be able to understand the working of analog circuits like rectifiers, clippers, clampers etc.**(K3)**

CO2 - Student should be able to design and implement circuits like RC coupled amplifier, tuned amplifier, Schmitt trigger etc.**(K3)**

CO3 - Student should be able to design and demonstrate the functioning of regulators, oscillators and power amplifiers.**(K3)**

CO4 - Students should be able to analyze and interpret the characteristics of diodes and transistors.**(K3)**

CO5 - Students should be able to function effectively as an individual and in a team to accomplish the given task.**(K3)**

List of Exercises

1. VI characteristics of rectifier and Zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Full-wave rectifiers - with and without filter - ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC Coupled CE amplifier - frequency response characteristics.
9. MOSFET amplifier (CS) - frequency response characteristics.
10. Cascade amplifier – gain and frequency response
11. Cascade amplifier – frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response
13. Low frequency oscillators – RC phase shift, Wien bridge
14. High frequency oscillators – Colpitt"s and Hartley
15. Power amplifiers (transformer less), Class B and Class AB.
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier – frequency response
18. Bootstrap sweep circuit
19. Multi vibrators – astable, monostable, bistable
20. Schmitt trigger

Reference Books

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education Eleventh Edition, 2015.
2. M. Morris Mano, "Digital Design", Pearson Education, 6th Edition, 2017.
3. David A Bell, “Fundamentals of Electronic Devices and Circuits”, Fifth edition Oxford Press, 2009
4. Thomas L. Floyd, “Digital Fundamentals”, Tenth Edition, Pearson Education, NewDelhi, 2009.

5. Varsha Agrawal Anil K. Maini,"Electronic Devices and Circuits",Wiley,1st edition,2019.

Web Resources

1. http://www.electronics-tutorials.ws
2. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
3. https://nptel.ac.in/courses/117106114/
4. https://nptel.ac.in/courses/117106086/
5. https://www.vlab.co.in/broad-area-electronics-and-communications

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-
4	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
5	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CSM303	PHYSICAL EDUCATION	L	T	P	C	Hrs
		0	0	2	-	30

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

SEMESTER IV

U20BST432	DISCRETE MATHEMATICS AND GRAPH THEORY (Common to CSE & IT)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To learn the concept of symbolic logic and truth tables.
- To apply the rules of Inference and predicate calculus.
- Analyze the asymptotic performance of Lattices.
- To understand the fundamental concepts of Graph theory.
- Synthesize efficient algorithms in Graph theory and trees.

Course Outcomes

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

CO1 - Construct mathematical arguments using logical connectives and truth tables. **(K3)**
CO2 - Apply propositional and predicate logic and quantifiers. **(K3)**
CO3 - Solve the problems using counting techniques in Lattices. **(K3)**
CO4 - Familiarize the different types of Graphs. **(K3)**
CO5 - Understand various types of trees and methods for algorithms. **(K2)**

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS (12 Hrs)

Introduction – Connectives – Statement formulae – Truth table – Tautologies – Equivalence of Statement formulae – NAND and NOR Connectives – Implications – Principal conjunctive and disjunctive normal forms.

UNIT II PREDICATE CALCULUS (12Hrs)

Inference calculus – Derivation process – Conditional proof – Indirect method of proof – Automatic theorem proving – Predicate calculus.

UNIT III LATTICES (12 Hrs)

Boolean algebra – Lattices – Sub lattices – Complemented and Distributive lattices. Partially Ordered Relations – Lattices as Posets – Hasse Diagram – Properties of Lattices.

UNIT IV GRAPH THEORY (12 Hrs)

Graphs – Applications of graphs – Degree – Pendant and isolated vertices – Isomorphism – Sub graphs – Walks – Paths and Circuits – Connected graphs – Euler graphs – Hamilton paths and circuits – Complete graph.

UNIT V TREES (12 Hrs)

Trees – Properties of Trees – Pendant vertices in a Tree – Kruskal algorithm.

Text Books

1. P.Tremblay and R.Manohar, “Discrete Mathematical structures with applications to computer science”, Tata McGraw - Hill publishers, 13th Edition, 2002.
2. Narsinghdeo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publications, 1st Edition, 2016.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw - Hill Publishing Company, Pvt. Ltd., 5th Edition, 2003.

Reference Books

1. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw - Hill Education Pvt., 3rd Edition, 2008.
2. F. Harary, "Graph theory", Narosa publishing house, 1988.
3. Douglas B. West, "Introduction to Graph theory", Pearson Education, 2nd Edition, 2002.
4. Oscar Levin, "Discrete Mathematics An Open Introduction", 3rd Edition, 2019.
5. Edgar C Coodare and Michael M Parmenter, “Discrete Mathematics with Graph Theory”, Pearson Education, 3rd Edition, 2015.

Web Resources

1. https://nptel.ac.in/courses/111/107/111107058/
2. https://nptel.ac.in/courses/106/106/106106183/
3. https://www.researchgate.net/publication/1922282_Discrete_Mathematics_for_Computer_Science_Some_Notes
4. https://www.pdfdrive.com/discrete-mathematics-for-computer-science-e17017833.html
5. https://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	1	3	1	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20EST467 **PROGRAMMING IN JAVA**

L	T	P	C	Hrs
3	0	0	3	45

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE and AIDS)

Course Objectives

- To gain and explore the knowledge of java programming
- To know the principles of inheritances, packages, interfaces
- To get familiarized to generic programming, multithreading concepts.
- To gain and explore the advanced concepts in Java.
- To explore database connectivity

Course Outcomes

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

CO1 - Write a maintainable java program for a given algorithm and implement the same. **(K2)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling, thread and generic programming. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams. **(K3)**
CO5 - Exemplify simple graphical user interfaces using GUI components and database programs. **(K3)**

UNIT I INTRODUCTION TO JAVA PROGRAMMING (9 Hrs)

The History and Evolution of Java – Byte code – Java buzzwords – Data types – Variables – Arrays – operators – Control statements – Type conversion and casting. Concepts of classes and objects: Basic Concepts of OOPs – constructors – static keyword – Final with data – Access control – This key word – Garbage collection – Nested classes and inner classes – String class

UNIT II INHERITANCE, PACKAGES AND INTERFACES (9 Hrs)

Inheritance: Basic concepts – Forms of inheritance – Super key word – method overriding – Abstract classes – Dynamic method dispatch – The Object class. Packages: Defining – Creating and Accessing – importing packages. Interfaces: Defining – Implementing – Applying – Variables and extending interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING (9 Hrs)

Concepts of Exception handling – Types of exceptions – Creating own exception – Concepts of Multithreading – creating multiple threads – Synchronization – Inter thread communication. Enumeration: Autoboxing – Generics.

UNIT IV COLLECTIONS, I/O STREAMS (9 Hrs)

Collections: List – Vector – Stack – Queue – Dequeue – Set – Sorted Set. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC (9 Hrs)

Events – Delegation event model – Event handling – Adapter classes. AWT: Concepts of components – Font class – Color class and Graphics. Introduction to Swing: Layout management - Swing Components. Java Database Connectivity. Develop real time applications.

Text Books

1. Herbert Schildt, “Java: The Complete Reference”, TMH Publishing Company Ltd, 11th Edition, 2018.
2. Sagayaraj, Denis, Karthik, Gajalakshmi, “JAVA Programming for core and advanced learners”, Universities Press Private Limited, 2018.
3. Herbert Schildt, “The Complete Reference JAVA 2”, TMH, Seventh Edition, 2006.

Reference Books

1. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017.
2. Nageshvar rao, "Core Java and Integrated Approach", 1st Edition, Dreamtech, 2016.
3. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013.
4. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
5. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Pearson Education, 8th Edition, 2008.

Web Resources

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	3	2	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CST408	DATABASE MANAGEMENT SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about Database Structure and Data Models.
- To study SQL Commands for storing and retrieving data into the database.
- To study the Relational database system design
- To understand the concept of Transactions
- To understand the concept of Concurrency Control and Recovery System

Course Outcomes

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

CO1 - Design conceptual data model using Entity Relationship Diagram. **(K2)**
CO2 - Design conceptual and logical database models for an application. **(K3)**
CO3 - Normalize relational database design of an application. **(K3)**
CO4 - Explain the need for Indexing, Hashing and Transactions in database**. (K2)**
CO5 - Understand the strategies for providing security, privacy, and recovery of data. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Database System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Database – Database Design – System Structure – Database Architecture. Database Design and E-R Model: Overview of the Design Process – The E-R Model – Constraints – E-R Diagrams- E-R Design Issues – Extended E-R features – Reduction to Relational Schemas – Other aspects of Database Design.

UNIT II RELATIONAL MODEL (9 Hrs)

Structure of Relational Database – Fundamental Relational Algebra Operations – Extended Relational Algebra Operations – Modification of the Database. Structured Query Language: Introduction – Basic Structure of SQL Queries – Set Operations – Additional Basic Operations – Aggregate Functions – Null Values – Nested Sub queries – Views – Join Expression.

UNIT III RELATIONAL DATABASE DESIGN (9 Hrs)

Features of Good Relational Designs – 1NF – 2NF – 3NF and 4NF with Examples. Atomic Domains and first Normal form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithm for Decomposition – Decomposition using Multivalued Dependencies.

UNIT IV INDEXING - HASHING AND TRANSACTION MANAGEMENT (9 Hrs)

Basic Concepts – Ordered Indices – B+ Tree Index Files – B-Tree Files – Multiples – Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices. Transaction Management: Transaction concept – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation and Atomicity – Serializability – Recoverability – Transaction Isolation Levels – Implementation of Isolation Levels.

UNIT V QUERY PROCESSING AND CONCURRENCY CONTROL (9 Hrs)

Query Processing: Measures of Query Cost – Selection Operation – Sorting – Join Operation – Other Operations – Evaluation of Expressions. Query optimization: Overview – Transformation of Relational Expressions – Estimating Statistics of Expression Results – Choice of Evaluation Plan Concurrency Control: Lock Based Protocols – Timestamp Based Protocols – Validation Based Protocols. Recovery System: Failure Classification – Remote Backup Systems.

Text Books

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", McGraw-Hill, 7th Edition, 2019.
2. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2018.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems The Complete Book" Prentice Hall, 2nd Edition, 2014.

Reference Books

1. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.
2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
4. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.
5. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.

Web Resources

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
4. https://nptel.ac.in/courses/106/106/106106095/
5. https://www.tutorialspoint.com/dbms/index.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	2	1	2	2	1	1	2	-	3	2	3	2
2	2	3	3	3	2	2	1	1	2	1	-	-	3	3	3
3	3	3	3	3	2	2	2	-	2	1	2	2	3	2	3
4	3	2	3	3	1	2	2	-	2	1	2	3	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	3	3	3	3

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CST409	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE and CCE)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To understand the performance analysis of Algorithms.
- To compare the searching and traversal techniques.
- To understand the problems based on divide and conquer and Greedy method.
- To understand the problems based on dynamic programming and backtracking methods.
- To understand the problems based on branch and bound and NP-Hard.

Course Outcomes

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

CO1 - Analyze and improve the efficiency of algorithms and estimate the performance of algorithm**. (K2)**

CO2 - Apply different designing methods for development of algorithms to realistic problems. **(K3)**

CO3 - Determine the Divide and Conquer, Greedy paradigms and explain when an algorithmic design situation calls for it**. (K3)**

CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it**. (K3)**

CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it**. (K2)**

UNIT I INTRODUCTION TO ALGORITHM AND NOTATIONS (12 Hrs)

Introduction – Algorithm – Pseudo code for expressing algorithms – Performance Analysis – Time complexity – Space complexity – Asymptotic Notation – Big oh notation – Omega notation – Theta notation and Little oh notation – Probabilistic analysis – Amortized analysis.

UNIT II DIVIDE AND CONQUER, GREEDY METHOD (12 Hrs)

Divide and Conquer method: Solving recurrence relations – Applications – Binary search – Merge sort – Quick sort. Greedy method: General method – applications – Job sequencing with deadlines – Knapsack problem – Minimum cost spanning trees – Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING (12 Hrs)

Dynamic Programming: Applications – Multistage graphs – Optimal binary search trees – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem – Reliability design – Chained Matrix Multiplication – Graph Applications: AND/OR graphs – Connected components – Identification of articulation points – Bi-connected components.

UNIT IV BACKTRACKING METHOD (12 Hrs)

Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle – 0/1 Knapsack Problem.

UNIT V BRANCH AND BOUND, NP-HARD PROBLEMS (12 Hrs)

General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution – FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts – Non deterministic algorithms – NP-Hard and NP-Complete classes.

Text Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rdEdition, 2009.

Reference Books

1. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
2. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
3. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education, 3rd Edition, 2010.
4. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

Web Resources

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	1	-	-	-	-	-	2	3	2
CO2	3	2	3	3	2	2	1	-	-	-	-	-	3	3	3
CO3	3	3	3	3	2	2	2	-	2	-	-	-	3	2	3
CO4	3	2	3	3	3	2	2	-	-	-	3	-	3	3	3
CO5	3	3	3	3	2	2	2	-	-	-	3	2	3	3	3

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20HSP402	GENERAL PROFICIENCY–II	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To examine various standardized test in English language
- To recognize the key features of various technical writing
- To integrate LSRW skills to endorse multifarious skill set in practical situation
- To understand the factors that influence the usage of grammar
- To understand the basic concepts of logical reasoning skills

Course Outcomes

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

CO1 - Infer ideas to attend international standardized test by broadening receptive and productive skills **(K2)**
CO2 - Interpret the types of writing in different state of affairs **(K2)**
CO3 - Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation **(K3)**
CO4 - Identify the rules of grammar in academic discourse settings **(K3)**
CO5 - Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. **(K2)**

UNIT I - CAREER SKILLS (6 Hrs)

Listening: Listening at specific contexts Speaking: Mock interview (Personal & Telephonic)-Reading: Read and Review – Newspaper – Advertisement – Company Handbooks, and Guidelines (IELTS based) Writing: Essay Writing (TOEFL) Vocabulary: Words at specified context (IELTS).

UNIT II - CORPORATE SKILLS (6 Hrs)

Listening: Listening and replicating Speaking: Team Presentation (Work Place Etiquettes) Reading: Short texts (signs, emoticons – messages) Writing: E-mail writing – Hard skills -Resume' Writing – Job Application Letter – Formal Letter Vocabulary: Glossary (IELTS).

UNIT III - FUNCTIONAL SKILLS (6 Hrs)

Listening: Listening TED Talks – Speaking: Brainstorming &Individual Presentation – Persuasive Communication –- Reading: Text Completion (GRE Based) Writing: Expansion of Compound Words Vocabulary: Expansion of vocabulary (IELTS).

UNIT IV - TRANSFERABLE SKILLS (6 Hrs)

Listening: Listening Documentaries and making notes – Speaking: Conversation practice at formal & informal context Reading: Read and transform – Report, memo, notice and advertisement. Writing: Euphemism, Redundancy and Intensifiers Vocabulary: Refinement of vocabulary (IELTS).

UNIT V – APTITUDE (6 Hrs)

Transformational Grammar: Phrases & Clauses, Concord, Conditional Clauses, Voice, Modals. Verbal Ability Enhancement: Letter Series – Coding &Decoding – Sentence Completion (GATE) – Critical Reasoning & Verbal Deduction (GATE) – Syllogism.

Reference Books

1. Tulgan, Bruce**.** "Bridging the soft skills gap: How to teach the missing basics to today's young talent". John Wiley & Sons, 2015.
2. Cullen, Pauline, Amanda French, and Vanessa Jakeman**.** "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
3. Ramesh, Gopalaswamy. "The ace of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.
4. Sherfield, Robert M. "Cornerstone: Developing Soft Skills". Pearson Education India, 2009.
5. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.

Web Resources

1. https://www.englishclub.com/grammar/nouns-compound.htm
2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5. http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20ESP468 PROGRAMMING IN JAVA LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE)

Course Objectives

- To acquire programming skill in core java.
- To learn how to design java program and applications.
- To acquire object oriented skills in java.
- To develop the skill of designing applications.
- To explore database connectivity.

Course Outcomes

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

CO1 - Apply and practice logical formulations to solve simple problems leading to specific applications. **(K3)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling multithread. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams**.(K3)**
CO5 - Develop simple database programs. **(K3)**

List of Exercises

1. Develop simple programs using java technologies and testing tools.
2. Develop a java program that implements class and object.
3. Write a java program to demonstrate inheritance.
4. Develop a simple real life application program to illustrate the use of Multi Threads.
5. Implement simple applications using Collections.
6. Develop a simple application and use JDBC to connect to a back-end database.
7. Create a student application with Add, Edit, Delete, Show functions using JDBC.
8. Create a Bill Application to store sales details using JDBC.
9. Create java applications using Exception Handling for error handling.
10. Develop a java program that implements the Packages.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Paul Deitel Harvey Deitel**, "**JAVA How to program (Early Objects)",19th Edition, 2011
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, Seventh Edition, 2010.
4. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.
5. E. Balaguruswamy, "Programming with Java", TMH, 2nd Edition, 2005.

Web Resources

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CSP404	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn and understand DDL & DML
- To learn and understand DCL.
- To implement Basic SQL commands.
- To execute PL/SQL programs.
- To develop GUI applications in any platform.

Course Outcomes

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

CO1 - Implement DDL and DML commands.**(K3)**

CO2 - Implement DCL commands. **(K3)**

CO3 - Analyze PL/SQL programs. **(K3)**

CO4 - Understand PL/SQL programs. **(K3)**

CO5 - Develop GUI applications in their known platform. **(K3)**

List of Exercises

1. Create Table using Data Definition Language (DDL).
2. Modify Table using Data Manipulation Language (DML).
3. Store and Retrieve data through Data Control Language (DCL).
4. Implement Constraints and Built-in functions in various tables.
5. Perform Joins and Group-by functions.
6. Implement Simple Programs in SQL.
7. Create SQL programs using functions.
8. Create SQL programs using procedures.
9. Create SQL programs using triggers.
10. Developing GUI applications.
    - Student Information System.
    - Inventory Management.
    - Payroll Processing.

Reference Books

1. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2016.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, McGraw Hill, 3rd Edition, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts", McGraw-Hill Indian Edition, 7th Edition, 2013.
4. Kuhn,"RMAN Recipes for Oracle Database", Apress,2nd Edition, 2013.
5. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, Pearson Education, 8th Edition, 2006.

Web Resources

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2	2	1	-	2	1	-	2	2	3	2
2	3	2	3	3	2	2	1	-	2	1	-	-	3	3	3
3	3	3	3	3	2	2	2	-	2	1	-	-	3	2	3
4	3	2	3	3	2	2	1	-	2	1	-	-	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	-	3	2	3

Correlation Level: 1 – Low, 2 – Medium, 3 - High

		L	T	P	C	Hrs
U20CSP405	**DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY** (Common to CSE and CCE)	**0**	**0**	**2**	**1**	**30**

Course objectives

- To introduce the basic concepts of various algorithm design techniques.
- Solving various real time problems using Greedy methods.
- To implement real time problems using Analyze dynamic programming
- Experimental with different algorithm techniques like Backtracking and Branch and Bound
- To analyze algorithm for time and space complexity.

Course Outcomes

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

CO1 - Demonstrate various algorithm design techniques used to solve real time problems**(K2)**
CO2 - Analyze the algorithm efficiency in terms of time and space complexity**.(K3)**
CO3 - Solve the real time problems using Divide and Conquer, and Greedy paradigms and derives the time complexity. **(K3)**
CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**
CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

List of Exercises

1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
3. Implementation of Knapsack using Greedy technique.
4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique.
5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.
6. Implementation of Multi-Stage Graphs using Dynamic Programming technique.
7. Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
8. Implementation of Traveling Salesman algorithms using Dynamic Programming technique.
9. Implementation of 8 Queens with the design of Backtracking.
10. Implementation of sum of subsets with the design of Backtracking.
11. Implementation of 0/1 Knapsack problems with Branch-and-Bound technique.
12. Implementation of Traveling Salesman problems with Branch-and-Bound technique.

Text Books

1. Faruqi A,"Design and Analysis of Algorithms", CBS Publishers, 2016.
2. S Sridhar," Design and Analysis of Algorithms First Edition", Oxford University Press,1st Edition, 2015.
3. Dave,"Desgin and Analysis of Algorithms", Pearson Education India, 2nd Edition, 2013.

References Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition, 2019.
2. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
3. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

Web Resources

1. https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial
2. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
3. https://swayam.gov.in/nd1_noc20_cs71/preview
4. https://swayam.gov.in/nd1_noc20_cs93/preview.

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	1	-	-	-	-	-	2	3	2
CO2	3	2	3	3	2	2	1	-	-	-	-	-	3	3	3
CO3	3	3	3	3	2	2	2	-	2	-	-	-	3	2	3
CO4	3	2	3	3	3	2	2	-	-	-	3	-	3	3	3
CO5	3	3	3	3	2	2	2	-	-	-	3	2	3	3	3

Correlation Level: 1 – Low, 2 – Medium, 3 - High

U20CSC4XX	CERTIFICATION COURSE - IV	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSS403	SKILL DEVELOPMENT COURSE - III EXPLORING PHOTOSHOP	L	T	P	C	Hrs
		0	0	2	0	30

Course Objectives

- To understand about the basic Photoshop files and tools
- Explore Photoshop Help, and use it to find out more about the tools in the Toolbox.
- Create a layered Photoshop document from a image
- Create images that demonstrate advanced selection and layering techniques.
- Create a theme based image using Photoshop tools.

Course Outcomes

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

CO1 - Identify elements of the Photoshop user interface and demonstrate knowledge of their functions.
CO2 - Demonstrate knowledge of layers and images
CO3 - Apply painted masks, selection-based masks, gradient masks, and blend modes to create sophisticated image effects.
CO4 - Create adjustment layers for editable, non-destructive changes to image coloration and exposure.
CO5 - Apply special effects to Zooming using masks, paths, and layer styles.

List of Exercises

1. Study of Photoshop files and tools
2. Create a Visiting Card by using appropriate tools in Photoshop.
3. Design a photo frame using custom shapes in Photoshop
4. Convert a color photo to black and white photo
5. Explain the steps for Designing a Passport Size Photo on a Max Size Paper
6. Removing White Background On Logo And Turn Into Transparent Image
7. Zooming Effect in picture
8. Panorama
9. Mass Image Editing Using Photoshop Actions
10. Create a Banner

Reference Books

1. Lisa Fridsma, Brie Gyncild,"Adobe After Effects Classroom in a book", Adobe Press, 2020.
2. Andrew Faulkner, Conrad Chavez," Adobe Photoshop CC", Adobe Press, 2016.
3. Conrad Chavez,"Color Management for Photographers and Designers," Peach Pit, 2014.
4. Elaine Weinmann, Peter Lourekas, "Photoshop CC: Visual QuickStart Guide ",Peachpit press,2014.
5. Derek Lea ,"Creative Photoshop:Digital Illustration and art techniques", Focal Press,2012.

Web Resources

1. https://nptel.ac.in/content/storage2/courses/112101002/downloads/Lec_41-42.pdf
2. https://nptel.ac.in/courses/106/106/106106177/
3. http://www.nptelvideos.com/adobe/adobe_photoshop_tutorials.php
4. https://www.adobe.com/products/captivateprime/content-catalog/creative-cloud/photoshop-cc.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	1	-	-	-	2	-	-	2	1	-	-
2	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
3	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
4	2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
5	3	3	1	-	-	2	3	-	3	2	3	3	3	3	-

Correlation Level: 1 – Low, 2 – Medium, 3 - High

		L	T	P	C	Hrs
U20CSS403	**SKILL DEVELOPMENT COURSE – III APTITUDE - II**	**0**	**0**	**2**	**-**	**30**

Course Contents

- Number System – II [Advanced Level].
- Factors [Sum, Product, odd, Even].
- Remainder Theorem - No of Zeros at End -Highest Power - Finding the Last two Digits.
- Time & Work, Chain Rule - Working Together.
- Combination Method - Before, After & Alternative Method.
- Men & Days - Men, Days & Work - Efficiency & Wages.
- Equation Method.
- Profit & Loss - Basics & Short Cuts - Passing Through Successive Hands.
- Purchase & Selling - Dishonest Shopkeeper.
- Successive Discount into Single Equivalent Discount - Dealing with two or more Parts.
- Percentage - Conversion & Shortcuts - Population, Depreciation Methods.
- Percentage Savings & Expenditure - Reduction in Consumption - Percentage Relationship.
- Time, Speed & Distance, Trains, Boats - Relationship between T/S/D.
- Train in same Direction - Opposite Direction.
- Boats along with Streams - Against the Streams.

		L	T	P	C	Hrs
U20CSS403	**SKILL DEVELOPMENT COURSE – III OFFICE AUTOMATION**	**0**	**0**	**2**	**-**	**30**

MS OFFICE

Introduction to MS Office - MS Word and Open Office – Writer: MS Word - Working with Documents -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, **Formatting Documents** - Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. **Setting Page style** - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

TABLES AND DRAWING TOOLS

Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, **Drawing** - Inserting ClipArts, Pictures/Files etc., **Tools** – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. Printing Documents – Shortcut keys.

MS POWERPOINT

MS Power point: Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. **Creating a presentation** - Setting Presentation style, Adding text to the Presentation. Formatting a Presentation - Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. **Adding Effects to the Presentation**- Setting Animation & transition effect. **Printing Handouts,** Generating Standalone Presentation viewer.

MS EXCEL

MS Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. **Entering & Deleting Data**- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks, **Setting Formula** - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae.

MS ACCESS

MS Access: Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Excel etc.

References Books

1. Working in Microsoft Office – Richard Mansfield – Tata McGraw Hill Education.
2. Professional Office Procedure by Susan H Cooperman, Printice Hall
3. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
4. Technology And Procedures for Administrative Professionals by Patsy Fulton-Calkins, Thomson Learning
5. Microsoft Office 2010 For Dummies By Wallace Wang
6. 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
7. Office XP : The Complete Reference- Stephen L. Selson – Tata McGraw Hill Education.

Web Resources

1. http://office.microsoft.com/en-us/training/CR010047968.aspx
2. https://gsuite.google.com/leaming-center
3. http://spoken-tutorial.org

U20CSM404	NSS	L	T	P	C	Hrs
		0	0	2	-	30

Course Content

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.

2. The above activities shall be carried out outside class hours.

3. In the above activities, the student participation shall be for a minimum period of 45 hours.

4. The above activities will be monitored by the respective faculty incharge and the First Year Coordinator.

5. Pass /Fail will be determined on the basis of participation, attendance, performance and behaviour. If a candidate Fails, he/she has to repeat the course in the subsequent years

6. Pass in this course is mandatory for the award of degree.

PROFESSIONAL ELECTIVES

U20CSE401	DATABASE ADMINISTRATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Learn Installing Oracle Software and create database.
- To study the SQL commands.
- To understand the memory structure and background process.
- To explore Database maintenance and monitoring process.
- To extract backup and recovery process.

Course Outcomes

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

CO1 - Install Oracle software and create the Oracle Database. **(K2)**
CO2 - Build queries using the SQL commands. **(K2)**
CO3 - Define and manage user access and security. **(K2)**
CO4 - Manage the storage structures. **(K3)**
CO5 - Design Database backup and recovery procedures. **(K3)**

UNIT I INTRODUCTION TO SQL *PLUS (9 Hrs)

Introduction: DBMS architecture and data independence – DBA roles and responsibilities – SQL *PLUS Overview: SQL Plus Fundamentals – Producing more readable outputs – Accepting values at runtime Using iSQL *Plus.

UNIT II DML STATEMENTS, CONSTRAINTS AND VIEWS (9 Hrs)

Introduction to DML Statements: Truncating a table – Transaction control language – Managing Constraints: Creating constraints – Dropping constraints – Enabling and disabling constraints – Defining Constraints Checks. Managing Views: Creating and modifying views – Using views – Inserting – Updating and deleting data through views.

UNIT III USER ACCESS AND SECURITY (9 Hrs)

Creating and modifying user accounts – Creating and using roles – Granting and revoking privileges – Managing user groups with profiles – Oracle Overview and Architecture: An overview of logical an physical storage structures – Oracle memory structures – Oracle background processes – Connecting to oracle instance – Processing SQL command.

UNIT IV MANAGING ORACLE (9 Hrs)

Starting up the oracle instance – managing sessions – shutting down the oracle instance – instances messages and instance alerts. Control and Redo Log Files: Managing the control files – Maintaining and monitoring redo log files. Managing Users and Security: Profiles – Managing users – managing privileges – managing roles – querying role information.

UNIT V INTRODUCTION TO NETWORK ADMINISTRATION (9 Hrs)

Network design considerations – Network responsibilities for the DBA – Network configuration – Overview of oracle Net features – Oracle Net Stack Architecture – Backup and Recovery Overview: Database backup – Restoration and recovery – Types of failure in oracle environment – Defining a backup and recovery strategy – Testing the backup and recovery plan.

Text Books

1. *Craig S. Mullins, "Database Administration: The Complete Guide to DBA Practices and Procedures",* 2012.
2. Chip Dawes, Biju Thomas, "Introduction to Oracle 9i SQL", BPB Publications, 2006.
3. C.J. Date, "Database Systems", Addison Wesley, 8th Edition, 2004.

Reference Books

1. *Susan Lawson, "DB2 11 for z/OS Database Administration", 2016.*
2. Bob Bryla, Biju Thomas, "Oracle 9i DBA Fundamental I", BPB Publications, 2006.
3. *Donald K. Burleson, "Physical Database Design Using Oracle", 2004.*
4. Doug Stums, Matthew Weshan, "Oracle 9i DBA Fundamental I", BPB, 2002.
5. Joseph C. Johnson, "Oracle 9i Performance Tuning", BPB, 2002.

Web Resources

1. https://www.udemy.com/course/ibm-db2-9-sql-and-database-administration-workshop/
2. https://www.tutorialspoint.com/listtutorials/oracle/dba-concepts/1
3. https://www.datacamp.com/courses/data-engineering-for-everyone
4. https://www.pluralsight.com/browse/it-ops/database-administration?
5. https://education.oracle.com/mysql/mysql-database-administration/product_159

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	2	1	2	3	1	2	1	3	2	2
2	3	3	2	2	2	2	1	2	3	3	2	1	2	3	2
3	3	3	2	-	2	-	1	2	3	1	2	1	3	2	2
4	3	2	2	3	2	2	1	2	2	2	2	2	2	1	2
5	2	2	1	2	3	3	1	1	2	2	1	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE402	E - BUSINESS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To explore both the technical and business related implications of electronically medicated commerce.
- To enable the students to trace the development of E-Business from its origins in electronic data interchange to its current growing importance.
- To explore the potential of electronic business for future development and the development of the information society.
- To explore the authentication and authorization of online transactions.
- To introduce the strategy, culture, legal methods of establishing websites for business organizations.

Course Outcomes

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

CO1 - Demonstrate advanced knowledge of technical and business strategies related to E-Business and E-Commerce. **(K2)**

CO2 - Describe about the available secure electronic protocols. **(K3)**

CO3 - Identify the security issues and provide appropriate solutions to overcome. **(K3)**

CO4 - Evaluate Mobile Business and related technologies. **(K3)**

CO5 - Discuss contemporary technologies for globally distributed teams. **(K3)**

UNIT I ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES (9 Hrs)

Background – The Electronic commerce environment – Electronic marketplace technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to open EDI – Electronic commerce with WWW / Internet – Commerce net advocacy – Web commerce going forward.

UNIT II APPROACHES TO SAFE ELECTRONIC COMMERCE (9 Hrs)

Overview – Secure Transport Protocols – Secure transactions – Secure Electronic Payment Protocol (SEPP) – Secure Electronic Transaction (SET) – Certificates for authentication – Security on Web Servers and enterprise networks – Electronic cash and electronic payment schemes: Internet Monetary payment and security requirements – Payment and purchase order process - Online electronic cash.

UNIT III INTERNET / INTRANET SECURITY ISSUES AND SOLUTIONS (9 Hrs)

The need for computer security – Specific intruder approaches – Security strategies – Security tools – Encryption – Enterprise networking and Access to the Internet – Antivirus programs – Security Teams.

UNIT IV MASTERCARD/VISA SECURE ELECTRONIC TRANSACTION (9 Hrs)

Introduction – Business requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of email. MIME: Multipurpose Internet Mail Extensions. S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

UNIT V INTERNET AND WEBSITE ESTABLISHMENT (9 Hrs)

Introduction – Technologies for web servers – Internet tools relevant to commerce – Internet applications for commerce – Internet charges – Internet access and architecture – Searching the Internet – Case study.

Text Books

1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2017.
2. Elias M. Awad , “Electronic Commerce from Vision to Fulfillment”, PHI, Feb-2003.
3. Bharat Bhaskar, “Electronic Commerce – Framework, Technology and Application”, TMH, 2003.

Reference Books

1. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money”, Atlantic Publishing Company, 2nd Edition, 2011.
2. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004.
3. Kamalesh K. Bajaj, “E-Commerce: The Cutting Edge & Business”, Tata McGraw-Hill, 2003.
4. Brenda Kennan, “Managing your E-Commerce Business”, PHI, 2001.
5. Jim A Carter, “Developing E-Commerce Systems”, PHI, 2001.

Web Resources

1. https://nptel.ac.in/courses/110/105/110105083/
2. https://www.tutorialspoint.com/listtutorial/INTRODUCTION-TO-E-BUSINESS/6549.
3. https://en.wikipedia.org/wiki/Electronic_business

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	3
2	2	1	3	3	-	3	-	-	-	-	-	-	1	1	3
3	2	2	3	-	2	3	-	1	-	-	-	-	1	1	3
4	2	2	3	-	2	2	-	-	-	-	-	-	1	1	3
5	2	1	1	1	-	3	-	-	-	-	-	-	1	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE403	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand objects, classes and inheritance.
- To learn the utilization of software objects to build software projects.
- To use UML in requirements elicitation and designing.
- To gain knowledge in the concepts of relationships and aggregations.
- To extract Object Oriented Analysis Processes.

Course Outcomes

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

CO1 - Analyze, design and document the requirements through use case driven approach. **(K4)**
CO2 - Categorize the different object oriented methodologies. **(K3)**
CO3 - Develop and Explore the Classes and Its Relationships. **(K4)**
CO4 - Apply the concepts of architectural design for view layer and access layer. **(K3)**
CO5 - Test for the software quality using different testing strategies. **(K4)**

UNIT I AN OVERVIEW OF OBJECT ORIENTED SYSTEM DEVELOPMENT (9 Hrs)

Introduction – Object Oriented System Development Methodology – Why object orientation – Overview of Unified Approach – Object Basics: Object oriented philosophy – Objects – Classes – Attributes – Object behavior and methods – Encapsulation and Information Hiding – Class hierarchy – Polymorphism – Object Relationships and Associations – Aggregations and Object Containment – Object Identity – Static and Dynamic Binding – Persistence. Object oriented systems development life cycle: Software development process – Building high quality software – Use case driven approach - Reusability.

UNIT II OBJECT ORIENTED METHODOLOGIES (9 Hrs)

Rumbaugh et al.'s Object modeling technique – Booch methodology – Jacobson et al. Methodologies – Patterns – Framework – Unified approach – Unified modeling language: Static and Dynamic Model – UML Diagrams – UML class diagram – UML use case diagram - UML dynamic modeling – UML extensibility – UML meta model.

UNIT III OBJECT ORIENTED ANALYSIS (9 Hrs)

Business object analysis – Use case driven object oriented analysis – Business process modeling – Use Case model - Developing Effective Documentation – Object Analysis Classification: Classification Theory – Noun Phrase Approach – Common Class Patterns Approach – Use Case Driven Approach – Classes Responsibilities and Collaborators – Naming Classes – Identifying Object Relationships – Attributes and Methods: Association – Super-Subclass Relationship – IS - A Relationship.

UNIT IV OBJECT ORIENTED DESIGN (9 Hrs)

Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Object constraint language – Process of designing class – Class visibility – Refining attributes – Access Layer: Object store and Persistence – Database management system – Logical and Physical database-Organization and Access Control – Distributed Databases and Client Server Computing – Object Oriented Database Management System – Object Relational Systems – Designing Access Layer Classes – View Layer: Designing View Layer Classes – Macro Level Process – Micro Level Process – Purpose of View Layer Interface – Prototyping the user interface.

UNIT V SOFTWARE QUALITY (9 Hrs)

Software Quality Assurance: Quality Assurance Test – Testing strategies – Impact of object oriented testing – Test cases – Test Plan – Myers debugging principle. System usability and measuring user satisfaction: Usability testing – User satisfaction testing.

Text Books

1. John Deacon, “Object Oriented Analysis and Design”, Addison Wesley, 1st Edition, 2012.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley, 3rd Edition , 2011.
3. Ali Bahrami, “Object oriented systems development using the unified modeling language”, McGraw-Hill, 1st Edition, 2008.

Reference Books

1. Craig Larman, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖”, Pearson Education, Third Edition, 2005.
2. Mike O’Docherty, “Object-Oriented Analysis & Design: Understanding System Development with UML 2.0”, John Wiley & Sons, 2005.
3. Bernd Oestereich, “Developing Software with UML, Object - Oriented Analysis and Design in Practice”, Addison-Wesley, 2nd Edition 2004.
4. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third edition, Addison Wesley, 2003.
5. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.

Web Resources

1. www.omg.org
2. http://www.ibm.com/developerworks/rational/products/rose/
3. http://www.smartdraw.com/resources/tutorials/jacobson-oose-diagrams/
4. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
5. https://www.uml-diagrams.org/
6. https://nptel.ac.in/courses/106/105/106105153/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	2	3	2	3	0	1	2	2	2	2	2	3
2	3	2	3	1	3	2	2	0	2	3	1	2	2	2	3
3	3	2	2	1	2	1	2	0	1	1	1	2	2	1	3
4	3	2	3	3	3	1	2	0	2	1	2	2	2	2	3
5	3	3	3	2	2	1	2	0	2	3	3	3	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

U20CSE404	SCRIPTING LANGUAGES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Creation of programs in the Linux environment
- Create and run scripts using Perl
- Create and run scripts using TCL
- Gain Knowledge about the scripting languages such as PERL, TCL/TK
- Create and run scripts using Python

Course Outcomes

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

CO1 - Illustrate the basic concepts of Linux Administration. **(K2)**
CO2 - Explore the concepts of Perl **(K5)**
CO3 - Explore the concepts of TCL **(K5)**
CO4 - Understand the basic fundamentals of TK **(K2)**
CO5 - Working with programing concepts of Python **(K1)**

UNIT I INTRODUCTION TO LINUX (9 Hrs)

Introduction to Linux – File system of the Linux – General usage of Linux kernel & basic commands – Linux users and group – Permissions for file – directory and users – Searching a file & directory – zipping and unzipping concepts.

UNIT II INTRODUCTION TO PERL (9 Hrs)

Introduction to Perl Scripting, working with Simple Values – Lists and Hashes – Loops and Decisions – Regular Expressions, Files and Data in Perl Scripting.

UNIT III TCL FUNDAMENTALS (9 Hrs)

TCL Fundamentals – String and Pattern Matching – TCL Data Structures – Control Flow Commands.

UNIT IV WORKING OF TCL/TK COMMANDS (9 Hrs)

Introduction to TCLTK – Tk Fundamentals – String processing – functions and Regular Expressions – Arrays – Files – Tk by Examples

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UNIT V PYTHON PROGRAMMING (9 Hrs)

Introduction to Python – History of Python – Features of Python – Simple Program in Python – Commenting in Python – Quotations in Python – Lines and Indentation – Multi-Line Statements – Input Operations – Output Operations.

Text Books

1. Mark Lutz, “Programming Python”, 4th Edition, O'Reilly Media, Inc., 2010.
2. David Barron, “The World of Scripting Languages”, 1st Edition, Wiley publications, 2009.
3. Brent Welch, Ken Jones, “Practical Programming in Tcl and Tk”, Pearson; 4th Edition, 2003.

Reference Books

1. Randal L. Schwartz, “Learning Perl: Making Easy Things Easy and Hard Things Possible O’Reilly Publication”, 7th Edition, 2016.
2. Daniel J. Barrett,” Linux”, 3rd Edition, O'Reilly Media, 2016.
3. Mark Lutz, “Learning Python: Powerful Object-Oriented Programming”, O’Reilly Publication, 5th Edition, 2013.
4. Morgan Kaufmann, Clif Flynt, “Tcl/Tk: A Developer's Guide”, 3rd Edition”, 2012.
5. Paul Raines, Jeff Tranter, “Tcl/Tk in a Nutshell”, O'Reilly Media, 1999.

Web Resources

1. http://www.bin-co.com/perl/perl_tk_tutorial/
2. https://www.tutorialspoint.com/tcl-tk/index.html
3. https://docs.python.org/3/tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	3	2	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	-	2	2	-	-	-	-	-	-	-	-	-
5	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE405	FUNDAMENTALS OF PROGRAMMING LANGUAGES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Describe and classify various programming languages and data types.
- To summarize the sequence control.
- To Generalize various object oriented programming paradigms.
- To Discuss about Logical and functional programming.
- To summarize the concept of concurrent programming.

Course Outcomes

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

CO1 - To understand various programming and data types **(k2)**
CO2 - Apply various sequence control techniques of programming languages. **(k2)**
CO3 - To understand the object oriented programming. **(k2)**
CO4 - To analyse logical and functional programming. **(k3)**
CO5 - To understand about concurrent programming. **(k2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Role of programming languages – Need to study programming languages – Characteristics of a good programming languages – Introduction to various programming paradigms: Procedural – Object-oriented – Logic and functional – Concurrent programming. Data Types: Properties of structured and non-structured data types and Objects – Variables – Constants – Derived and abstract data types – Declaration – Type checking. Binding and binding times – Type conversion – Scalar data type – Composite data types – Implementation and Storage representation of data types and control flow statement.

UNIT II SEQUENCE CONTROL (9 Hrs)

Sequence Control: Implicit and explicit sequence control – Sequencing with arithmetic and non-arithmetic expressions – Sequence control between statements. Subprograms control: Subprogram sequence control – Attributes of data control – Shared data in.

UNIT III OBJECT ORIENTED PROGRAMMING (9 Hrs)

Object Oriented Programming: The class declarations – Constructors – Information hiding and data abstraction using classes – Access specification – Inheritance – Polymorphism – Parameterized types – Exception handling.

UNIT IV LOGICAL AND FUNCTIONAL PROGRAMMING (9 Hrs)

Logic Programming: Logic programming language model – Logical statements – Resolution – unification – search structures: backward and forward – Applications of logic programming – PROLOG. Functional Programming: Features of functional languages – LISP – Applications of functional and logic programming languages.

UNIT V CONCURRENT PROGRAMMING (9 Hrs)

Basic concepts of Concurrent Programming: processes – Synchronization primitives – Safety and liveness properties – Parallelism in Hardware – Streams – Concurrency as interleaving – Safe access to shared data.

Text Books

1. Richard Fairley," Software Engineering Concepts", Tata Macgraw Hill, 2006.
2. Sethi R., "Programming Languages concepts & constructs", 2nd Edition, Pearson Education, 2006.
3. Terrance W. Pratt, and Marvin V. Zelkowitz, "Programming Languages, Design and Implementation", Prentice-Hall of India, Fourth Edition, 2002.

Reference Books

1. Ghezzi C, Milano P., Jazayeri M., "Programming Languages Concepts", Pearson, 11th Edition, 2016
2. Scbesta R., "Concepts of Programming Languages", Pearson Education, 10th Edition, 2013.
3. Roosta S., "Foundations of Programming Languages", Cengage, 1st Edition, 2009.
4. M. Ben Ari, "Principles of Concurrent and Distributed Programming, Pearson, 2nd Edition, 2005.
5. Robert W. Sebesta, "Concepts of Programming Languages", Addison Wesley, Sixth Edition, 2003.

Web Resources

1. www,nptel.ac.in/Fundamentals of Programming Language.
2. https://www.edx.org/learn/computer-programming.
3. https://www.classcentral.com/course/programming1-385.
4. www.greeksforgreeks.org/Fundamentals of Programming Language.

COs/POs/PSOs Mapping

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1	3	3	2	1	2	2	2	-	-	3	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	-	-	3	3	3	2
3	3	3	3	2	3	2	2	-	-	2	-	3	3	3	3
4	2	2	2	2	2	2	2	-	-	2	-	2	2	2	2
5	3	3	2	2	2	2	2	-	2	3	3	3	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN ELECTIVES

		L	T	P	C	Hrs
U20EEO402	**ELECTRICAL SAFETY** (Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To familiarize the Indian Electricity Rules and Act related with electrical safety.
- To provide a knowledge about electrical shocks and safety precautions.
- To create awareness of the electrical safety associated with installation of electrical equipment.
- To analyze different Hazardous areas for electrical safety.
- To expose knowledge about necessity of safety policy and safety management.

Course Outcomes

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

CO1 - Describe the Indian Electricity (IE) acts and various rules for electrical safety. **(K2)**

CO2 - Expose safety measures to prevent electrical shock in handling of domestic electrical appliances**. (K3)**

CO3 - Evaluate the safety aspects during installation of plant and equipment**. (K3)**

CO4 - Describe the various hazardous area and application of electrical safety in various places**. (K3)**

CO5 - Acquire knowledge about importance of electrical safety training to improve quality management in electrical systems**. (K3)**

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS (9 Hrs)

Objective and scope of electrical safety - National electrical Safety code - Statutory requirements – Indian Electricity acts related to electrical Safety - Safety electrical one line diagram - International standards on electrical safety safe limits of current and voltage - Grounding of electrical equipment of low voltage and high voltage systems - Safety policy - Electrical safety certificate requirement

UNITII ELECTRICAL SHOCKS AND THEIR PREVENTION (9 Hrs)

Primary and secondary electrical shocks - Possibilities of getting electrical shock and its severity - Effect of electrical shock of human being - Shocks due to flash/ Spark over's - Firing shock - Multi storied building - Prevention of shocks - Safety precautions - Safe guards for operators - Do's and Don'ts for safety in the use of domestic electrical appliances - Case studies on electrical causes of fire and explosion

UNIT III SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE (9 Hrs)

Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects during installation -Safety during installation of electrical rotating machines - Importance of earthing in installation– Agricultural pump installation

UNIT IV HAZARDOUS ZONES (9 Hrs)

Primary and secondary hazards - Hazardous area classification and of electrical equipments (IS, NFPA, API and OSHA standards) - Explosive gas area classifications: Class I(Division 1) - Zone 0, Zone 1, zone 2 classified locations, Design Philosophy for Equipment and installations-Classification of equipment enclosure for various hazardous gases and vapors - flash hazard calculation and approach distances- calculating the required level of arc protection

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS (9 Hrs)

Principles of Safety Management - Occupational safety and health administration standards - Safety organization - Safety auditing - Employee electrical safety teams - Electrical safety training to improve Quality management - Total quality control and management – Importance of high load factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvement - Importance of P.F. improvement - Case studies of electrical workplace safety practices.

Text books

1. John Cadick, Mary CapelliSchellpfeffer, Dennis Neitzel, Al Winfield, “Electrical Safety Handbook”, McGraw-Hill Education, 4th Edition, 2012.
2. Madden, M. John, “Electrical Safety and the Law: A Guide to Compliance”, Wiley publications, 4th Edition, 2002.
3. Mohamed A. El-Sharkawi, “Electric Safety: Practice and Standards”, CRC Press; 1st Edition, 2013.

Reference books

1. Rob Zachariason, “Electrical Safety”, Delmar Cengage Learning, 1st Edition, 2011.
2. Peter E. Sutherland, “Principles of Electrical Safety”, Wiley-IEEE Press; 1st Edition, 2014.

Web Resources

1. https://www.apeasternpower.com/downloads/elecact2003.pdf
2. https://safetyculture.com/topics/electrical-hazards/
3. https://www.jove.com/science-education/10114/electrical-safety-precautions-and-basic-equipment
4. https://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment
5. https://www.electrical4u.com/safety-precautions-for-electrical-system/
6. https://www.constellation.com/energy-101/electrical-safety-tips.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
2	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
3	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
4	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
5	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	CONSUMER ELECTRONICS	L	T	P	C	Hrs
U20ECO402	(Common to EEE, ICE, CSE MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To enable the troubleshoot of different types of microphones and loudspeakers
- To make the students to analyse the working of digital console, digital FM tuner and troubleshoot audio systems
- To train to test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

After completion of the course, students will be able to

CO1 -Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker (K1)
CO2 -Explain the working of digital console, digital FM tuner and troubleshoot the audio systems (K2)
CO3 -Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera (K2)
CO4 -Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players (K3)
CO5 -Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera (K2)

UNIT I AUDIO FUNDAMENTALS AND DEVICES (9Hrs)

Basic characteristics of sound signal, Microphone- working principle, sensitivity, nature of response. Types of Microphone, Loud speaker- working principle, Woofers and Tweeters, characteristics.Types of Loudspeaker. Sound recording

UNITII AUDIO SYSTEMS (9Hrs)

Introduction to audio system, Digital Console- Block diagram, working principle,applications, FM tuner-concepts of digital tuning, ICs used in FM tuner TD702IT, PA address system- Planning, speaker impedance matching, characteristics, Power amplifier specification

UNIT III TELEVISION SYSTEMS (9Hrs)

Monochrome TV standards, Components of TV system, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal,Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera.

UNIT IV TELEVISION RECEIVERS AND VIDEO STANDARDS (9Hrs)

Colour TV receiver- block diagram, Digital TVs- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI, Digital Video Interface, CD and DVD player: working principles, interfaces

UNIT V HOME AND OFFICE APPLIANCES (9Hrs)

Microwave Oven: Types, technical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

1. Bali S.P. , 'Consumer Electronics', **copyright 2008**,Pearson Education India.
2. Bali R and Bali S.P. 'Audio video systems : principle practices & troubleshooting', Khanna Book Publishing Co. (P) Ltd
3. Gulati R.R., 'Modern Television practices', 5th edition, 2015, New Age International Publication (P) Ltd.

Reference Books

1. Gupta R.G., 'Audio video systems', 2nd edition,2017, Tata Mcgraw Hill, New Delhi, India
2. Whitaker Jerry & Benson Blair, 'Mastering Digital Television', McGraw-Hill Professional, 2006
3. Whitaker Jerry & Benson Blair, 'Standard handbook of Audio engineering', 2nd edition,2002, McGraw-Hill Professional

Web Resources

1. http://www.scientificamerican.com/article.cfm?id = experts.bluetooth-work
2. http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
3. http://www.circuitstoday.com/blu-ray-technology-working
4. http://www.freevideolectures.com

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
2	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
3	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
4	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
5	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	WEB DEVELOPMENT	L	T	P	C	Hrs
U20CSO401	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

CO1 - Develop basic web applications. **(K5)**
CO2 - Design the web applications using CSS. **(K5)**
CO3 - Validate the web pages using javascripts functions. **(K5)**
CO4 - Demonstrate the web 2.0 application to advance scripts. **(K3)**
CO5 - Update the knowledge of XML Data. **(K4)**

UNIT I INTRODUCTION TO WWW & HTML (9 Hrs)

Protocols – Secure Connections – Application and development tools – Web browser – Server definition – Dynamic IP. Web Design: Web site design principles – Planning the site and navigation. HTML: Development process – Html tags and simple HTML forms – Web site structure.

UNIT II STYLE SHEETS (9 Hrs)

Introduction to CSS: Need for CSS – Basic syntax and structure using CSS – Background images – Colors and properties – Manipulating texts using fonts, borders and boxes – Margins, padding lists, positioning using CSS – CSS2.

UNIT III JAVASCRIPTS (9 Hrs)

Client side scripting: Basic JavaScript – Variables – Functions – Conditions – Loops. Applications: Page Validation – Reporting.

UNIT IV ADVANCE SCRIPT (9 Hrs)

JavaScript and objects – DOM and Web browser environments – Forms and Validations – DHTML. AJAX: Introduction – Web applications – Alternatives of AJAX.

UNIT V XML (9 Hrs)

Introduction to XML – Uses of XML – Simple XML – XML key components – DTD and Schemas – Well-formed XML document – Applications of XML – XSL and XSLT.

Text Books

1. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
2. Semmy Purewal, "Learning Web App Development", O'Reilly Media, 2014.
3. P.J. Deitel AND H.M. Deitel," Internet and World Wide Web - How to Program", Pearson Education, 2009.

Reference Books

1. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, “Enterprise Web Development “, O’Reilly Media, 2014.
2. Steven Suehring, Janet Valade, “PHP, MySQL, JavaScript & HTML5 All-in-One”, John Wiley & Sons, Inc, 2013.
3. UttamK.Roy, “Web Technologies”, Oxford University Press, 2010.
4. Rajkamal, “Web Technology”, Tata McGraw-Hill, 2009.
5. Shklar, Leon, Rosen, Rich, “Web Application Architecture: Principles, Protocols and Practices”, Wiley Publication, 2009.

Web Resources

1. https://www.w3schools.com
2. https://www.geeksforgeeks.org/web-technology/
3. https://www.guru99.com/cakephp-tutorial.html
4. https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
5. http://Oriel.ly/learning-web-app

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	ANALYSIS OF ALGORITHMS	L	T	P	C	Hrs
U20CSO402	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To analyze the performance of algorithms in terms of time and space complexity.
- To understand the performance of the algorithms such as divide and conquer, greedy method
- To solve problems using Dynamic Programming and derive the time complexity.
- To solve problems using Backtracking technique and derive the time complexity.
- To solve problems using Branch and Bound technique and derive the time complexity.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1 - Choose the appropriate data structure and algorithm design method for a specified application.**(K2)**

CO2 - Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyse them. **(K3)**

CO3 - Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO4 - Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO5 - Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis – Time complexity, Space complexity, Asymptotic Notation – Big oh notation, Omega notation, Theta notation and Little oh notation.

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD (9 Hrs)

Divide and Conquer method: Applications – Binary search, Merge sort, Quick sort. Greedy method: General method, applications – Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING (9 Hrs)

Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING (9 Hrs)

Backtracking: General method, Applications – N-queen problem, Sum of subsets problem, Graph Coloring – Hamiltonian Cycles.

UNIT V BRANCH AND BOUND (9 Hrs)

Branch and Bound**:** General method, Applications – Traveling sales person problem, 0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Text Books

1. E. Horowitz and S.Sahni, “Fundamentals of Algorithms”, Galgotia Publications, 2nd Edition, 2010.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, “Introduction to Algorithms”, PHI/Pearson Education, 3rdEdition, 2009.
3. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, Third Edition, 2012.

Reference Books

1. Michael T. Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis and Internet Examples”, Wiley India, 2006.
2. Sara Baase and Allen Van Gelder, “Computer Algorithms Introduction to Design and Analysis”, Pearson Education Asia, 3rd Edition, 2010.
3. Donald E Knuth, “The Art of Computer Programming, Volume I & II”, Addison Wessely, Third Edition, 2011.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2006.
5. Harsh Bhasin, ”Algorithms Design and Analysis”, Oxford university press, 2016.

Web Resources

1. https://swayam.gov.in/nd1_noc20_cs71/preview
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
3. https://www.javatpoint.com/daa-tutorial
4. https://www.guru99.com/design-analysis-algorithms-tutorial.html
5. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2	2	1	-	-	-	-	-	2	1	2
2	3	2	3	3	2	2	1	-	-	-	-	-	2	1	2
3	3	3	3	3	2	2	2	-	2	-	-	-	2	1	2
4	3	2	3	3	3	2	2	-	-	-	3	-	2	1	2
5	3	3	3	3	2	2	2	-	-	-	3	2	2	1	2

COs/POs/PSOs Mapping

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20ICO401	**SENSORS AND TRANSDUCERS** (Common to ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS and FT)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers
- To introduce about advancements in sensor technology.

Course Outcomes

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

CO1 - Understand the concepts of classification of Transducers. **(K2)**
CO2 - Familiar with the working of resistance Transducer. **(K3)**
CO3 - Familiar with the principle and working of various Inductive and Capacitive transducer. **(K1)**
CO4 - Able to design signal conditioning circuit for various transducers. **(K3)**
CO5 - Able to identify or choose a transducer for a specific measurement application. (**K4)**

UNIT I CLASSIFICATION OF TRANSDUCERS (9 Hrs)

General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system, Statistical analysis of measurement data.

UNIT II RESISTANCE TRANSDUCERS (9 Hrs)

Resistive transducers: Potentiometers, metal and semiconductor strain gauges and signal conditioning circuits, strain gauge applications: Load and torque measurement, Digital displacement sensors.

UNIT III INDUCTIVE AND CAPACITIVE TRANSDUCERS (9 Hrs)

Transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT IV OTHER TRANSDUCERS (9 Hrs)

Piezoelectric transducers and their signal conditioning, Seismic transducer and its dynamic response, photoelectric transducers, Hall effect sensors, Magnetostrictive transducers. Eddy current transducers. Hall effect transducers – Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors

UNIT V SMART TRANSDUCER (9 Hrs)

Introduction to semiconductor sensor, materials, scaling issues and basics of micro fabrication. Smart sensors, Intelligent sensor, Mems Sensor, Nano-sensors, SQUID Sensors- Environmental Monitoring sensors

Text Books

1. Doebelin E.O. and Manik D.N., “Measurement Systems”, 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge,2003
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design Clarendon, Oxford 2nd edition Jacob Fraden - 2010
4. Doeblin E..O. “Measurement System Applications and Design”, TMH, 5th Edition, 2004.

Reference Books

1. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol.1 ISA/CRC Press, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th edition, Vol.2 ASME PTC ,2018
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.

Web Resources

1. www.electrical4u.com
2. https://nptel.ac.in/courses/108108147/
3. https://www.youtube.com/watch?v=1uPTyjxZzyo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	-	1	2	-	-	-	2	-	-	-	-
2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	-
3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	-
4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	-
5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	INDUSTRIAL SAFETY MANAGEMENT	L	T	P	C	Hrs
U20ICO402	(Common to CSE, IT, MECH, CCE and AI&DS)	**3**	**0**	**0**	**3**	**45**

***Course* Objectives**

- To get adequate knowledge about Energy conversion.
- To get adequate knowledge about Energy management.
- To understand the Air pollutants and global climate.
- To get knowledge about the Safety measures.
- To know about the Safety preventions in Power Plants.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1- Understand the energy conversion and its management **(K1)**
CO2 - Understand the energy management and energy conservation in industries **(K2)**
CO3 - Understand about the pollutions and different types of pollutions **(K1)**
CO4 -Understand the safety measures and policies **(K1)**
CO5 - Understand the safety codes and standards **(K1)**

UNIT I ENERGY CONVERSION (9 Hrs)

Energy conversion – world fossil fuel reserves – world energy consumption – historical lives of fossil fuels – global energy and environmental management – environmental aspects of fossil, nuclear, hydro and biomass energy conversion – gaseous emissions – solid waste – liquid waste

UNIT II ENERGY MANAGEMENT (9 Hrs)

Energy management – need for energy conservation – energy auditing – conducting real time continuous energy audits – data collection – automated data acquisition – data analysis – role of energy manager – energy audit instruments – gas analyzer – energy conservation in industries: boilers, pumps, fans, compressed air systems, refrigeration and air conditioning systems, DG sets, electrical motors, variable speed motors

UNIT III AIR POLLUTANTS AND POLLUTION CONTROL (9 Hrs)

Air pollutants and global climate – air pollutant effects. Pollution control laws and regulation – national and international – role of environmental monitoring in environmental management systems – continuous emissions monitoring systems. Pollution control – review of pollution control methods in thermal power plants –industrial – nuclear – automobiles – disposal/treatment of solid and liquid wastes –alternate fuels.

UNIT IV SAFETY MEASURES (9 Hrs)

Safety and productivity – causes of accidents in industries – accidents reporting and investigation – measuring safety performance – workman compensation rules.

UNIT V SAFETY PREVENTIONS (9 Hrs)

Safety codes and standards – general safety considerations in power plants, pressure vessels and pressurized pipe lines – operation and inspection of extinguishers – preventing the spread of fire – emergency exit facilities.

Text Books.

1. Blake Roland. P, “Industrial safety”, Prentice Hall of India, 2014.
2. Callaghan. P. O, “Energy Management”, McGraw Hill Book Co., 2011

Reference Books

1. Culp. A. W, “Principles of Energy Conservation”, McGraw Hill Book Co., 2012.
2. Noel de Nervers, “Air Pollution Control Engineering”, McGraw Hill Book Co.,2009.

Web Resources

1. https://www.youtube.com/watch?v=9cLsR-78Nsk
2. https://www.academia.edu/7775550/BASIC_CONCEPTS_IN_INDUSTRIAL_SAFETY

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	1	-	-	1	1	-	-	-	-	-	-	1	1
2	3	-	1	-	-	1	1	-	-	-	-	-	-	1	1
3	3	-	1	-	-	1	1	-	-	-	-	-	-	1	1
4	2	-	1	-	-	1	1	-	-	-	-	-	-	1	1
5	3	-	1	-	-	1	1	-	-	-	-	-	-	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

		L	T	P	C	Hrs
U20BMO401	**MEDICAL ELECTRONICS** (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS)	3	0	0	3	45

Course Objectives

- To gain knowledge about the various physiological parameters measurements
- To understand the various biochemical and nonelectrical sensors
- To study about the assist devices
- To gain knowledge on surgical equipments and telemetry in healthcare
- To understand the concepts of recent advancements in healthcare

Course Outcomes

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

CO1 - Explain the electro- physiological parameters and bio-potentials recording **(K2)**
CO2 - Measure the biochemical and non-electrical physiological parameters **(K2)**
CO3 - Interpret the various assist devices used in the hospitals **(K3)**
CO4 - Identify physical medicine methods and biotelemetry **(K3)**
CO5 - Analyse recent trends in medical instrumentation **(K3)**

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9 Hrs)

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9 Hrs)

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES (9 Hrs)

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters, Heart-Lung Machine.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY (9 Hrs)

Diathermies - Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry - Single Channel and Multiple Channel.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9 Hrs)

Telemedicine, Insulin Pumps, Radio pill, Endo-microscopy, Brain machine interface, Lab on a chip, Cryogenic Technique.

Text Books

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2011.
2. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 2017.
3. John G.Webster, “Medical Instrumentation Application and Design”, Third Edition, Wiley India , 2012.

Reference Books

1. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2011.
2. R.Anandanatarajan, “Biomedical Instrumentation and Measurements”, Second Edition, PHI Learning, 2016.
3. Mandeep singh, “Introduction to Biomedical Instrumentation”, Second Edition, Prentice Hall of India, New Delhi,2014
4. Shakti Chatterjee, Aubert Miller, “Biomedical Instrumentation Systems”, Cengage Learning, 2012
5. C.Raja Rao, Sujoy K.Guha, “ Principles of Medical Electronics and Biomedical Instrumentation”, Universities Press, 2010

Web Resources

1. https://www.nap.edu/read/21794/chapter/7
2. https://www.embs.org/about-biomedical-engineering/our-areas-of-research/diagnostic-therapetic systems
3. https://nptel.ac.in/courses/127/106/127106136/
4. medicinenet.com/script/main/art.asp?articlekey=6414
5. https://www.verywellhealth.com/cardiopulmonary-bypass-machine-used-for-surgery-3157220

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	2	2	2	-	1	-	-	-	-	1	-	-
2	3	2	-	2	2	2	-	1	-	-	-	-	1	-	-
3	3	-	-	2	3	3	-	1	-	-	-	-	1	-	-
4	3	-	2	2	3	2	-	1	-	-	-	-	1	-	-
5	3	2	2	3	3	2	-	1	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20BMO402	TELEMEDICINE (Common to EEE, ECE, CSE, IT, ICE, CCE, AI&DS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives:

- To understand the classification of telemetry.
- To gain knowledge about biotelemetry principles
- To know about the applications of telemetry in various fields
- To provide the idea about the value of telemedicine
- To know the various applications in telemedicine.

Course Outcomes:

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

CO1 - Categorize the telemetry systems **(K2)**
CO2 - Understand the principles of biotelemetry in transmission of biological signals **(K3)**
CO3 - Apply the various Biotelemetry applications for diagnostics **(K3)**
CO4 - Acquire clear idea about the fundamentals of telemedicine **(K2)**
CO5 - Know about various applications of telemedicine **(K3)**

UNIT I INTRODUCTION TO TELEMETRY (9 Hrs)

Basic system, Classification, Non electrical telemetry systems, Mechanical and Pneumatic type, Voltage and Current telemetry systems, Local transmitters and Converters, Frequency telemetry system, Power Line carrier communication (PLCC).

UNIT II BIOTELEMETRY (9 Hrs)

Radio Telemetry principles, FM, AM, PCM, Transmission of biological data through radio telemetry.

UNIT III APPLICATION OF BIOTELEMETRY (9 Hrs)

Wireless Telemetry - Single Channel and Multi-channel Telemetry systems, Multi Patient Telemetry, Implantable Telemetry Systems, Ambulatory patient monitoring.

UNIT IV FUNDAMENTALS OF TELEMEDICINE (9 Hrs)

History and advancements in telemedicine, Benefits of telemedicine, Functional Block of a telemedicine system, Use of computers in distance mode of healthcare delivery, Familiarizing with technology of telemedicine, scanner, electro stethoscope, data reception equipment, Scope for telemedicine, Limitations of telemedicine.

UNIT V APPLICATIONS OF TELEMEDICINE (9 Hrs)

Telemedicine in Neuroscience, Telecardiology, Telepathology, Telepediatrics, Telepharmacy, Telepsychiatry and mental health, Veterinary.

Text Books

1. Marilyn J. Field , “A Guide to Assessing Telecommunications in Health Care”, Fourth Edition, Academy Press,2011.
2. Bashshur , R. L. , Sanders, J. H and Shannon, G, “Telemedicine: Theory and Practice”, Eight Edition, Springer,2014.
3. Olga (EDT), Ferre Roca, M. Sosa, “Handbook of Telemedicine”, Third Edition, IOS press 2009.

Reference Books

1. Bemmel, J.H. van, Musen, M.A. (Eds.), “Handbook of Medical Informatics”, Second Edition, Springer, 2010.
2. Simpson, W, “Video over IP. A practical guide to technology and applications’”, Ninth Edition, Focal Press, Elsevier, 2009.
3. Ferrer-Roca, O., Sosa-Iudicissa, , “Handbook of Telemedicine”, IOS Press, 2012
4. Norris, A.C, “Essentials of Telemedicine and Telecare”, Eight Edition, Wiley, 2017
5. Wotton, R., Craig, J., Patterson, V. (Eds.), “Introduction to Telemedicine”, Fifth Edition, Royal Society of Medicine Press Ltd., 2014.

Web Resources

1. https://en.wikipedia.org/wiki/Biotelemetry
2. https://www.who.int/goe/publications/goe_telemedicine_2010.pdf
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5927731/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	2	1	-	1	-	2	-	-	-	-	-
2	3	2	-	-	2	1	-	1	-	2	-	-	-	-	-
3	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-
4	3	2	-	2	2	1	-	1	-	2	-	-	2	-	-
5	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CCO402	**INTRODUCTION TO COMMUNICATION SYSTEMS** (Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	3	0	0	3	45

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals.(**K2**)

CO2- Comprehend needs of modulation and various analog modulation techniques (**K2**)

CO3- Illustrate pulse modulation and multiplexing (**K3**)

CO4- Explain Digital transmission techniques (**K2**)

CO5- Describe multiple access techniques and advanced communication systems.(**K2**)

UNIT I SIGNAL ANALYSIS

(9 Hrs)

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform.

UNIT II ANALOG COMMUNICATION (9 Hrs)

Need for Modulation-– Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Super heterodyne receivers.

UNIT III PULSE COMMUNICATION (9 Hrs)

Low pass sampling theorem – Quantization – PAM – PCM, DPCM, DM, and ADPCM And ADM - Time Division Multiplexing, Frequency Division Multiplexing.

UNIT IV DIGITAL COMMUNICATION (9 Hrs)

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK.

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION (9 Hrs)

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems”, 3rd edition, TMH 2007
2. S. Haykin, “Digital Communications”, John Wiley, 2005.
3. B.P.Lathi,” Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University Press, 2007.

Reference Books

1. H P Hsu, Schaum Outline Series, “Analog and Digital Communications”, TMH 2006
2. B.Sklar,” Digital Communications Fundamentals and Applications”, 2nd edition Pearson Education 2007.
3. A.Bource Carson and Paul B.Crilly, “Communication Systems”, 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, “Principles of Spread Spectrum Communication Systems”, Springer, 2015
5. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.

Web Resources

1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
2	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	1
4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ADO401	KNOWLEDGE REPRESENTATIONS AND REASONING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

CO1 - Analyse and design knowledge based systems intended for computer implementation. **(K3)**

CO2 - Acquire theoretical knowledge about principles for logic-based representation and reasoning. **(K2)**

CO3 - Ability to understand knowledge-engineering process. **(K2)**

CO4 - Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making. **(K2)**

UNIT I **(9 Hrs)**

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic. Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT II **(9 Hrs)**

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

UNIT III **(9 Hrs)**

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT IV **(9 Hrs)**

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V **(9 Hrs)**

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics. Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.

Text Books

1. John F. Sowa, Thomson Learning “Knowledge Representation logical, Philosophical, and Computational Foundations”, Course Technology Inc. publication, 1999.
2. Ronald J. Brachman, Hector J. Levesque,”Knowledge Representation and Reasoning”, Morgan Kaufmann; 1st edition, 2004.
3. Eileen Cornell Way “Knowledge Representation and Metaphor” Springer; 1991st edition, 1991.

Reference Books

1. Trevor Bench-Capon, “Knowledge representation: an approach to artificial intelligence”, Academic Press, 2014.
2. Yulia Kahl, Michael Gelfond “Knowledge Representation, Reasoning, and the Design of Intelligent Agents The Answer-Set Programming Approach”, Cambridge University Press; 1st edition, 2014.
3. Arthur B. Markman, “Knowledge representation” Psychology Press; 1st edition, 1998.
4. Sanida Omerović, Grega Jakus, V. Milutinovic, Sašo Tomažič “Concepts, Ontologies, and Knowledge Representation” Springer; 2013.
5. Bernhard Nebel, Gerhard Lakemeyer “Foundations of Knowledge Representation and Reasoning” Springer, 1994.

Web Resources

1. https://www.javatpoint.com/knowledge-representation-in-ai
2. https://nptel.ac.in/courses/106/106/106106140/
3. https://www.youtube.com/watch?v=kXlr6ydiPAQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	3	-	-	-	-	-	-	-	2	1	3
2	2	3	2	3	2	-	-	-	-	-	-	-	2	1	3
3	1	3	1	2	2	-	-	-	-	-	-	-	2	1	3
4	1	2	1	2	1	-	-	-	-	-	-	-	2	1	3
5	2	1	3	1	3	-	-	2	-	-	-	-	2	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ADO402	INTRODUCTION TO DATA SCIENCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

Course Outcomes

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

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science.**(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

UNIT I INTRODUCTION TO DATA SCIENCE (9 Hrs)

Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES (9 Hrs)

Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS (9 Hrs)

Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)

Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS (9 Hrs)

Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.
3. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, "Ethics and Data Science", O' Reilly, 1st edition, 2018.

Reference Books

1. Hector Guerrero, "Excel Data Analysis: Modeling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. Mc Owan, "The Power of Computational Thinking", World Scientific Publishing, 2017.
3. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

Web Resources

1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. https://www.javatpoint.com/data-science
3. https://www.coursera.org/browse/data-science /

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	3	2	2	-	-	-	-	-	-	-	2	1	2
2	2	2	2	1	1	-	-	-	-	-	-	-	2	1	2
3	2	1	3	2	3	-	-	-	-	-	-	-	2	1	2
4	1	2	2	1	1	-	-	-	-	-	-	-	-	1	2
5	2	1	1	2	1	-	-	1	-	-	-	-	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

SEMESTER V

		L	T	P	C	Hrs
	PROBABILITY AND STATISTICS	**2**	**2**	**0**	**3**	**60**
U20BST546	(Common to CSE & IT)					

Course Objectives

- To acquire skills in handling situation including more than one random variable.
- To familiarize the student about the continuous random variables and their applications.
- To study the basic concepts of Statistics.
- To learn the concept of testing of hypothesis using statistical analysis.
- To learn the concept of Small sampling.

Course Outcomes

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

CO 1 - Apply the concept of probability in random variables. **(K3)**
CO 2 - Apply the basic rules of continuous random variables. **(K3)**
CO 3 - Understand the basic concepts of Statistics. **(K2)**
CO 4 - Derive the inference for various problems using testing of hypothesis in large samples **(K3)**
CO 5 - Solve the problems related to testing of hypothesis in small samples **(K3)**

UNIT I DISCRETE RANDOM VARIABLES (12Hrs)

Random Variables and their event spaces – The probability mass function – Distribution functions – Binomial – Geometric – Negative Binomial and Poisson.

UNIT II CONTINUOUS RANDOM VARIABLES (12 Hrs)

Distributions – Exponential distribution – Gamma – Weibull – Gaussian distributions. Application of distribution – Reliability – Failure density and Hazard function.

UNIT III STATISTICS (12 Hrs)

Measures of central tendency – Arithmetic Mean, Median and Mode – Measures of dispersion and Standard deviation – Skewness and Measures of Skewness – Pearson's coefficient of skewness – Moments – Correlation – Rank correlation and regression.

UNIT IV LARGE SAMPLES (12 Hrs)

Curve fitting by the method of least squares – fitting of straight lines – second degree parabolas and more general curves – Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations.

UNIT V SMALL SAMPLES (12 Hrs)

Test for single mean – Difference of means and correlations of coefficients – Test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

Text Books

1. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.
2. B.S.Grewal, "Higher Engineering Mathematics", khanna publishers - Paperback – 3rd Edition - 2017.
3. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill Education, 2008.

Reference Books

1. William Mendenhall, Robert J. Beaver, Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning, 15th Edition, 2019.
2. Richard .A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, 9th Edition, 2018.
3. Ravish R. Singh, Mukul Bhatt "Engineering Mathematics", McGraw-Hill, 1st Edition, 2017.
4. E. Rukmangadachari, "Probability and Statistics", Pearson Education, 2012.
5. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, "An Introduction to Probability and Statistics", Wiley, 2008.

Web Resources

1. http:// www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	2	2
2	3	2	1	1	-	-	-	-	-	-	-	1	3	2	2
3	2	1	-	-	-	1	-	-	-	-	-	1	3	2	2
4	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2
5	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	HANDHELD COMPUTING: DESIGN AND APPLICATION DEVELOPMENT	L	T	P	C	Hrs
U20CST510		3	0	0	3	45

Course Objectives

- To about the system requirements for mobile applications.
- To learn the intricacies of UI required by mobile applications.
- To understand the App functionality beyond UI
- To explore the design using specific mobile development frameworks.
- To know the latest technologies available in mobile applications.

Course Outcomes

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

CO1 - Describe the requirements for mobile applications. **(K2)**
CO2 - Explain the challenges in mobile application design and development. **(K3)**
CO3 - Create the states and lifecycle to create App functionality beyond UI. **(K3)**
CO4 - Develop the design for software development using Android SDK. **(K4)**
CO5 - Design software using iOS SDK. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Mobility Landscape-Mobile Platforms- Mobile Apps Development -Overview of Android Platform-Setting up the Mobile App Development Environment along with an Emulator-A case study on Mobile App Development.

UNIT II USER INTERFACE (9 Hrs)

App User Interface Designing - Mobile UI Resources (Layout, UIelements, Draw-able and Menu) -Activity- States and Life Cycle-Interaction amongst Activities- App Functionality beyond User Interface.

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UNIT III APP FUNCTIONALITY BEYOND UI (9 Hrs)

Threads - AsyncTask- Services - States and Lifecycle-Notifications-Broadcast Receivers-Telephony and SMS APIs-Native Data Handling - On-device File I/O- Shared Preferences-SQLite and Enterprise Data Access

UNIT IV ANDROID SOFTWARE DEVELOPMENT (9 Hrs)

Android toolkit - Java for android - components of an Android Application. Kotlin Concepts and Terminology - Kotlin Environment Setup – Kotlin Architecture – Kotlin Views and Perspective - Kotlin and Android - Effective java for Android Building a View - Fragments and Multiplatform Support – Drawing - Handling and Persisting Data.

UNIT V OTHER MOBILE FRAMEWORKS (9 Hrs)

IOS - Objective C Basics - a simple App in IOS - Windows Phone basics - Simple Application in Windows Phone - Blackberry basics - Simple Application in Blackberry - Introduction to Cross-platform Mobile Application development.

Text Books

1. Anubhav Pradhan, Anil V. Deshpande, "Composing Mobile Apps: Learn, Explore, Apply Using Android", 1st Edition Wiley publication, 2014.
2. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development”, Wiley India Private Limited, 2012.
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Beginning iOS Development: Exploring the iOS SDK, Apress, 2013.

Reference Books

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O"Reilly, 2nd Edition, 2012.
2. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
3. James Dovey and Ash Furrow, Beginning Objective C, Apress, 2012
4. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C, Wrox Wiley, 2010.
5. “App Programming Guide for iOS-Apple developer” - 2014 Apple Inc.

Web Resources

1. https://www.theserverside.com/tutorial/Mobile-application-development-tutorial
2. https://www.toptal.com/android/developing-mobile-web-apps-when-why-and-how
3. http://developer.android.com/develop/index.html
4. https://www.tutorialspoint.com/ios/index.htm

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	3	-	-	1	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
CO4	2	2	3	2	2	2	-	2	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

U20CST511	PROGRAMMING IN PHP	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the Core concepts of PHP.
- To understand and program with the object oriented concepts in PHP and Forms.
- To learn about PHP with Database Connectivity.
- To understand file handling methods using PHP.
- To understand the concepts of Website creation using PHP.

Course Outcomes

After completion of the course, the students should be able to:

CO 1 - Explain and program with core concepts of PHP. **(K2)**
CO 2 - Explain the object oriented concepts in PHP and Forms. **(K2)**
CO 3 - Design and build database**. (K4)**
CO 4 - Understand file handling methods using PHP. **(K4)**
CO 5 - Design a micro project. **(K2)**

UNIT I INTRODUCTION TO PHP (9 Hrs)

PHP Foundation: Installation - Syntax - Variables - Echo / Print - Data Types - Math – Constants. Operators: Arithmetic - Comparison - Logical - String - If...Else...Elseif - Switch - Loops - Arrays - Functions - Super globals – RegEx.

UNIT II FORMS AND OOPS WITH PHP (9 Hrs)

PHP Form: Form Handling - GET/POST - Using Bootstarp - Form Validation - Form Required - Form Submission. Data: Date and Time - File Upload - Cookies - Sessions - Include - Exceptions. OOPS: Classes/Objects - Constructor - Destructor - Access Modifiers – Inheritance.

UNIT III WORKING WITH DATABASE (9 Hrs)

Database - Some Essential SQL - Creating a MySQL Database - Creating a New Table - Putting Data into the New Database - Accessing the Database in PHP - Updating Databases - Inserting New Data Items into a Database - Deleting Records - Sorting the Data.

UNIT IV FILE HANDLING (9 Hrs)

Opening Files using fopen - Looping over a File's contents with feof - Reading Text using fgets - Closing a File - Reading from a File Character by Charater with fgetc - Reading a Whole File at Once with file_get_contents - Coping Files with copy - Deleting Files with unlink.

UNIT V PHP FOR BUILDING WEBSITES (9 Hrs)

Creating secure websites - Sending email and access other websites - Working with files, uploads and images – Creating eCommerce websites.

Text books

1. Kevin Tatroe, Peter MacIntyre, "Programming PHP", O'Reilly Media, 4th Edition, 2020.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education, 3rd Edition, 2017.
3. Joel Murach, "PHP & MySQL", Mike Murach Publications, 2nd edition, 2014.
4. Leon Atkinson, "Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Reference Books

1. Richard Blum, "PHP, MySQL & JavaScript All-in-One", John Wiley & Sons, 2018.
2. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
3. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development", O'Reilly Media, 2014.
4. SemmyPurewal, "Learning Web App Development", O'Reilly Media, 2014.
5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.

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Web Resources

1.https://www.tutorialspoint.com/php/php_introduction.html
2.https://www.w3schools.com/php/php_intro.asp
3.https://www.guru99.com/cakephp-tutorial.html
4.https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
5. https://www.tutorialspoint.com/netbeans_online_training/index.asp

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	3	3	-	3	3	3
4	3	3	3	3	3	3	-	3	-	3	-	3	3	3	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST512	SOFTWARE ENGINEERING AND TESTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To familiarize the concepts of Software Engineering.
- To understand Software Design concepts.
- To learn about Software testing.
- To understand the Software testing techniques.
- To understand the levels of testing.

Course Outcomes

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

CO1 – Perform Software engineering processes**. (K2)**
CO2 – Make use of software design**. (K3)**
CO3 – Apply different software testing strategies**. (K3)**
CO4 – Illustrate different testing techniques**. (K2)**
CO5 – Make use of different levels of testing in their software**. (K3)**

UNIT I SOFTWARE ENGINEERING PROCESSES (9 Hrs)

Software engineering concepts – Development activities – Software development lifecycle models – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management – Project Planning – Empirical Estimation Techniques – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Software Requirements specification.

UNIT II SOFTWARE DESIGN (9 Hrs)

Characteristics of a Good Software Design – Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Detailed Design – Object oriented concepts – UML Diagrams – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – state chart diagrams – Object Oriented Analysis and Design methodology – Characteristics of a good User Interface – Types – A User Interface Design methodology.

UNIT III SOFTWARE TESTING (9 Hrs)

Introduction to Software testing – Psychology of Testing – Principles of Software Testing – Defects – Defect Prevention Strategies – Role of a tester – Software Testing Life Cycle.

UNIT IV TESTING TECHNIQUES AND TESTING TOOLS (9 Hrs)

Testing Techniques – Verification vs Validation – Software Testing Methodologies – White Box, Black Box and Grey Box – Static and Dynamic Techniques – Informal Reviews, Walkthroughs, Technical Reviews, Inspection – Structural Techniques, Black Box Techniques, Experienced Based Techniques. Testing Tools: Selenium – Jmeter

UNIT V LEVELS OF TESTING (9 Hrs)

Levels of Testing – Test Case Design – Building Test Cases – Test data mining – Test execution – Test reporting – Functional Testing – Unit, Integration, System, Acceptance, Regression, Retest – Non Functional Testing – Performance, Memory, Scalability, Compatibility, Security, Cookie, Session, Recovery, Adhoc, Risk Based Testing.

Text Books

1. Glenford J Myers, Corey Sandler, Tom Badgett," The Art of Software Testing", Wiley, 3rd Edition 2015.
2. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 3rd Edition, 2013.
3. Ian Sommerville, "Software Engineering", Pearson Education, 8th Edition, 2008.

Reference Books

1. Rahul Shende “Software Automation Testing Tools for Beginners”, Arizona Business Alliance, 2012
2. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, McGraw-Hill International Edition, 7th Edition, 2009.
3. S. L. Pfleeger and J.M. Atlee, “Software Engineering Theory and Practice”, Pearson Education, 3rd Edition, 2008.
4. Lee Copeland “A Practitioner's Guide to Software Test Design”, Artech House Publishers, 2003
5. Cem Kaner “Lessons Learned in Software Testing: A Context-Driven Approach”, Wiley; 1st Edition, 2002.

Web Resources

1. https://nptel.ac.in/courses/106/105/106105150/
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. https://www.coursera.org/lecture/introduction-software-testing/stages-of-software-testing-process-UMOpe

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	2	-	-	1	3	1	1
2	3	3	3	2	-	-	-	-	2	-	-	1	3	1	1
3	3	3	3	2	2	-	-	-	2	-	-	1	3	1	1
4	3	3	3	2	2	-	-	-	2	-	-	1	3	1	1
5	3	3	3	2	2	-	-	-	2	-	-	1	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP506	HANDHELD COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basics of mobile application development
- To work with mobile app development platforms.
- To develop applications using components of android framework.
- To develop android applications including files and databases

Course Outcomes

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

CO1 - Describe the basic requirements of mobile applications**. (K3)**
CO2 - Analysis the challenges in mobile application design and development. **(K4)**
CO3 - Create the designs for software development using Android SDK. **(K4)**
CO4 - Design software applications with files and database connectivity. **(K4)**

List of Exercises

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.
12. Micro Project

Reference Books

1. “App Programming Guide for iOS-Apple developer” - 2014 Apple Inc.
2. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development paperback”, Wiley India Private Limited, 2012.
3. JamesDovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
5. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C, Wrox Wiley, 2010.

Web Resources

1. http://developer.android.com/develop/index.html
2. https://www.theserverside.com/tutorial/Mobile-application-development-tutorial
3. https://www.tutorialspoint.com/android/index.htm
4. https://www.programiz.com/kotlin-programming

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	3	-	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	2	2	2	-	2	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP507	PROGRAMMING IN PHP LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basic concepts of PHP
- To understand string concepts in PHP.
- To learn about file handling concepts in PHP
- To understand the concepts of form.
- To develop a form and link the form with data base using PHP.

Course Outcomes

After completion of the course, the students should be able to:

CO 1 - Explain and program with basic concepts of PHP**. (K4)**

CO 2 - Design a form and work with form. **(K4)**

CO 3 - Understanding POST/GET, Session**. (K2)**

CO 4 - Understanding cookies. **(K2)**

CO 5 - Understanding PHP and Database connectivity. **(K3)**

List of Exercises

1. Write a program in PHP to handle numbers, strings.
2. Write a program in using if else, else if statements, loops.
3. Write a simple program in PHP to manipulate array values.
4. Write a function in PHP to generate random password.
5. Write a program in PHP for processing a simple form (use controls like checkbox, radio buttons and options).
6. Write a program in PHP for a simple POST and GET functions.
7. Write a program in PHP for setting and retrieving a Session.
8. Write a program in PHP for setting and retrieving a Cookie.
9. Design a login form using cookies, bootstrap, PHP, Database.
10. Design an event registration form using bootstrap, PHP, Database.
11. Design a student form with add, update, delete, display all and search option using student database.
12. Write a program in PHP for file operations.

Reference Books

1. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
2. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
3. Leon Atkinson," Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Web Resources

1.https://www.w3schools.com/php/DEFAULT.asp
2.https://www.tutorialspoint.com/php/index.html
3.https://www.phptpoint.com/php-tutorial/
4.https://www.javatpoint.com/php-tutorial

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

U20CSP508	SOFTWARE TESTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To familiarize the concept of Software Testing.
- To apply and understand testing techniques.
- To build test reports.

Course Outcomes

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

CO1 – Apply and practice test on websites using Selenium**. (K3)**

CO2 – Apply and practice different tests on websites using JMeter. **(K3)**

CO3 – Build test reports using BeautifulSoup**. (K4)**

CO4 – Apply Unit testing on software module**. (K3)**

CO5 – Apply Integration testing on software modules**. (K4)**

List of Exercises

1. Introducing Selenium Browser Automation Tool, environmental setup and web page navigation on browser..
2. Use Selenium to Check Functionality of Web Page's User Login and Registration
3. Use Selenium to Check Any Functionality of Web Page and Generate a Report Document.
4. Select a Website to write test plans for the website and to design Test cases using Selenium.
5. Test and Provide test reports for the given website using Selenium.
6. Select any 5 options in the website and test them using Selenium.
7. Introduction to JMeter and Setup JMeter Environment for Testing.
8. Use JMeter to perform Load Testing.
9. Use JMeter to perform Stress Testing.
10. Introduction to Timers in JMeter and Generate a Load using Timers.
11. Introduction to JMeter Response Assertion and Assert Response from Web Page.
12. Test and provide test reports for the given website using Beautiful Soup
13. Introduction to Unit Testing Framework and Unit Testing.
14. Manipulate Unit tests and Integration Tests.

Reference Books

1. Glenford J Myers, Corey Sandler, Tom Badgett," The Art of Software Testing", Wiley, Third edition, 2015.
2. Rahul Shende "Software Automation Testing Tools for Beginners", Arizona Business Alliance, 2012
3. Elfriede Dustin, Thom Garrett, and Bernie Gauf, "Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality", Addison-Wesley Professional, 1st Edition, 2009.
4. Lisa Crispin, Janet Gregory" Agile Testing: A Practice Guide for Testers and Agile Teams", Addison-Wesley Professional, 1st Edition, 2008.
5. Lee Copeland, "A practitioner's guide to Software Test Design", Artech House Publishers, 2003

Web Resources

1. https://www.youtube.com/watch?v=5FUdrBq-WFo
2. https://intellipaat.com/blog/tutorial/selenium-tutorial/
3. https://www.youtube.com/watch?v=mXGcBvWYl-U
4. https://octoperf.com/blog/2018/03/29/jmeter-tutorial/
5. https://www.youtube.com/watch?v=87Gx3U0BDlo
6. https://www.guru99.com/unit-testing-guide.html
7. https://www.youtube.com/watch?v=4_Ik8eb2ln0

COs/POs/PSOs Mapping

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2	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3
3	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3
4	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3
5	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSC5XX	**CERTIFICATION COURSE-V**	**0**	**0**	**4**	**-**	**50**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
U20CSS504	**SKILL DEVELOPMENT COURSE 4** (Foreign Language / IELTS – I/ Career and Professional Skill Development Program -I)	**0**	**0**	**2**	**-**	**30**

1. BASIC APTITUDE & MATHEMATICAL SKILLS:

- Number System – Basics
- Number System – Advanced
- Surds & Indices
- Ratio & Proportion
- Problem On Ages & Partnership

2. APPLIED APTITUDE & MATHEMATICAL SKILLS:

- Average
- Alligations & Mixtures
- Profit & Loss, Discounts
- Percentage
- Time, Speed & Distance
- Problem On Trains
- Boats & Streams
- Time & Work
- Chain Rule
- Pipes & Cisterns
- Calendars

3. ENGINEERING APTITUDE SKILLS:

- Simple & Compound Interest
- Probability
- Permutation & Combination
- Mensuration
- Data Interpretation

		L	T	P	C	Hrs
U20CSS505	**SKILL DEVELOPMENT COURSE 5** (Presentation Skills using ICT)	**0**	**0**	**2**	**-**	**30**

The methodology used is “learning by doing”, a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

` ICT skills

- Understand ICT workflow in cloud computing.
- Manage multitasking.
- Deal with main issues using technology in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study and have to prepare a report, running to 15 or 20 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee for a total of 100 marks. The marks attained for this course is not considered for CGPA calculation.

U20CSM505	INDIAN CONSTITUTION	L	T	P	C	Hrs
		2	0	0	0	30

Course Objectives

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties

Course Outcomes

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

CO1 - Understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration

CO2 - Understand knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

UNIT I INDIAN CONSTITUTION

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties.

UNIT II PARLIAMENTRY SYSTEM

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker.

UNIT III THE JUDICIARY

Organization and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

UNIT IV STATE GOVERNMENTS

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature.

UNIT V LOCAL GOVERNMENTS

73rd and 74th Constitutional Amendments – Federalism - Center – State Relations.

Text Books

1. Basu D.D," Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

Reference Books

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010

PROFESSIONAL ELECTIVES

		L	T	P	C	Hrs
U20CSE506	ENTERPRISE SOLUTIONS	3	0	0	3	45

Course Objectives

- To understand the architecture of ERP and its technologies
- To gain knowledge about SAP.
- To Learn the concepts of oracle suite.
- To understand about people soft
- To study about Siebel Enterprise Applications

Course Outcomes

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

CO1 – Analyse the fundamentals of ERP and its technologies **(K2)**
CO2 – Summarize the concepts of SAP**(K3)**
CO3 – Demonstrate the SQL/PLSQL**(K3)**
CO4 – Examine people soft and its functionalities**(K2)**
CO5 – Know the Siebel Enterprise Applications and its tools. **(K1)**

UNIT I INTRODUCTION TO ENTERPRISE RESOURCE PLANNING (9 Hrs)

Introduction: ERP – Definition – Concept – Fundamentals – Need for ERP – Advantages of ERP – Implementation of ERP – Key issues and Characteristics of ERP – Typical Architecture Components of ERP – ERP system Architecture.

UNIT II ERP AND RELATED TECHNOLOGIES (9 Hrs)

Business Process RE-engineering – Management Information System – Decision Support System – Executive Support System – On-Line Analytical Processing, Supply Chain Management, Customer Relationship Management**.**

UNIT III SAP R/3 (9 Hrs)

SAP: History – SAP R/2 – SAP R/3 – Characteristics of SAP R/3 – Architecture of SAP R/3 – SAP Modules, NetWeaver, Customer Relationship Management, Business Warehouse, Advanced Planner and Optimiser. ABAP/4: Workbench – Workbench Tools – ABAP/4 Data Dictionary – ABAP/4 Repository Information – Structure of ABAP/4 program – ABAP/4 syntax – Data types – Constants and Variables. Statements: DATA, PARAMETERS, TABLE, MOVE, MOVE-CORRESPONDING, CLEAR, WRITE, CHECK, FORMAT, LOOP STRUCTURES, Sample program

UNIT IV ORACLE ERP (9 Hrs)

Oracle Suite: Oracle Apps 11i – Application Framework – File System – Workflow Analysis – SQL/ PLSQL fundamentals – Creating Forms – Oracle Reports. Oracle Electronic Data Interchange – functions of EDI – Data File Structure – Oracle Data, Oracle Database – DW vs OLTP – DW Connectors.

UNIT V PEOPLESOFT (9 Hrs)

PeopleSoft: Basic PeopleSoft Functionality – Opening Multiple Windows – Database structure – Understanding People Soft Data Mover – Records – Pages vs. Forms. PeopleSoft HRMS: Introduction to PeopleSoft HRMS database – PeopleSoft products – Functional PeopleSoft - Financial Management System – PeopleSoft Enterprise HRMS.

Text Books

1. SAP ABAP/4, Black Book, DreamTech Press, 2012.
2. Jim J. Marion, PeopleSoftPeopleTools: Tips and Techniques, Oracle Press, 2010.
3. Oracle EDI Gateway User guide, Oracle Corporation.
4. V.K. Garg and N.K. Venkatkrishnan, ERP Concepts and Planning, PHI, 2004.

Reference Books

1. Alexis Leon, "ERP Demystified ", Mc Graw Hill Publication, 2014.
2. Paula Dean and Jim J. Marion, "PeopleSoft People Tools: Data Management and Upgrade Handbook, Oracle Press", 2013.
3. Kogent , "SAP ABAP / 4 (Covers SAP ECC 6.0) Black Book Paperback" , Learning Solutions Inc, 2009.
4. Chrispopher Allen, Oracle Database PL/SQL, TMH, 2004.
5. Rashami Anandi , "Oracle 11i: The Complete Reference Hardcover", Lakshmi Publication, 2009.

Web Resources

1. https://www.tutorialspoint.com/sap/index.htm
2. https://peoplesofttutorial.com/
3. https://www.oracletutorial.com/plsql-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	3	2	3	2	2	1	2	3	2	3	2	3	1	2
3	3	2	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	2	2	3	3	1	2	2	3	1	3	3	3	2	2
5	2	3	3	2	2	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSE507	**GAME DEVELOPMENT USING UNITY**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To discuss and define the terms and principles of game design and development.
- To select and evaluate programming and scripting languages to develop particular games.
- To define the structure and duties of the game development team.
- To practice animation production development with interfaces.
- To choose an optimal solution and design the game development.

Course Outcomes

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

CO1 – Explain all game development stages. **(K1)**
CO2 – Explain story creation in different dimensions. **(K2)**
CO3 – Analyze the required mathematical and physical analysis. **(K3)**
CO4 – Create and design menus and interfaces. **(K3)**
CO5 – Organize and select the appropriate optimization technique for game development **(K3)**

UNIT I SETTING UP UNITY DEVELOPMENT ENVIRONMENT (9 Hrs)

Welcome screen – The Unity interface – Menus – Toolbar – Hierarchy – Inspector – Project browser – Scene view – Game view – File formats – 3D Formats – 2D Formats – Importing Assets – Importing from inside Unity – Importing premade assets from the file browser – Creating new assets – Importing Packages – Unity Packages – Custom Packages.

UNIT II GAME OBJECTS and COMPONENTS (9 Hrs)

Game objects – Our first GameObjects – Creating a GameObjects – Components – Creating a component – Assign a Component – Prefabs. Creating 2D sprites: Working in 2D – 2D behaviours – 2D Workspace. Building our sprites: Import Settings – Pixels to units – Sprite editor – Sprite Packing – Packing tag – Sprite packer – Additional sprite packing resources. Setting the scene – Creating a roadmap – Adding details – Getting around Our Scene – Scene Gizmo – Perspective vs Isometric – Camera controls – Manipulating Objects in Unity – Transform tools.

UNIT III BUILDING THE GAME WORLD (9 Hrs)

The three languages: Choosing the “Right” Language – Making the Player Go – Different ways of Handling Movement – Creating and hooking up Player Controller – Setting up a basic Follow-cam. Introducing the input manager: Error handling and debugging – Handling exceptions – Try-Catch-Finally – Gracefully Handling exceptions – Breakpoints. Rules for animation: Animation principles – 2D versus 3D Animation – Transform versus Frame Animation – Scripted Animations.

UNIT IV SETTING UP PLAYER PHYSICS AND COLLIDERS (9 Hrs)

Understanding Physics: Physics – Mass – Gravity – Force – 2D versus 3D – 6DoF – Z-Depth – Rotations – Physics 2D Settings – General Physics Settings – Layer Collision Matrix – Rigidbodies – Colliders – Circle Collider – Box Collider – Edge Collider – Polygon Collider – Physics Materials – Constraints – Trigger Volumes in Unity – Trigger2D Functions – Adding Trigger Components to GameObjects – Creating Checkpoints – Scripting the Checkpoint Component – Sizing and Placing Our Checkpoint Trigger .

UNIT V CREATING THE MENUS AND INTERFACE ELEMENTS (9 Hrs)

UI Design – Diegetic – Non-diegetic – Meta – Spatial – Unity native GUI – GUI style – GUI skin – GUI controls – Compound controls – GUI class – GUI layouts – GUI text – GUI texture – Creating a splash screen – Title screen – Game Over screen – HUD – Creating the visuals – Creating the Visuals – Creating the Scripts – Introducing the Shuriken Particle System – Creating a Particle System – Modules and Properties of a Particle System – Base Particle System Properties – Other Particle System Modules.

Text Books

1. Nicolas Alejandro Borromeo, “Hands-On Unity 2020 Game Development”, Packt, 2020.
2. Franz Lanzinger, “2D Game Development with Unity”, CRC Press, 1st Edition, 2020.
3. Mike Geig, “Unity Game Development in 24 Hours”, sams, 3rd Edition, 2020.

Reference Books

1. Penny de Byl, Holistic “Game Development with Unity”, CRC Press,3rd Edition, 2019
2. Paris Buttfield–addis , Jonathon Manning , Tim Nugent , “Unity Game Development Cookbook, Essentials for Every Game”, O'reilly, 2019.
3. Matthew Johnson, James A. Henley, “Learning 2D Game Development with Unity“, Pearson Education, 2014.
4. Michelle Menard, “Game Development with Unity”, Course Technology, 2012.
5. Michelle Menard, “Game Development with Unity”, Course technology PTR Stacy L Hiqust, 2011.

Web Resources

1. https://www.udemy.com
2. https://nptel.ac.in/courses/110/104/110104063/
3. https://www.capterra.com/game-development-software/
4. https://www.gamedesigning.org/gaming/game-development-tools/
5. https://en.wikipedia.org/wiki/Game_development_tool

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	3	2	1	1	1	2	3	2	1	2	2	3	2
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3	2	2	2	3	3	2	2	2	2	3	3	2	3	2	3
4	2	2	3	1	3	2	2	2	3	1	3	3	3	3	2
5	2	2	3	3	3	2	2	2	3	3	3	3	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

U20CSE508	FUNCTIONAL PROGRAMMING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Understand the fundamentals of functional programming
- To learn the programming in Haskell
- To write functional programs using recursion and higher order functions
- Combine functional programming with classes and objects
- To learn Haskell proofs on program equivalence and Monads

Course Outcomes

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

CO1 – List and define the fundamental concepts of functional programming **(K1)**
CO2 – Utilize the polymorphism and higher-order functions on Haskell **(K1)**
CO3 – Describe the required data types and construct the features of the Haskell **(K2)**
CO4 – Write functional programming using classes and objects of the system **(K2)**
CO5 – Apply the reasoning and proofs on programs in functional programming **(K3)**

UNIT I **(9 Hrs)**

Introduction to Functional Programming – Expressions and Values, Evaluations, Functions, Recursion, Types.

UNIT I **(9 Hrs)**

Introduction to Haskell - Tuples, Polymorphism, Higher Order Functions, Strings & Characters.

UNIT III **(9 Hrs)**

Data Types – Data Type Declarations, Data and Type Constructors, Defining Functions Over Data Types using Pattern, Abstract Data Types, Polymorphism, Polymorphic Functions, Polymorphic Data Types, Type Constructors to Define Polymorphic Constructor Functions, Recursive Data Types, Higher Order Functions.

UNIT IV **(9 Hrs)**

The Haskell Class System – Classes as Predicates on Types, Instance Declarations, Inheritance and Dependent Classes, Derived Instances, The Show Class, The Eq class.

UNIT V **(9 Hrs)**

Programs and Proofs - Equational Reasoning, Proofs on Program Equivalence. Monads-IO Monad, List Monad, Maybe Monad , State Monad.

Text Books

1. Simon Thompson, Haskell - The Craft of Functional Programming, Pearson Education, 2015
2. Richard Bird, Introduction to Functional Programming using Haskell, Prentice-Hall International, 2nd Edition, 2010.
3. Benjamin C. Pierce, Types and Programming Languages, The MIT Press, 2002

Reference Books

1. Graham Hutton, Programming in Haskell, 2nd Edition, Cambridge University Press, 2016.
2. Miran Lipovaca, Learn You a Haskell for Great Good, No Starch Press, 1st Edition, 2011.
3. Richard Bird, Introduction to Functional Programming using Haskell, Prentice-Hall International, 2nd Edition, 2010.
4. Simon Peyton Jones, Haskell 98 language and libraries - The Revised Report, Cambridge University Press, 2003
5. Paul Hudak, The Haskell School of Expression: Learning Functional Programming through Multimedia, Cambridge University Press, 2000.

Web Resources

1. https://nptel.ac.in/courses/Functional_Programming/
2. https://en.wikipedia.org/wiki/Game_development_too
3. https://www.coursera.org/learn/progfun1

COs/POs/PSOs Mapping

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3	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ITCM04	ROBOTICS PROCESS AUTOMATION (Common to IT , CSE and CSBS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the role of the Artificial Intelligence in Automation
- To learn the evolution and future of Robotic Process Automation
- To Learn Web, Windows, Email, Excel, PDF, Database, API and Image Automation using UI path
- To learn Blue Prism process and operations for operating system of Digital Workforce.
- To learn Automation Anywhere and automate any business process with intelligent, scalable software robots

Course Outcomes

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

CO1 - Apply basic principles of AI in solutions that require problem solving, knowledge and automation (**K3)**

CO2 - Identify processes suitable for RPA and recognize how RPA is transforming businesses **(K2)**

CO3 - Design automation strategy using orchestrator, queues, and bots **(K3)**

CO4 - Elucidate cost-effectiveness through automation and with improved accuracy by creating a virtual workforce (**K3)**

CO5 - Explore process team's consistency, automate workflows, create IQ bots and manage them effectively (**K2)**

UNIT I AI AND AUTOMATION (9Hrs)

AI Foundations - AI Data, AI Capabilities framework - Associated Technologies of AI - AI Prototyping- Industrialising AI - Cognitive Automation tools - Natural language processing - AI Resources - Future of AI.

UNIT II INTRODUCTION TO RPA (9Hrs)

RPA Foundations- History of RPA-Difference between RPA and AI - Benefits of RPA - Components of RPA - RPA Architecture - RPA Skills - Process Methodologies in RPA - Planning for RPA-RPA Platforms - Types of Bots - Deployment platforms - Future of RPA.

UNIT III UI PATH (9Hrs)

Introduction to UI Path: UI Path Studio - UI Path Robot - UI path Orchestrator - Task Recorder - Sequence, Flowchart, and Control Flow - Sequencing the workflow - Data Manipulation - Application with Plug-ins and Extensions Terminal Plug-in - Handling User Events and Assistant Bots - Deploying and Maintaining the Bot.

UNIT IV BLUE PRISM (9Hrs)

Introduction-Process Studio - Pages, Actions, Decisions, Choices and collections - Implementing business objects-Spying Elements - Working with excel - Sending and receiving email, Control room and work queues - Exception Handling

UNIT -V AUTOMATION ANYWHERE (9Hrs)

Introduction of Automation Anywhere –Tasks - Tasks Editors - Integration and collaboration with Automation Anywhere - working with web pages and JSON Data - Citrix Automation - E-mail Automation - PDF integration - Web Recorder - Creating IQ bots - Deploying and Maintaining the Bot.

Text Books

1. Tom Taulli ,"Artificial Intelligence Basics: A Non-Technical Introduction ",First Edition,Apress,2019
2. Alok Mani Tripathi ,"Learning Robotic Process Automation Create Software robots and automate business processes with the leading RPA tool – UiPath", First Edition, Packt Publishing ,2018
3. Lim Mei Ying ,"Robotic Process Automation with Blue Prism Quick Start Guide ",First Edition ,Packt Publishing ,2018
4. Tom Taulli ,"The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", First Edition,Apress,2020

Reference Books

1. Palgrave Macmillan," The Executive Guide to Artificial Intelligence: How to identify and impement application for AI in your organization", Springer press ,2018
2. Jonathan Sireci ,"The Practitioner's Guide to RPA: A Practical Guide for Deploying Robotics Process Automation,Kindle Edition,2020

Web References

1. https://www.uipath.com/solutions/technology/web-automation
2. https://www.uipath.com/developers/video-tutorials/web-data-extraction-automation
3. https://community.blueprism.com/communities/community-home/
4. https://www.blueprism.com/
5. https://www.automationanywhere.com/in/

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3	3	3	1	1	2	-	-	-	-	-	-	-	2	3	3
4	2	2	-	-	2	-	-	-	-	-	-	-	2	2	3
5	2	2	-	-	2	-	-	-	-	-	-	-	2	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSCM01	SOFTWARE PROJECT MANAGEMENT (Common to CSE and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand Software Project Management
- To explore the project life cycle and cost of estimation
- To Learn about Risk Management and Resource allocation
- To understand about managing control and contract

To create our own organizing Teams

Course Outcomes

After completion of the course, the students should be able to

CO 1 – Understand Project Management and planning strategies **(K1)**
CO 2 – Obtain adequate knowledge about software process models and software effort estimation techniques **(K1)**
CO 3 – Estimate the risks involved in various project activities **(K2)**
CO 4 – Understand project monitoring and control strategies **(K2)**
CO 5 – Staff selection process and the issues related to people management **(K2)**

UNIT I PROJECT EVALUATION AND PLANNING (9 Hrs)

Software Project Management – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION (9 Hrs)

Project Life Cycle – Software Process and Process Models – Rapid Application Development – Agile Methods – Dynamic System Development Method – Extreme Programming – Managing Interactive Processes – Basics of Software Estimation – Effort and Cost Estimation Techniques – COSMIC Full Function points – COCOMO II – A Parametric Productivity Model.

UNIT III ACTIVITY PLANNING, SCHEDULING AND RISK MANAGEMENT (9 Hrs)

Objectives of Activity planning – Project Schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo Simulation – Resource Allocation – Creation of Critical Patterns – Cost Schedules.

UNIT IV MONITORING AND CONTROL (9 Hrs)

Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – The ISO 12207 Approach – Supply Process – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLES AND ORGANIZING TEAMS (9 Hrs)

Staffing in Software Projects – Managing People – Organizational Behavior – Best methods of Staff Selection – Motivation – The Oldham – Hackman Job Characteristic Model – Stress – Health and Safety – Ethical and Professional Concerns – Working in Teams – Decision Making – Organizational Structures – Dispersed and Virtual Teams – Communications Genres – Communication Plans – Leadership.

Text Books

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2017.
2. Maneesh Dutt, Mind Maps for Effective Project Management, 1st edition , Notion Press, 2015.
3. Kalpesh Ashar, Project Management Essentials You Always Wanted To Know, VIBRANT PUBLISHERS, 2020.

Reference Books

1. Meredith , Mantel , Shafer, Project Management, ISV: A Managerial Approach, Wiley, 2017.
2. Stanley E. Portny, Project Management For Dummies, Fifth edition, Wiley, 2017.
3. Gopalaswamy Ramesh, Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.
4. Robert K. Wysocki Effective Software Project Management – Wiley Publication, 2011.
5. Walker Royce: Software Project Management- Addison-Wesley, 1998.

Web Resources

1. https://www.pmi.org/learning/library/strategic-program-management-office-structure-4613
2. https://www.simplilearn.com/project-estimation-techniques-article
3. https://www.tutorialspoint.com/software_engineering/software_project_management.html
4. https://www.javatpoint.com/software-project-management
5. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

COs/POs/PSOs Mapping

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3	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN ELECTIVES

U20ECO503	ELECTRONIC PRODUCT DESIGN AND PACKAGING	L	T	P	C	Hrs
		3	0	0	3	45

(Common to EEE, CSE, IT, ICE, MECH BME and Mechatronics)

Course Objectives

- To provide basic knowledge about Electronic Produc tand Packaging
- To introduce and discuss various issues related to the system packaging
- To get clear idea about design of packages which can withstand higher temperature,vibrations and shock
- To Design of PCBs which minimize the EMI and operate at higher frequency
- To acquire depth knowledge about the concepts of Testing and testing methods

Course Outcomes

After completion of the course, students are able to

CO1 - Explain the basics of Electronic Product and Packaging.(K2)

CO2 - Infer various issues related to the system packaging.(K2)

CO3 - Summarize the clear idea about design of packages which can with stand higher temperature, vibrations and shock (K2)

CO4 - Describe the design of PCBs which minimize the EMI and operate at higher frequency(K2)

CO5 - Explain the various testing methods (K2)

UNIT I OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING (9Hrs)

Definition of a system and history of semiconductors, Products and levels of packaging, Packaging aspects ofhandheld products, Definition of PWB, Basics of Semiconductor and Process flowchart, Wafer fabrication,inspection and testing, Wafer packaging; Packaging evolution; Chip connection choices, Wire bonding, TABandflipchip.

UNIT II SEMICONDUCTOR PACKAGES (9Hrs)

Single chip packages or modules (SCM), Commonly used packages and advanced packages; Materials inpackages;Thermalmismatchinpackages;Multichipmodules(MCM)-types;System-in-package(SIP);Packagingroadmaps;Hybridcircuits;

UNIT III ELECTRICAL ISSUES IN PACKAGING (9Hrs)

Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution, Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digital and RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance and Inductance fundamentals; Packaging roadmaps – Hybrid circuits – Resistive, Capacitive and Inductive parasitics.

UNIT IV CHIP PACKAGES (9Hrs)

IC Assembly – Purpose, Requirements, Technologies, Wire bonding, Tape Automated Bonding, Flip Chip,Wafer Level Packaging, reliability, wafer level burn – in and test. Single chip packaging: functions, types, materials processes, properties, characteristics, trends. Multi-chip packaging: types, design, comparison,trends. System–in–package (SIP); Passives: discrete ,integrated, and embedded

UNIT V TESTING (9 Hrs)

Testing Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue – failures -thermo mechanically induced -electrically induced – chemically induced. Electrical Testing: System level electricaltesting,Interconnectiontests,ActiveCircuitTesting,DesignforTestability

TextBooks

1. Tummala,RaoR.,Fundamentals of Micro systems Packaging, McGrawHill,2001
2. R.G.Kaduskar and V.B.Baru,Electronic Product design,Wiley India, 2011
3. Tummala,RaoR,Microelectronics packaging handbook,McGrawHill,2008.

Reference Books

1. Blackwell(Ed),“The electronic packaging handbook”,CRCPress,2000.
2. R.S.Khandpur,“Printed Circuit Board”,TataMcGrawHill,2005
3. R.K.Ulrich,“Recent literature in Electronic Packaging”,2005
4. MichaelL.Bushnell and Vishwani D.Agrawal, “Essentials of ElectronicTesting for Digital, Memory and Mixed signal VLSICircuits”,Kluwer Academic Publishers.2000.
5. M.Abramovici,M.A.Breuer,andA.D.Friedman,“DigitalSystemTestingandTestableDesign”,ComputerScience Press,

Web Resources

1. http://www.logopeople.in/blog/awesome-packaging-design-of-electronic-products-for-inspiration/
2. https://www.pinterest.com/PackagingTPI/electronic-packaging/
3. https://www.einfochips.com/blog/semiconductor-and-electronic-design-networks-and-profiles-to-follow-in-2018/
4. https://en.wikipedia.org/wiki/Electronic_packaging
5. https://nptel.ac.in/courses/108/108/108108031/

COs/POs/PSOs Mapping

COs	Program Outcomes(POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	-	-	-	-	-	1	-	-	1	2	1
2	3	1	1	-	-	-	-	-	-	1	-	-	1	2	1
3	3	1	1	-	-	-	-	-	-	1	-	-	1	2	1
4	3	1	1	-	-	-	-	-	-	1	-	-	1	2	1
5	3	1	1	-	-	-	-	-	-	1	-	-	1	2	1

CorrelationLevel:1-Low,2-Medium,3-High

U20ICCM01	FUZZY LOGIC AND NEURAL NETWORKS (Common to EEE, ECE, CCE, CSE, IT, CIVIL, BME, AI&DS))	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To acquaint the students with the basics of fuzzy logic.
- To impart knowledge about fuzzy logic control system.
- To familiarize the basics of neural networks
- To inculcate knowledge on neural network based computation.
- To make the students understand the concept of hybrid Neuro-fuzzy logic controller schemes.

Course Outcomes

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

CO1 - Illustrate the fuzzy sets and the properties of fuzzy logic **(K2)**
CO2 - Comprehend fuzzy logic controllers and its applications. **(K2)**
CO3 - Familiarize in the neural network architecture. **(K2)**
CO4 - Impart knowledge on various training algorithm of neural network and its application. **(K3)**
CO5 - Recognize the hybrid Neuro-fuzzy logic controllers. **(K2)**

UNIT I INTRODUCTION TO FUZZY LOGIC (9 Hrs)

Classical sets - Fuzzy sets – properties of fuzzy sets – operations on fuzzy sets, Cartesian Product, Fuzzy relations linguistic variables – Linguistic approximation. Fuzzy statements: Assignments, Conditional and Unconditional statements.

UNIT II FUZZY LOGIC CONTROL SYSTEM (9 Hrs)

Introduction to Fuzzy logic controller: Architecture – Fuzzification, Membership functions: Triangular, Trapezoidal, Gaussian. Inference Mechanism, knowledge base, fuzzy rule base, Inference method: Mamdani, Sugeno and TSK models, Defuzzification - Applications of Fuzzy logic controller.

UNIT III INTRODUCTION TO NEURAL NETWORK (9 Hrs)

Introduction to neural networks – Biological neural networks, Artificial Neural network: Single and Multi layer feed forward network- Activation function, types (step and sigmoid function), threshold function- Classification of learning: Supervised, Unsupervised and Reinforced. McCulloh Pitts neuron: architecture, algorithm and applications.

UNIT IV NEURAL NETWORKS CONTROL (9 Hrs)

Back propagation neural net: standard architecture, algorithm -Hopfield net: architecture and algorithm- Kohonnen's Self Organizing map- Adaptive Resonance Theory ART 1: Architecture and operation- Neural networks for control: Schemes of neuro control - Applications of neuro controller.

UNIT V HYBRID CONTROL SCHEMES (9 Hrs)

Adaptive Neuro-Fuzzy Inference Systems (ANFIS), Hybrid system: Types of Hybrid Systems: Neuro-Fuzzy Hybrid systems, Neuro Genetic Hybrid systems, Fuzzy Genetic Hybrid systems- Applications of fuzzy logic and neural network.

Text Books

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International Editions,2010
2. Laurene Fausett, "Fundamentals of Neural Networks", Pearson Education, 2008
3. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA .2015

Reference Books

1. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2019
2. Rajasekaran. S, Pai. G.A.V. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice-Hall of India, 2003
3. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Pearson Education 2007
4. W.T.Miller, R.S.Sutton and P.J.Webrose, Neural Networks for Control, MIT Press, 2001.

S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Networks using MATLAB 6.0", Tata McGraw Hill Education, 1st Edition, 2017.

Web Resources

1. https://lecturenotes.in/subject/922.
2. https://www.ifi.uzh.ch/dam/jcr:00000000-2826-155d-0000-00005e4763e3/fuzzylogicscript.pdf.
3. https://nptel.ac.in/courses/106/105/106105173/.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	-	-	2	-	-	-	2	-	1	3	2	1
2	3	3	-	3	3	2	-	-	-	2	-	2	2	2	1
3	3	3	2	3	3	2	-	-	-	2	-	2	2	2	1
4	3	3	3	3	3	2	-	-	-	2	-	2	2	2	1
5	3	3	3	2	2	2	-	-	-	2	-	2	2	2	1

CorrelationLevel:1-Low,2-Medium,3-High

	DISASTER MANAGEMENT	L	T	P	C	Hrs
U20CEO503	(Common to EEE,ECE, CSE, IT, ICE, MECH and BME)	3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basic conceptual understanding of disasters
- Understand approaches of Disaster Management
- Build skills to respond to disaster
- Understand the safety precaution
- Understand the basic planning and policy act of the disaster

Course Outcomes

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

CO1 - Understanding Disasters, man-made Hazards and Vulnerabilities **(K2)**
CO2 – Understanding the flood management studies **(K2)**
CO3 - Understanding disaster mitigation and management mechanism **(K1)**
CO4 - Understanding the disaster safety precaution **(K2)**
CO5 – Understanding the disaster plan and act **(K3)**

UNIT I DEFINITION AND TYPES (9 Hrs)

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

UNIT II STUDY OF IMPORTANT DISASTERS (9 Hrs)

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) Earthquakes, Landside). Social Economics and Environmental impact of disasters.

UNIT III MITIGATION AND MANAGEMENT (9 Hrs)

Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief.

UNIT IV SAFETY PROCESS (9 Hrs)

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

UNIT V PLANNING AND ACT (9 Hrs)

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans.

Text Books

1. Dr. MrinaliniPandey, Disaster Management, Wiley India Pvt. Ltd
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd.
3. Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
4. J. P. Singhal, Disaster Management, Laxmi Publications
5. C. K. Rajan, NavalePandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication

Reference Books

1. Disaster Management by MrinaliniPandey Wiley 2014.
2. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015
3. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
4. National Disaster Management Plan, Ministry of Home affairs, Government of India
5. Manual on Disaster Management, National Disaster Management, Agency Govt of India.

Web Resources

1. http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf
2. http://nidm.gov.in/pdf/guidelines/new/sdmp.pdf
3. http://sdmassam.nic.in/pdf/publication/undp/disaster_management_in_india.pdf

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
2	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
3	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
4	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
5	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

		L	T	P	C	Hrs
U20CEO504	AIR POLLUTION AND SOLID WASTE MANAGEMENT	3	0	0	3	45

Course Objectives

This course should enable the students to

- Provide general understanding of air pollution, air pollutants, their sources and their effects
- Provide knowledge about meteorological parameters, air sampling and measurement of pollutants.
- Provide knowledge of air pollution controlling technologies, air pollution due to automobiles and general Idea of noise pollution.
- Study the importance of solid waste management by processing, treatment, disposal and reuse of solid waste.
- Study about the equipment used for waste collection and transportation of solids waste.

Course Outcome

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

CO1 - understand the type, sources & effect of air pollutants (**K2)**
CO2 – know the parameters affecting air pollution and various methods of measurement and estimation of pollutants **(K3)**
CO3 - gain knowledge of basics of noise pollution **(K2)**
CO4 - understand various air pollution control equipment's & pollution caused due to automobile exhaust **(K4)**
CO5 - understand the concepts of solid waste management **(K2)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and K5 – Evaluate

UNIT I INTRODUCTION TO AIR POLLUTION (8 Hrs)

Introduction to air pollution: Air pollution episodes, Atmosphere and its zones, classification and sources of air pollutants, effects of air pollutants on man, plants animal & materials

UNIT II METEOROLOGICAL ASPECTS (8Hrs)

Meteorological Aspects: Atmospheric stability, plume behavior, Ambient air sampling and stack sampling, collection of particulates and gaseous pollutants, methods of estimation.

UNIT III AIR POLLUTION CONTROL METHODS (9 Hrs)

Air pollution control methods and equipment: Principle of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters cyclones, wet scrubbers, automobile exhaust: Pollution due to diesel and petrol engines, exhaust treatment and abatement, noise Pollution: Sources, ill effects, control measures.

UNIT IV SOLID WASTE MANAGEMENT (8Hrs)

Introduction to solid waste management, sources, quantification and characterisation, classification and components, sampling and analysis, Method of collection

UNIT V EQUIPMENT (12 Hrs)

Equipment used for collection and transportation, transfer stations, solid waste processing and management. Treatment and disposal methods: composting, sanitary landfills, Incineration – concept, components and applications, leachate management.

Text Books

1. M.N. Rao & H.V.N. Rao, 1988, Air Pollution, Tata McGraw Hill Publishing Co. Ltd.
2. C.S. RAO, 2007, Environmental Pollution Control Engineering, New Age International, Wiley Estern Ltd. New Delhi.
3. Stern A. C., 1973, Air pollution, Academic Press.
4. A.D. Bhide & Sunderesan B.B., 1983, Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tohobanoglous, 1993, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd.

Reference books

1. P. Aarne Vesilind, William Worrell & Debra Reinhart, 2002, Solid Waste Engineering, Cengage Learning India pvt. Ltd.
2. Dr. Y Anjaneyulu, 2002, Air Pollution and Control Technologies, Allied Publisher pvt. Ltd.
3. Waste Management: A Reference Handbook. Contributors: Jacqueline Vaughn - Author. Publisher: ABC-Clio
4. K. V. S. G. Murlikrishna, 1995, Air Pollution, Kaushal& Company.

Web Resources

1. https://nptel.ac.in/courses/120108005/
2. http://cpheeo.gov.in/upload/uploadfiles/files/Part1
3. https://nptel.ac.in/content/storage2/courses/104103022

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	3	2	3	3	3	3	3	2	3	3	2	3
2	3	3	2	3	3	3	3	2	3	2	2	3	3	3	3
3	3	3	3	2	2	2	3	3	3	3	2	3	3	3	2
4	2	3	2	3	2	3	2	3	3	2	2	3	3	3	3
5	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 – High

U20BMO503	BIOMETRIC SYSTEMS (Common to EEE,ECE,CSE, IT,ICE, MECH AND MECHATRONICS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives:

- To understand the basics of Biometric systems
- To gain knowledge in different fingerprint technologies
- To understand the classification of face recognition methods.
- To understand multimodal Biometrics and its performance evaluation.
- To know personal privacy and security implications of biometrics systems.

Course Outcomes:

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

CO1 - Explain the fundamentals of biometric systems**(K2)**
CO2 - Describe the various fingerprint technologies**(K3)**
CO3 - Distinguish different face recognition and hand geometry pattern**(K3)**
CO4 - Analyze the multimodal biometrics and performance evaluation of biometrics **(K4)**
CO5 - Recognize various Biometric authentication methods **(K3)**

UNIT I INTRODUCTION TO BIOMETRICS (9 Hrs)

Introduction– biometric technologies – passive biometrics – active biometrics - Biometric systems – Enrolment – templates – algorithm – verification – Authentication technologies –Need for strong authentication - Protecting privacy and biometrics policy – Biometric applications – biometric characteristics.

UNIT II FINGERPRINT TECHNOLOGY (9 Hrs)

History of fingerprint pattern recognition - General description of fingerprints - Finger print feature processing techniques - fingerprint sensors using RF imaging techniques – fingerprint quality assessment – computer enhancement and modelling of fingerprint images – fingerprint enhancement – Feature extraction – fingerprint classification – fingerprint matching

UNIT III FACE RECOGNITION AND HAND GEOMETRY (9 Hrs)

Introduction to face recognition - face recognition from correspondence maps - Hand geometry- scanning - feature extraction - Adaptive Classifiers - Visual Based feature extraction and Pattern Classification -types of algorithm - Biometric fusion.

UNIT IV MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION (9 Hrs)

Voice scan - Physiological biometrics –Behavioural biometrics - Introduction to multimodal biometric system- Integration strategies - Architecture -level of fusion - combination strategy – training and adaptability - examples of multimodal biometric systems - Performance evaluation - Statistical Measures of Biometrics- FAR - FRR - FTE - EER -Memory requirement and allocation.

UNIT V BIOMETRIC AUTHENTICATION (9 Hrs)

Introduction - Biometric Authentication Methods - Biometric authentication by fingerprint - Biometric Authentication by Face Recognition. Expectation-Maximization theory - Support Vector Machines- Biometric authentication by hand geometry- Securing and trusting a biometric transaction – matching location – local host - authentication server – match on card (MOC) – Multibiometrics and Two-Factor Authentication.

Text Books

1.Anil K. Jain, Arun Ross, and KarthikNandakumar“ Introduction to Biometrics”, Springer,2011
2. Richard O. Duda, David G.Stork,Peter E. Hart, “Pattern Classification,”, Wiley 2007
3. S.Y.Kung, S.H. Lin, M.W.Mak, “Biometric Authentication: A Machine Learning Approach”, Prentice Hall,2005

Reference Books

1.Anil K. Jain, Patrick Flynn, and Arun A. Ross, “Handbook of Biometrics”, Springer, 2008
2.John Chirillo, Scott Blaul, “Implementing Biometric Security”, John Wiley, 2003.
3.John R. Vacca, “Biometric Technologies and Verification Systems”, Elsevier Inc, 2007
4.James Wayman, Anil Jain, DavideMaltoni, Dario Maio, “Biometric Systems, Technology Design and Performance Evaluation”,Springer,2005
5.Nikolaos V. Boulgouris,Konstantinos N. Plataniotis ,EvangeliaMicheli-Tzanakou,”Biometrics: Theory, Methods, and Applications” , Wiley 2009

Web Resources

1.http://www.findbiometrics.com/Pages/glossary.html
2. http://www.biometrics.gov/Documents/privacy.pdf
3. http://zing.ncsl.nist.gov/biousa/docs/Usability_and_Biometrics_final2.pdf
4. User Interface, System Design
5. http://www.cesg.gov.uk/site/ast/biometrics/media/BEM_10.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	-	1	-	-	-	-	-	1	1	1	-
2	3	2	2	1	1	2	-	-	-	-	-	1	1	1	-
3	3	2	2	1	2	2	-	-	-	-	-	1	1	1	-
4	3	1	1	1	1	1	-	-	-	-	-	1	1	1	-
5	3	1	2	1	2	2	-	-	-	-	-	1	1	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

U20BMO504	MEDICAL ROBOTICS (Common to CSE, IT, MECH, MECHATRONICS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basics of Robotics
- To gain knowledge in Kinematics
- To know about the robot vision
- To describe various motion planning solutions
- To explain various applications of Robots in Medicine

Course Outcomes

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

CO1 - Understand the basics of robotic systems**.(K2)**
CO2 - Explore workspace and related motion of the Robots**(K3)**
CO3 - Analyse and extract information from the image using Robots **(K3)**
CO4 - Design of task planning and simulating the task. **(K4)**
CO5 - Construct Robots for Medical applications **(K4)**.

UNIT I INTRODUCTION (9 Hrs)

Introduction- Automation and Robots – Classification - Applications- Specifications – Direct Kinematics Dot and cross products – Coordinate frames – Rotations – Homogeneous coordinates Link coordination arm equation – Four-axis robot -Five-axis robot - Six-axis robot.

UNIT II KINEMATICS (9 Hrs)

Inverse Kinematics – General properties of solutions tool configuration – Workspace analysis and trajectory planning work envelope - examples- workspace fixtures – Pick and place operations – Continuous path motion – Interpolated motion – Straight-line motion.

UNIT III ROBOT VISION (9 Hrs)

Robot Vision- Image representation – Template matching – Polyhedral objects – Shane analysis – Segmentation – Thresholding – region labelling – Shrink operators – Swell operators – Euler numbers – Perspective transformation – Structured illumination – Camera calibration.

UNIT IV PLANNING (9 Hrs)

Task Planning – Task level programming – Uncertainty – Configuration – Space, Gross motion – Planning – Grasp Planning – Fine-motion planning – Simulation of planar motion – Source and Goal scenes – Task Planner simulation.

UNIT V MEDICAL APPLICATIONS (9 Hrs)

Applications in Biomedical Engineering – Biologically Inspired Robots – Application in Rehabilitation – Interactive Therapy – Bionic Arm – Clinical and Surgical – Gynaecology – Orthopaedics – Neurosurgery.

Text Books

1. Robert Schilling, “Fundamentals of Robotics-Analysis and control”, Prentice Hall, 2003.
2.Paula Gomes,“Biomedical Instrument and Robotic Surgery System: Design and Development for Biomedical Applications”,Woodhead Publishing,2012.
3.Klafter, Chmielewski and Negin, “Robotic Engineering - An Integrated approach”,, PHI, f*irst edition,* 2009.

Reference Books

1.J.J.Craig, “Introduction to Robotics”, Pearson Education, 2005.
2. Fu, Lee and Gonzalez., “Robotics, control vision and intelligence”, McGraw Hill International, 2nd edition, 2007
3 John J. Craig, “Introduction to Robotics”, Addison Wesley Publishing, 3rd edition, 2010.
4. Saeed B. Niku, “Introduction to Robotics: Analysis, Systems, Applications”, Prentice Hall, 2001.
5. K. S. Fu, R. C. Gonzales and C. S. G. Lee, “Robotics”, McGraw Hill, 2008.

Web Resources

1.https://nptel.ac.in/courses/112/105/112105249/
2.https://www.intechopen.com/books/medical_robotics/motion_tracking_for_minimally_invasive_robotic_surgery
3.https://www.intechopen.com/books/medical_robotics/robotic_applications_in_neurosurgery
4.https://www.intechopen.com/books/medical_robotics/medical_robotics_in_cardiac_surgery
5.https://www.worldscientific.com/worldscinet/jmrr

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	-	1	-	-	-	-	-	1	-	1	-
2	3	2	-	1	1	1	-	-	-	-	-	1	-	1	-
3	3	2	-	1	1	1	-	-	-	-	-	1	-	1	-
4	3	1	1	1	1	1	-	-	-	-	-	1	-	1	-
5	3	1	1	-	1	1	-	-	-	-	-	1	-	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

U20ADO503	PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand basic principles of Artificial Intelligence
- To learn and design Knowledge representation
- To understand the concept of reasoning
- To master the fundamentals of machine learning, mathematical framework and learning algorithms
- To understand the reinforcement and statistical learning.

Course Outcomes

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

CO1 - Understand foundational principles of artificial intelligence. **(K2)**
CO2 - Understand formal methods of knowledge representation. **(K2)**
CO3 - Understand the fundamental issues and challenges of Reasoning. **(K2)**
CO4 - Analyze the underlying mathematical relationships with Machine Learning algorithms. **(K3)**
CO5 - Apply various models for Artificial Intelligence programming techniques. **(K4)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction to Artificial Intelligence - Artificial Intelligence Problems -Timelines of Artificial Intelligence - Production Systems - State Space Representation - Branches of Artificial Intelligence - Application of Artificial Intelligence.

UNIT II KNOWLEDGE REPRESENTATION **(9 Hrs)**

Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge representation - Issues in Knowledge representation - Knowledge base. First order Logic – Frames — Conceptual Dependency.

UNIT III REASONING **(9 Hrs)**

Types of reasoning - reasoning with Fuzzy Logic - Rule based Reasoning - Diagnosis Reasoning.

UNIT IV LEARNING **(9 Hrs)**

Types of Learning - Machine Learning - Intelligent agents - Association Learning: Apriori Algorithm - Case Study: Customer Sequence and SCADA Application – k-Means Clustering - Fuzzy Clustering - Cluster Similarity

UNIT V REINFORCEMENT AND STATISTICAL LEARNING **(9 Hrs)**

Markov Decision Problem - Hidden Markov Model - Linear Classifier - decision Trees: Random forest - Bayesian Network – ANN - ANN Learning process - Types of Network – Perceptron - RBF Network - Case studies: Character recognition.

Text Books

1. Anand Hareendran S., Anand Hareendran, And Vinod Chandra S.S. “Artificial Intelligence and Machine Learning” PHI Publication, 2014.
2. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Science, 1997.
3. Peter Harrington, “Machine Learning in action”, Manning Publication, 2012.

Reference Books

1. Charu C. Aggarwal “Data Classification Algorithms and Applications”, Chapman & Hall/CRC Data Mining and Knowledge Discovery Series.
2. Andreas C. Mueller and Sarah Guido, “Introduction to Machine Learning with Python”, O’Reilly Media, Inc. First Edition, 2016.
3. Eremy Watt, Reza Borhani, and Aggelos K. Katsaggelos “Machine Learning Refined Foundations, Algorithms, and Applications”, Cambridge University Press, 2016.
4. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014.

Web Resources

1. https://www.coursera.org/learn/machine-learning
2. https://ml-cheatsheet.readthedocs.io/en/latest/regression_algos.html
3. https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	–	1	-	-	-	-	-	-	-	2	2	2
2	1	2	2	–	–	-	-	-	-	-	-	-	1	1	-
3	2	2	1	2	–	-	-	-	-	-	-	-	-	1	1
4	3	2	2	2	1	-	-	-	-	-	-	-	1	-	1
5	2	2	2	2	1	-	-	-	-	-	-	-	1	1	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

	DATA SCIENCE APPLICATION OF VISION	L	T	P	C	Hrs
U20ADO504	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To understand the capability of a machine to get and analyze visual information and make decisions
- To learn methods and algorithms for Vision
- To learn how to use deep learning for Vision tasks
- To understand the neural network concepts
- To study the real world applications using computer vision

Course Outcomes

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

CO1 - Understand the methods and algorithms for image processing. **(K2)**
CO2 - Apply object detection and segmentation concepts for image processing. **(K4)**
CO3 - Apply scalable algorithms for large datasets in vision. **(K4)**
CO4 - Analyze deep learning and neural network architectures for image and video processing. **(K3)**
CO5 - Apply vision-based solutions for specific real-world applications. **(K4)**

UNIT I IMAGE FUNDAMENTALS (9 Hrs)

Pixels - The Building Blocks of Images - The Image Coordinate System - RGB and BGR Ordering - Scaling and Aspect Ratios. Image filters - Gaussian blur - Median filter - Dilation and erosion - Custom filters - Image thresholding - Edge detection - Sobel edge detector - Canny edge detector.

UNIT II OBJECT DETECTION AND SEGMENTATION (9 Hrs)

Image Features - Harris corner detection - Local Binary Patterns - Image stitching - Segmentation: Contour detection - The Watershed algorithm - Super pixels - Normalized graph cut.

UNIT III MACHINE LEARNING WITH COMPUTER VISION (9 Hrs)

Data pre-processing - Image translation through random cropping - Image rotation and scaling - Applications of machine learning for computer vision - Logistic regression - Support vector machines - K-means clustering.

UNIT IV IMAGE CLASSIFICATION USING NEURAL NETWORKS (9 Hrs)

Image Classification Basics Types of Learning - The Deep Learning Classification Pipeline - Introduction to Neural Networks - The Perceptron Algorithm - Backpropagation and Multi-layer Networks - The Four Ingredients in a Neural Network Recipe - Weight Initialization - Constant Initialization - Uniform and Normal Distributions - LeCun Uniform and Normal - Understanding Convolutions - CNN Building Blocks - Common Architectures and Training Patterns.

UNIT V COMPUTER VISION AS A SERVICE (9 Hrs)

Computer vision as a service – architecture - Developing a server-client model - Computer vision engine.

Text Books

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2009.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, Third Edition, Cengage Learning, 2007.
3. Gary Bradski, “Learning OpenCV”, First Edition, 2008.

Reference Books

1. Alok Kumar Singh Kushwaha, Rajeev Srivastava, “Recognition of Humans and Their Activities for Video Surveillance”, IGI Global, 2014.
2. Ying-li Tian, Arun Hampapur, Lisa Brown, Rogerio Feris, Max Lu, Andrew Senior, “Event Detection, Query, and Retrieval for Video Surveillance”, IGI Global, 2009.
3. Matthew Turk, Gang Hua, “Vision-based Interaction”, First Edition, Morgan Claypool, 2013.
4. Ian Goodfellow, Yoshuo Bengio, Aaron Courville, “Deep Learning (Adaptive Computation and Machine Learning series)”, MIT Press, 2017.
5. Fan Jiang, “Anomalous Event Detection from Surveillance Video”, ProQuest, 2012.

Web Resources

1. https://www.kaggle.com/learn/computer-vision
2. https://machinelearningmastery.com/what-is-computer-vision/
3. https://www.udemy.com/course/pythoncv/
4. https://www.analyticsvidhya.com/blog/2019/03/opencv-functions-computer-vision-python/
5. https://www.youtube.com/watch?v=N81PCpADwKQ&ab_channel=ProgrammingKnowledge

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	1	-	-	-	-	-	-	-	2	2	-
2	2	1	1	2	–	-	-	-	-	-	-	-	1	1	1
3	2	2	2	1	–	-	-	-	-	-	-	-	-	-	1
4	1	2	2	2	1	-	-	-	-	-	-	-	1	2	-
5	2	1	2	2	1	-	-	-	-	-	-	-	1	1	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Open Elective Courses offered to other Department students

		L	T	P	C	Hrs
U20CSO503/ U20CSO603	**PLATFORM TECHNOLOGY** (Common to EEE, ECE, ICE, MECH, CIVIL and BME)	3	0	0	3	45

Course Objectives

- To understand the fundamentals of developing modular application by using object oriented concepts.
- To utilize the C# and .NET framework to build distributed enterprise applications.
- To develop Console Application, Windows Application and Web Applications.
- To connect to multiple data sources and managing them effectively.
- To develop the Enterprise kind of applications

Course Outcomes

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

***CO1* -** Understand the concept of .NET Framework. **(K2)**

CO2 - Develop, implement and creating Applications with C#. **(K4)**

CO3 - Evaluate various graphics and window forms. **(K5)**

CO4 - Integrating front end applications with Database connectivity. **(K3)**

CO5 - Classifying various Enterprise applications into real world problems. **(K3)**

UNIT I INTRODUCTION TO .NET FRAMEWORK (9 Hrs)

.NET Framework – Common Language Runtime (CLR) – Common Type System (CTS) – Common Language Specification (CLS) – Compilation Process – Assemblies – Namespaces – Command Line Compiler.

UNIT II C# FUNDAMENTALS (9 Hrs)

C# Class – Object – String Formatting – Types – Scope – Constants – C# Iteration – Control Flow – Operators – Array – String – Enumerations – Structures - Custom Namespaces. Programming Constructs – Value Types and Reference Types – Object Oriented Concepts – Encapsulation – Inheritance – Polymorphism – Interfaces – Collections – Multithreading.

UNIT III GRAPHICS AND WINDOWS FORMS (9 Hrs)

Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run time – Graphics Programming GDI+.

UNIT IV DATABASE PROGRAMMING (9 Hrs)

Data Access with ADO.NET – Architecture – Data Reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML based Data Sets.

UNIT V J2EE (9 Hrs)

Enterprise Edition Overview – Multi-Tier Architecture – Best Practices – Comparison between J2EE and .NET.

Text Books

1. Herbert Schildt, "C# 3.0 The Complete Reference", McGraw-Hill Professional, 3rd Edition, 2008.
2. Keogh, "J2EE The Complete Reference", Tata McGraw-Hill, 2008.
3. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2002.

Reference Books

1. Joh Skeet, “C# in depth, Manning publications”, 3rd Edition, 2014.
2. Adrew Stellman and Jennifer Greene, “Head First C#”, 3rd Edition, O’Reilly, 2013.
3. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Sixth edition, A Press, 2012.
4. Michael Schmalz, “C# Database Basics”, O'Reilly Media, January 2012.
5. Rod Johnson, “J2EE Design and Development”, Wrox, 2002

Web Resources

1. https://www. nptel.ac.in/
2. https://www.c-sharpcorner.com/csharp-tutorials
3. https://www.guru99.com/c-sharp-tutorial.html

COs/POs/PSOs Mapping

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	3	2	-	-	-	-	-	-	-	-	-
2	1	2	2	2	-	-	-	-	-	-	-	-	-	-	-
3	2	3	-	3	3	-	2	-	-	-	-	-	-	-	-
4	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
5	2	2	2	2	-	1	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	GRAPHICS DESIGNING	L	T	P	C	Hrs
U20CSO504/ U20CSO604	(Common to EEE, ECE, ICE, MECH, CIVIL, BME and FT)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To develop basic skills using graphics and theory used in design process.
- Create computer-based projects using Adobe Photoshop.
- Understand, develop and employ visual hierarchy using images and text
- Use a computer to create and manipulate images and layers for use in various print and digital mediums.
- To acquire the knowledge of Animation

Course Outcomes

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

CO1 – Develop the basic design elements of graphics. **(K3)**
CO2 – Apply the various photoshop tools. **(K3)**
CO3 – Modify the image size, selection and grids using tools. **(k3)**
CO4 – Create and Work with colored layers. **(K4)**
CO5 – Apply different methods for Animation & Panoramic Picture creation. **(K5)**

UNIT I BASIC CONCEPTS (9 Hrs)

Basic Concepts of Designing – Design Principles – Basics of Design Elements – Typography – Color theory – Introduction to Graphics – Introduction to Photoshop – Bitmap and Vector Images - Understanding Image Size and Resolution.

UNIT II INTRODUCTION TO PHOTOSHOP (9 Hrs)

Introduction to Tools – Environment – Layout of Photoshop – Design Layout Setup – Color – Resolution setting – Using Basic Marquee – Selection Tools Usage of Lasso Tools – Using Brushes – Using and Filling Colors – Layers Using Text Tool – Free Transform Tool – Exercise: Designing Greeting Card / Advertisement.

UNIT III IMAGE SIZE, SELECTION, GRID AND GUIDES (9 Hrs)

Modifying Image Size – Resolution, Marquee – Lasso – Magic Wand – Selection Tools – Selecting – Saving – Crop tool – Coping Selection And Image - Grid and Guide Options – Masks – Channel – Painting and Editing – Working with Quick Masks – Painting (Brush, and its effects) – Blending Modes, Color Palettes – Editing – Background – Color – Touchup – Cleanup – Gradient Tools – Layer Blending Modes - All Types of Text Tools – Shape Tools Exercise : Designing Magazine Cover – Poster – Brochure

UNIT IV LAYERS (9 Hrs)

The layer Palette - Changing and controlling layer order - Editing layers - Adjustment layers - Layer Effects Filters - Actions - Automation - Extract - Filter Gallery - Liquefy , Pattern making - Vanishing point - Built in Bitmap Filters - 3rd party Plug-ins - Using predefined Actions - Creating and Recording Actions - Using built in automation - Learning Filter effects - managing the files with layers and layer effects - plugins Manipulation tools - Image control options – HUE - Levels - brightness control Using image – modifying - changing color Exercise : Converting black and white photo to color - designing a photo album

UNIT V ANIMATION & PANORAMIC PICTURE CREATION (9Hrs)

Creating Product Packaging Designs – CD Cover – Book and Magazine Front Cover – Envelope – Visiting card – Color Correction and Color Channel Management – Design Automation Theory and Practical's Samples and Demos – Guidelines for Freelance Work – Website Links – Resource Sharing – Preparing Image For Print and Web – Calculating Image Size and Resolution, Changing Image Dimensions – Layout Preview – Color Separation – Optimizing Images for Web – File Formats – Creating Webpages – Web Photo Galleries.

Text Books

1. Katherine A.Hughes, “Graphic Design”, Learn It, Do It,CRC Press 2019.
2. Ken Pender, “Digital color in Graphics Design”, CRC Press 2012.
3. Adobe Creative Team, “Adobe Photoshop – Classroom in a Book”, Adobe system incorporation, Adobe Press, 2010.

Reference Books

1. Poppy Evans, Aaris Sherin, Irina Lee, “The Graphic Design”, Rockport, 2013.
2. Peter Bauer, “Photoshop CC for Dummies”, Wiley, 2013.
3. Mike Wooldridge, “Teach Yourself Visually Adobe Photoshop CS 5”, Wiley Publishing, 2010.
4. Lesa Snider, “Photoshop the missing Manual”, O’Reilly Media, Inc, 2010.
5. Scott Onstott, “Enhancing CAD Drawings with Photoshop”, Wiley, 2006.

Web Resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/MIT6_831S11_lec18.pdfhttp://www.moshplant.com/direct-or/bezier/
2. https://www.cs.montana.edu/courses/spring2004/352/lectures/CS351-GUIDesign.pdf
3. https://www.university.youth4work.com/study-material/graphic-design-lecture
4. https://kmayeunhia.wordpress.com/lecture-notes/
5. https://nptel.ac.in/courses/106/106/106106090/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	-	-	-	-	-	-	2	1	2
2	3	2	2	1	-	1	-	-	-	-	-	-	1	3	1
3	3	2	-	1	-	2	-	-	-	-	-	-	1	2	1
4	-	2	-	3	-	-	-	-	-	-	-	-	3	3	-
5	3	2	1	-	-	2	-	-	-	-	-	-	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

SEMESTER VI

		L	T	P	C	Hrs
U20CST613	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	2	2	0	3	60

Course Objectives

- To study the concepts and different problem solving techniques of AI.
- To understand the Knowledge representation and reasoning in the field of artificial intelligence dedicated to representing information about the world in a form that a computer system
- To adjust new inputs and perform human-like tasks.
- To make the student knowledgeable in the area planning, machine learning.
- To apply the AI Models.

Course Outcomes

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

CO1 – Understand and apply AI and Problem Solving with search techniques**. (K4)**
CO2 – Understand the logical thinking and knowledge representation. (**K4)**
CO3 – Evaluate various algorithms through Bayes rule. **(K4)**
CO4 – Understand Machine Learning and Deep learning**. (K3)**
CO5 – Explore Real-World problems where artificial intelligence technology can be applied**. (K4)**

UNIT I INTRODUCTION TO AI AND PROBLEM SOLVING (12 Hrs)

Introduction – Foundations of Artificial Intelligence – History of Artificial Intelligence – AI Agents and its Structure – Problem Solving by Searching– Uninformed Search Strategies – Breadth first search – Depth-First Search – Depth-Limited Search – Iterative Deepening Depth-First Search - Bidirectional Search, Informed(Heuristic) Search Strategies – Greedy Best-First Search – A* Search – Memory-Bounded Heuristic Search.

UNIT II REPRESENTATION OF KNOWLEDGE, REASONING AND PLANNING (12 Hrs)

Basic Concepts of Fuzzy Set Theory – Operations of Fuzzy Sets – Properties of Fuzzy Sets – Crisp Relations – Fuzzy Relational Equations – Operations on Fuzzy Relations – Fuzzy Systems – Logical Agents, Predicate Logic – First-Order Logic, Inference in First-Order Logic, Forward and Backward Chaining – Knowledge Representation, Classical Planning, Knowledge Representation.

UNIT III KNOWLEDGE INFERENCE (12 Hrs)

Basic Probability Notations – Bayes Rule and its Applications – Bayesian Networks – Hidden Markov Models – Kalman Filters, Dempster-Shafer Theory.

UNIT IV MACHINE LEARNING (12 Hrs)

Introduction to Machine Learning – Overview of Different Forms of Learning – Supervised Machine Learning – Basic Models: Learning Decision Trees, Regression and Classification – Neural Networks and Deep Learning – Composite Models: Random Forests, Ensemble Learning.

UNIT V APPLICATIONS (12 Hrs)

Applications of AI – Language Models – Information Extraction – Natural Language Processing: Machine Translation, Database Access, Information Retrieval, Text Categorization, Extracting Data from Text. Speech Recognition – Robotics: Hardware – Perception – Planning – Moving.

Text Books

1. Bratko, I., Prolog Programming for Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
2. Stuart Russel, Peter Norvig “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education 2009.
3. Rajasekaran. S.. Vijayalakshmi Pai. G.A. “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall of India Private Limited, 2003.

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009.
2. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. Elaine Rich, Kevin Knight, “Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
4. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc; 1 edition, 2008
5. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill, 2008.

Web Resources

1. https://nptel.ac.in/courses/106/105/106105077/
2. https://www.reddit.com/r/artificial/
3. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/
4. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm
5. https://www.javatpoint.com/expert-systems-in-artificial-intelligence

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSCM02	**C# AND .NET PROGRAMMING** (Common to CSE and IT)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To study and learn the MS.NET framework developed by Microsoft.
- To learn the fundamental concepts using C#.
- To understand the Programming Constructs using C#.
- To develop the Graphical User Interface using C#.
- To explore the Database Connectivity using ADO.NET.

Course Outcomes

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

CO1 – Learn about MS.NET framework developed by Microsoft. **(K1)**
CO2 – Learn the fundamental concepts using C#. **(K3)**
CO3 – Understand the Programming Constructs using C#. **(K4)**
CO4 – Develop the Graphical User Interface using C#. **(K2)**
CO5 – Explore the Database Connectivity using ADO.NET. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assemblies – Namespaces – Command line compiler.

UNIT II C# FUNDAMENTALS (9 Hrs)

C# Class – Object – String Formatting – Types – Scope – Constants – C# Iteration – Control Flow – Operators – Array – String – Enumerations – Structures – Custom Namespaces.

UNIT III PROGRAMMING CONSTRUCTS USING C# (9 Hrs)

Programming Constructs – Value Types and Reference Types – Object Oriented Concepts – Encapsulation – Inheritance – Polymorphism – Interfaces – Collections – Multithreading.

UNIT IV GRAPHICS & WINDOW FORMS IN C# (9 Hrs)

Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run Time – Graphics Programming GDI+.

UNIT V DATABASE PROGRAMMING WITH C# (9 Hrs)

Data Access with ADO.NET – Architecture – Data reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML Based Data Sets.

Text Books

1. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill, 2015.
2. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition, 2009.
3. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley, 2002.

Reference Books

1. Gabriel Baptista and Francesco Abbruzzese, “Hands-On Software Architecture with C# 8 and .NET Core 3: Architecting software solutions using microservices, DevOps, and design patterns for Azure Cloud”, Packt Publications, 2019
2. Mark J. Price,”C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development”, Packt Publications, 2019.
3. Joh Skeet, “C# in depth”, Manning publications, Third Edition, 2014.
4. Adrew Stellman and Jennifer Greene, “Head First C#”, Third Edition, O’Reilly, 2013.
5. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Sixth edition, A Press, 2012.

Web Resources

1. https://www.c-sharpcorner.com/csharp-tutorials
2. https://www.guru99.com/c-sharp-tutorial.html
3. https://www.w3schools.com/cs/
4. https://www.javatpoint.com/c-sharp-tutorial
5. https://nptel.ac.in/courses/106/105/106105084/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	2	1	1	-	2	1	1	1	3	3	3
2	2	2	2	3	2	1	1	-	-	1	1	1	2	2	2
3	3	2	3	2	2	2	1	-	-	2	1	2	3	3	3
4	2	2	2	2	2	1	1	-	2	1	1	1	2	2	3
5	3	2	1	2	2	2	1	-	3	2	1	2	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST615	CLOUD COMPUTING AND BIG DATA	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To understand the cloud virtualization concepts and vm ware.
- To understand the Big Data Platform and its Use cases
- To provide an overview of Apache Hadoop, Provide HDFS Concepts and Interfacing with HDFS

Course Outcomes

After completion of the course, the students should be able to:

CO1 – Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing**. (K3)**

CO2 – Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient. **(K2)**

CO3 – Illustrate the fundamental concepts of cloud virtualization**. (K4)**

CO4 – Identify Big Data and its Business Implications**. (K2)**

CO5 – List the components of Hadoop and Hadoop Eco-System, Access and Process Data on Distributed File System.**(K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to Cloud Computing – The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization – Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service. Federation in the Cloud - Presence in the Cloud – Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud – Common Standards in the Cloud – End-User Access to the Cloud Computing.

UNIT II CLOUD INFRASTRUCTURE (9 Hrs)

Introduction – Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities – Standards and Working Groups – Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management – Utility Computing Technology.

UNIT III CLOUD VIRTUALIZATION (9 Hrs)

Virtualization – Hyper Threading – Blade Servers – Automated Provisioning – Policy Based Automation – Application Management – Evaluating Utility Management Technology – Virtual Test and Development Environment - Data Center Challenges and Solutions - Automating the Data Center – Basics of VMWare, Advantages of VMware Virtualization, Using Vmware Workstation, Creating Virtual Machines – understanding Virtual Machines.

UNIT IV INTRODUCTION TO BIG DATA AND HADOOP (9 Hrs)

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix Tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Info Sphere Big Insights and Big Sheets.

UNIT V HDFS(HADOOP DISTRIBUTED FILE SYSTEM) & MAP REDUCE (9 Hrs)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop File System Interfaces, Data Flow, Data Ingest with Flume and Scoop and Hadoop Archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data Structures. Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Text Books

1. Ritting house, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
3. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.

Reference Books

1. Garry Turkington ,"Hadoop Beginner's Guide",1st Edition, Packt Publishing Limited, 2013.
2. Pete Warden, “Big Data Glossary”, O’Reily, 2011.
3. John W. Rittinghouse and james F. Ransome, “Cloud Computing Implementation, Management and Security”, CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
4. Alfredo Mendoza, “Utility Computing Technologies, Standards, and Strategies”, Artech House INC, 2007.
5. Bunker and Darren Thomson, “Delivering Utility Computing”, 2006, John Wiley & Sons Ltd.

Web Resources

1. www.coltdatacentres.net/Cloud Technology.
2. https://www.zdnet.com/article/what-is-cloud-computing-everything-you-need-to-know-about-the-cloud/
3. www.digitalocean.com/community/tutorials/an-introduction-to-big-data-concepts-and-terminology
4. https://www.tutorialspoint.com/hadoop/hadoop_introduction
5. https://www.oracle.com/in/big-data/what-is-big-data.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	1	3	-	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	2	2	2	-	2	-	-	-	-	-	-	-
5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CST616	ANIMATION AND VISUAL EFFECTS	3	0	0	3	45

Course Objectives

- Understand and learn Animation and Visual effects.
- Learn and develop animation effects using After Effects.
- Learn and develop animation effects using Premier Pro.
- Learn and develop animation effects using Blender.
- Learn and develop Character Rigging using Blender.

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Course Outcomes

After Completion of the course, the students will be able to

CO 1: Understand Animation and Visual Effects **(K3)**
CO 2: Design and Develop Animation effects using After Effects **(K4)**
CO 3: Design and Develop Animation effects using Premier Pro **(K4)**
CO 4: Design and Develop Animation effects using Blender tools **(K4)**
CO 5: Make use of Character Designing, Character rigging and Rendering using Blender**(K4)**

UNIT I – VFX & ANIMATION (9 Hrs)

VFX – Understanding VFX – Brief History of VFX - Need for Visual Effects – Future of Visual Effects – Pros & Cons of Visual Effects – Applications of VFX – Comparison between VFX and Animation. **Animation** – History of Animation – Applications of Animation – Career in Animation – Pros & Cons of Animation

UNIT II – LEARNING AFTER EFFECTS (9 Hrs)

Usage of Platform – Tools used – Plugins & Types – Imports & Exports – Masking – Object Duplication – Motion Tracking – Rotoscoping – Color Play – Visual Effects – Render Tab & Advance Option – Exploring to Media Encoder

UNIT III – LEARNING PREMIERE PRO (9 Hrs)

Usage of Platform – Difference between After Effects & Premiere Pro – Effects & Presets Tab – Audio Splitting & its work – LUTs & its Application – Working with Creative Curve – Render Tab & Advance Options.

UNIT IV - INTRODUCTION TO BLENDER & TOOLS (9 Hrs)

Basics of Blender – Understanding Blender Interface & Tools – The Blender Scene - Project overview & Character Design – Using Other Design Methods

UNIT V - BLENDER WORKS (9 Hrs)

Modeling & its Tools in Blender – Character Modelling – Unwrapping, Painting & Shaders – Character Rigging & Animation – The Render Page – Lighting & Composition

Text Books

1. Eran Dinur ,"The Filmmaker's Guide to Visual Effects",2nd Edition, Routledge,2017
2. Patmore ,"Complete Animation Course",1st Edition ,Barron's Educational Series,2013
3. Andy Wyatt,"The Complete Digital Animation Course: Principles, Practices, and Techniques: a Practical Guide for Aspiring Animators",1st Edition, B E S Pub Co,2010

Reference Books

1. Peter Lord, "Cracking Animation: The Aardman Book of 3-D Animation",1st Edition,Thames, 2015.
2. David Landau, "Lighting for Cinematography: A Practical Guide to the Art and Craft of Lighting for the Moving Image ",1st Edition, Continuum Publishing Corporation,2014.

3. Ron Ganbar, "Nuke 101: Professional Compositing and Visual Effects (Digital Video & Audio Editing Courses)", 2nd Edition, Peachpit Press,2014.
4. Richard Williams, "The Animator's Survival Kit", 2nd Edition, Faber, 2009.
5. Ron Brinkmann, "The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", 2nd Edition, Morgan Kaufmann, 2008.

Web Resources

1. https://www.bloopanimation.com/animation-for-beginners/
2. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
3. https://www.premiumbeat.com/blog/text-effect-premiere-pro/
4. https://conceptartempire.com/blender-animation-tutorials/
5. https://www.visualeffectssociety.com/

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	3	-	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	2	2	2	-	2	-	-	-	-	-	-	-
5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP609	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course objectives

- To perform such intellectual tasks as decision making and planning.
- To implement searching algorithms
- To understand knowledge of reasoning and planning.
- To understand Bays Rule.
- To understand and apply various Machine Learning algorithms.

Course outcomes

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

CO1 – Analyze a problem and identify and define the computing requirements appropriate to its solution**. (K4)**

CO2 – Apply various AI search algorithms. **(K3)**

CO3 – Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information**. (K3)**

CO4 – Implement Bayesian classifier**. (K3)**

CO5 – Apply Machine Learning algorithms. **(K3)**

List of Exercises

1. Graph coloring problem.
2. Blocks world problem.
3. Water Jug Problem using DFS, BFS.
4. Heuristic algorithms (A * Algorithm, best first search).
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
7. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Reference Books

1. David L. Poole, Alan K. Mackworth, “Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, Edition 2017.
2. Bratko, I., “Prolog Programming for Artificial Intelligence (International Computer Science Series)”, Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
3. Stuart Russell, Peter Norvig “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education 2009.
4. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009.
5. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.

Web Resources

1. https://www. nptel.ac.in/
2. https://www.reddit.com/r/artificial/

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3
2	2	2	2	2	3	2	-	2	-	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	2	2	-	2	-	2	2	2	2	2	3
5	3	3	3	3	3	3	-	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP610	L	T	P	C	Hrs
C# AND .NET PROGRAMMING LABORATORY	**0**	**0**	**2**	**1**	**30**

Course Objectives

- To understand the development .NET Programming.
- To study the object oriented concepts through application development.
- To develop applications and establish connection with database.

Course Outcomes

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

CO1 – Explore in the Object Orientation using C#.Net. **(K5)**
CO2 – Understand the Exception Handling, Operator Overloading and Multi-Threading in C# .Net**.(K2)**
CO3 – Develop an application using C# with ADO.Net **(K4)**

List of Exercises

1. Develop an application to implement Inheritance concepts
2. Develop a console application that implements Classes and Objects concepts
3. Implement Polymorphism concepts with window form applications
4. Develop a window form application to implement an Interfaces
5. Implement an Operator Overloading concepts
6. Develop an application to brief about Delegates and Events
7. Write an application that elaborate any one of Exception Handling
8. Implement a concepts of Multi-Threading with starting of multiple threads
9. Develop an interactive application to connect database through ADO.NET
10. Develop an application to implement multiple tools for design graphical interfaces

Reference Books

1. Gabriel Baptista and Francesco Abbruzzese, “Hands-On Software Architecture with C# 8 and .NET Core 3: Architecting software solutions using microservices, DevOps, and design patterns for Azure Cloud”, Packt Publications, 2019.
2. Mark J. Price,” C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development”, Packt Publications, 2019.
3. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill, 2015.
4. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition, 2009.
5. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley, 2002.

Web Resources

1. https://www.c-sharpcorner.com/csharp-tutorials
2. https://www.guru99.com/c-sharp-tutorial.html
3. https://www.guru99.com/c-sharp-tutorial.html
4. https://www.w3schools.com/cs/
5. https://www.javatpoint.com/c-sharp-tutorial

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	2	2	3	2	1	1	-	-	1	1	1	2	2	2
3	3	2	3	2	2	2	1	-	-	2	1	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	ANIMATION AND VISUAL EFFECTS LABORATORY	L	T	P	C	Hrs
U20CSP611		0	0	2	1	30

Course Objectives

1. To learn the effect of Animation.
2. To understand Key frames of animation.
3. To learn the Motion effects in video editing.
4. To understand Bevel Tool, Knife Tool & Shading Concepts.
5. To create 3D Environment.

Course Outcomes

After completion of the course, students will be able to

CO1 – Understand Layers, Panels, Frames, etc. **(K3)**
CO2 – Implement motion effects in video clips **(K4)**
CO3 – Implement new methods in animations **(K4)**
CO4 – Understand Bevel Tool, Knife Tool & Shading Concepts. **(K4)**
CO5 – Create 3D Environment**. (K5)**

List of Exercises

AFTEREFFECTS

1. Understanding AFTEREFFECTS
    a. What is AE?
    b. Interface Introduction
    c. Layers, Timeline Panels, Compositions, Links Panel
    d. Animation Principles
    e. Key frames
2. Simple Video Editing & Animation
3. Easing & Time Stretching & Imports\Exports\Footage Replacements
4. Presets & Masking & Text Animation
5. Working with Media Encoder
6. Vfx & Rendering

PREMIEREPRO

1. Basic start
    a. Timeline & New Sequence
    b. Selection & Track Selection tools
    c. Rolling & Ripple Edit
    d. Make Slow Motion
    e. Split\Cut video clip
    f. Transitions
2. Motion Effects control & Animae layers\ Chroma keys
3. Masking and Duplication \ Effects & Adjustments Layer
4. Colour Splash\ Imports & Exports

ANIMATION BLENDER

1. Introduction & fundamentals
2. Viewport Navigation & Transform & Add\Del
3. Modeling Instructions & Creating Meshes
4. Extrude & Loop cut
5. Bevel Tool & Knife Tool & Shading
6. Shading Editor & Texture
7. Rigging & parenting
8. Creating Landscapes & Environments
9. Rain effects & Abstract creation
10. 3D Environment

Reference Books

1. Peter Lord ,"Cracking Animation: The Aardman Book of 3-D Animation",1st Edition,Thames,2015.
2. David Landau, "Lighting for Cinematography: A Practical Guide to the Art and Craft of Lighting for the Moving Image ", 1st Edition, Continuum Publishing Corporation, 2014.
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4. Richard Williams, "The Animator's Survival Kit", 2nd Edition, Faber, 2009
5. Ron Brinkmann,"The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", 2nd Edition,Morgan Kaufmann, 2008.

Web Resources

1. https://www.pdfdrive.com/3d-art-essentials-the-fundamentals-of-3d-modeling-texturing-and-animation-e157006123.html
2. https://www.pdfdrive.com/aim-awards-suite-of-games-animation-and-vfx-skills-qualifications-e50802091.html
3. https://www.bloopanimation.com/animation-for-beginners/
4. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
5. https://www.premiumbeat.com/blog/text-effect-premiere-pro/

COs/POs/PSOs Mapping

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3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	2	2	-	2	-	2	2	2	2	2	3
5	3	3	3	3	3	3	-	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSC6XX	CERTIFICATION COURSE – VI	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSS606	SKILL DEVELOPMENT COURSE 6 (Foreign Language / IELTS – II/ Career and Professional Skill Development Program -II)	L	T	P	C	Hrs
		0	0	2	-	30

1. **LOGICAL REASONING:**
   - Syllogism
   - Coding Inequalities
   - Coding & Decoding
   - Blood Relationship
   - Direction Sense
   - Number Series
   - Odd Man Out
   - Ranking Test
   - Logical Analogy

2. **ANALYTICAL REASONING & CRITICAL REASONING:**
   - Analytical Thinking
   - Seating Arrangement
   - Selection Decision Table – Eligibility Test
   - Numerical Puzzles
   - Data Sufficiency
   - Critical Reasoning

3. **NON VERBAL REASONING:**
   - Cubes & Dices
   - Sequence Oriented, Analogy Oriented, Coding Oriented
   - Figure & Factual Analysis
   - Water & Mirror Image
   - Paper Cutting Problems

4. **FUNCTIONAL GRAMMAR:**
   - Naming &Substituting Words - (Noun &Pronoun)
   - Qualifying Words - (Adverb)
   - Describing Words - (Adjectives)
   - Action Words - (Verb)
   - Positioning Words - (Preposition)
   - Connecting / Linking Words - (Conjunction)
   - Articles
   - Tenses

5. **VERBAL APTITUDE – I:**
   - Error Correction & Spotting Errors
   - Error Detection
   - Sentence Correction & Improvement
   - Phrases & Idioms
   - Sentence Completion
   - Cloze Test
   - One Word Sunstitute

6. **VERBAL APTITUDE – II:**
   - Reading Comprehension
   - Para Jumbled Sentences
   - Vocabulary Development
   - Essay Writing

		L	T	P	C	Hrs
U20CSS607	**SKILL DEVELOPMENT COURSE 7** (Technical Seminar)	**0**	**0**	**2**	**-**	**30**

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

Course Outcomes

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

CO1 - Review, prepare and present technological developments.
CO2 - Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 20 minutes.
- In a session of three periods per week, 8 to 10 students are expected to present the seminar.
- Each student is expected to present atleast twice during the semester and the student is evaluated based on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.

U20CSS608	SKILL DEVELOPMENT COURSE 8 (NPTEL / MOOC - I)	L	T	P	C	Hrs
		0	0	0	-	0

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

U20CSM606	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

The course will introduce the students to

- To get a knowledge in Indian Culture
- To Know Indian Languages and Literature and the fine arts in India
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

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

CO1 – Understand philosophy of Indian culture. **(K2)**
CO2 – Distinguish the Indian languages and literature. **(K3)**
CO3 – Learn the philosophy of ancient, medieval and modern India**. (K1)**
CO4 – Acquire the information about the fine arts in India. **(K3)**
CO5 – Know the contribution of scientists of different eras. **(K2)**

UNIT – I INTRODUCTION TO CULTURE

Culture, Civilization, Culture and Heritage, General Characteristics of Culture, Importance of Culture in Human Literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT – II INDIAN LANGUAGES, CULTURE AND LITERATURE

Indian Languages and Literature-I: The role of Sanskrit, Significance of Scriptures to Current Society, Indian Philosophies, Other Sanskrit Literature, Literature of South India Indian Languages and Literature-II: Northern Indian languages & Literature.

UNIT – III RELIGION AND PHILOSOPHY

Religion and Philosophy in Ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)

Indian Painting, Indian handicrafts, Music, Divisions of Indian Classic Music, Modern Indian Music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, Development of Science in Ancient, Medieval and Modern India.

UNIT – V EDUCATION SYSTEM IN INDIA

Education in Ancient, Medieval and Modern India, Aims of Education, Subjects, Languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Reference Books

1. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, 2014.
2. Science in Samskrit, “Samskrita Bharti Publisher”, 2007.
3. NCERT, “Position paper on Arts, Music, Dance and Theatre”, 2006.
4. Kapil Kapoor, “Text and Interpretation: The India Tradition”, 2005.
5. S. Narain, “Examinations in ancient India”, Arya Book Depot, 1993.
6. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989.

PROFESSIONAL ELECTIVES

U20CSCM03	AUGMENTED REALITY (Common to CSE and CSBS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Understanding the System Architecture of Augmented Reality
- Learn the Hardware for Augmented Reality
- Learn the Software for Augmented Reality
- Understanding the Augmented Reality and Mixed Reality
- Understanding the AR Digital Entertainment

Course Outcomes

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

CO1 – Apply geometric concepts to understand Augmented Reality **(K3)**
CO2 – Utilize hardware components for Augmented Reality **(K4)**
CO3 – Make use of software components for Augmented Reality **(K3)**
CO4 – Apply AR with the Virtual Reality to provide Mixed Reality **(K4)**
CO5 – Apply AR in Digital Entertainment **(K4)**

UNIT I INTRODUCTION OF AUGMENTED REALITY (AR) (9 Hrs)

System Structure of Augmented Reality – Key Technology in AR – General Solution for Calculating Geometric – Illumination Consistency in the Augmented Environment.

UNIT II 3D USER INTERFACE INPUT HARDWARE (9 Hrs)

Input Device Characteristics – Desktop Input Devices – Tracking Devices – 3D Mice - Special Purpose Input Devices – Direct Human Input – Home-Brewed Input Devices - Choosing Input Devices for 3D Interfaces.

UNIT III SOFTWARE TECHNOLOGIES (9 Hrs)

Database-World Space, World Coordinate, World Environment, Objects-Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and Other Attributes, VR Environment-VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction-Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits.

UNIT IV AUGMENTED AND MIXED REALITY (9 Hrs)

Taxonomy, Technology and Features of Augmented Reality, Difference between AR and VR, Challenges with AR, AR Systems and Functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Wireless Displays in Educational Augmented Reality Applications, Mobile Projection Interfaces, Marker-less Tracking for Augmented Reality, Enhancing Interactivity in AR Environments, Evaluating AR Systems.

UNIT V DEVELOPMENT TOOLS AND FRAMEWORKS IN AR (9 Hrs)

Frameworks of Software Development Tools in AR. X3D Standard; Vega, MultiGen, Virtools etc. Applications of AR in Digital Entertainment: AR Technology in Film & TV Production.AR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by AR.

Text Books

1. Peddie, Jon,"Augmented Reality Where We Will All Live", 1st Edition, 2017.
2. Dieter Schmalstieg and Tobias Hollerer, "Augmented Reality: Principles and Practice (Usability)", Addison-Wesley Educational Publishers, 1st Edition, 2016.
3. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design', Morgan Kaufmann publishers, 2009.

Reference Books

1. N. Honcharova,"Technology of augmented reality in textbooks of new generation", Boeing Corporation, 2019.
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces: Theory and Practice, Addison Wesley, 2nd Edition, 2017.
3. Borko Furht,"Handbook of Augmented Reality", Springer, 2011.
4. Michael Haller, "Emerging Technologies of Augmented Reality: Interfaces and Design", Idea Group Publishing, 2007.
5. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, Springer, 2005.

Web Resources

1. https://www.8thwall.com/
2. https://developers.google.com/web/updates/2018/06/ar-for-the-web
3. https://www.sitepen.com/blog/augmented-reality-on-the-web-in-2019/
4. https://hacks.mozilla.org/2019/01/augmented-reality-and-the-browser%E2%80%8A-%E2%80%8Aan-app-experiment/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE612	SERVICE ORIENTED ARCHITECTURE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand Software Architecture and various Patterns used to construct.
- To understand the analysis and design of service oriented architecture business models.
- To understand SOA Governance and best practices.
- To understand XML and security framework involved in SOA.
- To understand Transaction Management in SOA.

Course Outcomes

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

CO1 - Identify type of architecture and its patterns. **(K1)**
CO2 - Identify Service oriented Analysis and Design activity. **(K1)**
CO3 - Identify the Governance strategy adopted and development of architecture. **(K1)**
CO4 - Know about Meta data management, security and issues **(K2)**
CO5 - Know about the Transaction Management using SOA **(K2)**

UNIT I ARCHITECTURE AND PATTERNS (9 Hrs)

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – Patterns for SOA – Architectural Patterns – The Unified Process: Use Case Driven, Architecture Centric, Iterative, and Incremental – SOA Programming Models.

UNIT II SOA ANALYSIS AND DESIGN (9 Hrs)

Service-oriented Analysis and Design – Design of Activity, Data, Client and Business Process Services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service Integration with ESB – Scenario – Business case for SOA – Stakeholder Objectives – Benefits of SPA – Cost Savings.

UNIT III SOA GOVERNANCE (9 Hrs)

SOA Implementation and Governance – Strategy – SOA Development – SOA Governance – Trends in SOA – Event-Driven Architecture – Software as a Service – SOA Technologies – Proof-of-Concept – Process Orchestration – SOA Best Practices

UNIT IV SOA AND XML (9 Hrs)

Meta Data Management – XML Security – XML Signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in Web Service Framework – Advanced Messaging.

UNIT V SOA TRANSACTION MANAGEMENT (9 Hrs)

Transaction Processing – Paradigm – Protocols and Coordination – Transaction Specifications – SOA in Mobile – Research Issues.

Text Books

1. Shankar Kambhampaty, “Service –Oriented Architecture & Micro Services Architecture: For Enterprise, Cloud, Big Data and Mobile”, Wiley India Pvt Ltd, 2018.
2. Frank Buschmann, “Pattern Oriented Software Architecture: A pattern language for distributed Computing”, Wiley, 2017.
3. Mark O’ Neill, et al., “Web Services Security”, Tata McGraw-Hill Edition, 2009.

Reference Books

1. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service-oriented Frameworks", Business Science Reference, 2014.
2. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2012.
3. Thomas Erl, “SOA Principles of Service Design”, Pearson Publication, 2007.

4. Eric Newcomer and Greg Lomow, “Understanding SOA with Web Services”, Pearson Education. 2006.
5. Thomas Erl, “Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services”, Pearson Publication, 2004.

Web Resources

1. https://www.tutorialspoint.com/soa/index.htm
2. https://www.javatpoint.com/service-oriented-architecture
3. https://tekslate.com/oracle-soa-11g
4. https://www.ibm.com/developerworks/webservices/tutorials/ws-soa-ibmcertified/ws-soa-ibmcertified.html
5. https://tutorialseye.com/soa

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3	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE613	AGILE DEVELOPMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To familiarize the concepts of Software Engineering.
- To understand Software Design concepts.
- To learn about Software testing.
- To understand the Software testing techniques.
- To understand the levels of testing.

Course Outcomes

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

CO1 – Perform Software engineering processes **(K2)**
CO2 – Make use of software design **(K2)**
CO3 – Apply different software testing strategies **(K3)**
CO4 – Illustrate different testing techniques. **(K3)**
CO5 – Make use of different levels of testing in their software. **(K3)**

UNIT I AGILE METHODOLOGY (9 Hrs)

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT II AGILE PROCESSES (9 Hrs)

Lean Production – SCRUM, Crystal, Feature Driven Development – Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT (9 Hrs)

Agile Information Systems – Agile Decision Making – Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING (9 Hrs)

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE (9 Hrs)

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

Text Books

1. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth Heinemann, 2007.
3. Craig Larman, "Agile and Iterative Development: A Managers Guide", Addison-Wesley, 2004.
4. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.

Reference 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, 2004.
4. Robert C. Martin, ”Agile Software Development, Principles, Patterns and Practices”, Prentice Hall, 2002
5. Ken Schawber, Mike Beedle, ”Agile Software Development with Scrum”, Pearson, 2001

Web Resources

1. https://www.tvagile.com/category/scrum/
2. https://www.wiziq.com/tutorials/agile

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE614	EMBEDDED SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn the architecture and process of embedded systems.
- To be familiar with the embedded computing platform design and analysis.
- To be exposed to the basic concepts and design models.
- To learn and understand the basic concepts of RTOS.
- To acquire the knowledge of design techniques and networks for embedded systems.

Course Outcomes

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

CO1 – Explain the basic architecture and programming of ARM Processors. **(K1)**
CO2 – Outline the concepts of embedded systems. **(K2)**
CO3 – Explain the various concepts of real time operating system design and system design techniques. **(K2)**
CO4 – Differentiate between the general purpose operating systems and the real time operating Systems. **(K3)**
CO5 – Explore the model real-time applications using embedded system concepts. **(K3)**

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS **(9 Hrs)**

Characteristics – Challenges of Embedded Systems – Design Process – Choice of Microcontroller – Building an Embedded Systems.

UNIT II EMBEDDED COMPUTING **(9 Hrs)**

The CPU Bus – Memory Devices and Systems – Designing with Computing Platforms – Consumer Electronics Architecture.

UNIT III DESIGN PLATFORM **(9 Hrs)**

Platform-level Performance Analysis – Components for Embedded Programs – Models of Programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis – Software Performance Optimization – Program Level Energy and Power Analysis and Optimization – Analysis and Optimization of Program Size – Program Validation and Testing.

UNIT IV PROCESSES AND OPERATING SYSTEMS **(9 Hrs)**

Introduction – Multiple asks and Multiple Processes – Multirate Systems – Preemptive real-time Operating Systems – Priority based Scheduling – Interprocess Communication Mechanisms – Evaluating Operating System Performance – Power Optimization Strategies for Processes – Example Real Time Operating Systems – POSIX – Windows CE.

UNIT V SYSTEM DESIGN TECHNIQUES AND NETWORKS **(9 Hrs)**

Design Methodologies – Design Flows – Requirement Analysis – Specifications – System Analysis and Architecture Design – Quality Assurance Techniques – Distributed Embedded Systems – MPSoCs and Shared Memory Multiprocessors.

Text Books

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Fourth Edition “Morgan Kaufmann Publisher(An imprint from Elsevier), 2016.
2. Jonathan Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
3. Raj kamal, “Embedded Systems – Architecture, Programming and Design”, Third Edition, McGraw Hill Education, 2017.

Reference Books

1. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2. Raymond J.A. Buhr, Donald L. Bailey, “An Introduction to Real-Time Systems- From Design to Networking with C/C++”, Prentice Hall, 1999.
3. Tammy Noergaard, “Embedded Systems Architecture”, Second Edition, Newness Publications, 2010.
4. Elecia White, “Making Embedded Systems”, Third Edition, O’REILLY, 2011.
5. K.V.Shibu, “Introduction to Embedded systems”, Second Edition, Mc Graw Hill Publications, 2017.

Web Resources

1. https://www.embedded.com
2. https://www.arm.com
3. https://www.edx.org/course/embedded-systems-shape-the-world-microcontroller-i
4. https://nptel.ac.in/courses/108/102/108102045/
5. https://www.codrey.com/embedded-systems/embedded-systems-introduction/

COs/POs/PSOs Mapping

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	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
CO 2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
CO 3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
CO 4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
CO 5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE615	ASSISTIVE TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Evaluate teaching and learning processes using assistive technology for students with disabilities.
- Describe and demonstrate how people with disabilities can benefit from working on multidisciplinary team.
- Describe and demonstrate the use of technology devices for people with disabilities.
- Identify and evaluate technologies that maximize the potential of people with disabilities.
- Describe and demonstrate the use of assistive technology performance areas that facilitate inclusion in academic learning and work settings.

Course Outcomes

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

CO1 – Develop technology-enabled assessment and evaluation strategies **(K1)**
CO2 – Demonstrate knowledge, attitudes and skills of assessment professionals working on Multidisciplinary team **(K2)**
CO3 – Facilitate instruction in the new technology devices that emerge within digital / interactive learning environments. **(K2)**
CO4 – Implement curriculum methods and strategies that use technology activities to maximize student learning. **(K3)**
CO5 – Identify and apply emerging technologies in learning and working environments. **(K3)**

UNIT I ASSISTIVE TECHNOLOGY ASSESSMENT PROCESS MODEL (9 Hrs)

Introduction to Assistive Technology – Assessing Individual Functionality and Disability – Measuring Individual Functioning – Measuring the Assistive Technology MATCH – Assessment of the Environments of AT use: Accessibility, Universal Design and Sustainability – Measuring the impact of Assistive Technology on Family caregivers

UNIT II ASSISTIVE TECHNOLOGY DEVICES (9 Hrs)

The Systemic User Experience Assessment – Gesture, Signing and Tracking – Using Brain Computer Interfaces for Motor Rehabilitation – Graphic User Interface for communication – New Horizon of Robotic Assistance for Human Giat – Technology Developments in Music Therapy.

UNIT III ASSISTIVE TECHNOLOGY ACTIVITIES (9 Hrs)

Seating Systems as Extrinsic Enablers – Human/Assistive Technology Interface – Sensory Aids for Persons with Visual Impairment - Sensory Aids for Persons with Auditory Impairment.

UNIT IV PERFORMANCE AREAS AND APPLICATIONS (9 Hrs)

Assistive Technologies for Cognitive Augmentation – Technology that Enable Mobility – Technologies that aid Manipulation and Control of the Environment – Assistive Technologies in the Context of the Classroom - Assistive Technologies in the Context of the Work.

UNIT V APPLICATIONS OF ASSITIVE TECHNOLOGY (9 Hrs)

Assistive Technology to Support Writing - Assistive Technology to Support Reading – Enhanced Communication - Computer Access - Computers and Math

Text Books

1. Cook and Hussey's, Assistive Technologies- E-Book: Principles and Practice, 3rd edition, Mosby 2007.
2. Pedro Encarnação Cook, Robotic Assistive technologies Principles and practices, CRC Press, 2017.
3. Stefano Federica, Marcia Scherer, Assistive Technology Assessment Handbook, 2nd edition, CRC Press, 2017.

Reference Books

1. Diane P. Bryant ,Brian R. Bryant, Assistive Technology for People with Disabilities, 1 edition, Pearson, 2002.
2. Desleigh De Jonge, Marcia Joslyn Scherer, Sylvia Rodger, Assistive Technology in the Workplace , Mosby Elsevier,2007.
3. Suzanne Robitaille, The Illustrated Guide to Assistive Technology & Devices, Demos Medical Publishing, 1st edition, 2009.
4. Albert, Janice Miller Polgar," Assistive Technologies: Principles and Practice" – 30 January 2015.
5. Joan Green, Assistive Technology in Special Education, Sourcebooks, 2018.

Web Resources

1. https://www.researchgate.net/publication/321683103_Assistive_Technology_Assessment_Handbook
2. https://www.atia.org/wp-content/uploads/2015/10/ATOBV1N1.pdf.
3. https://www.understood.org/en/school-learning/assistive-technology/assistive-technologies-basics/assistive-technology-what-it-is-and-how-it-works
4. https://webdesign.tutsplus.com/tutorials/introduction-to-assistive-technology--cms-26619.
5. https://www.atia.org/home/at-resources/what-is-at/

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1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN ELECTIVES

		L	T	P	C	Hrs
U20HSO601	**PRODUCT DEVELOPMENT AND DESIGN** (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	**3**	**1**	**0**	**3**	**45**

Course Objectives

- To provide the basic concepts of product design, product features and its architecture.
- To have a basic knowledge in the common features a product has and how to incorporate them suitably in product.
- To enhance team working skills.
- To design some products for the given set of applications.
- To compete with a set of tools and methods for product design and development.

Course Outcomes

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

CO1 - Apply the concept for new product development. **(K3)**
CO2 - Validate knowledge on the concepts of product specification. **(K5)**
CO3 - Describe the principles of industrial design and prototyping. **(K2)**
CO4 - Apply knowledge on product architecture. **(K3)**
CO5 - Review the concept of product development and customer needs. **(K5)**

UNIT I: INTRODUCTION TO PRODUCT DEVELOPMENT (9 Hrs)

Product development versus design, product development process, product cost analysis, cost models, reverse engineering and redesign product development process, new product development, tear down method.

UNIT II: PRODUCT SPECIFICATIONS (9 Hrs)

Establishing the product specifications– Target specifications – Refining specifications, concept generation- Clarify the problem – Search internally – Search externally – Explore systematically - Reflect on the Results and the Process.

UNIT III: PRODUCT CONCEPTS (9 Hrs)

A: Concept generation, product configuration, concept evaluation and selection, product embodiments.
B: Quality function deployment, product design specification, physical prototypes-types and technique, dimensional analysis, design of experiments.

UNIT IV: PRODUCT ARCHITECTURE (9 Hrs)

Concept selection- Screening – scoring, Product architecture – Implication of architecture - Establishing the architecture – Related system level design issues.

UNIT V: PROTOTYPING (9 Hrs)

Reliability, failure identification techniques, Poka-Yoke, Design for the environment, design for maintainability, product safety, liability and design, design for packaging.

Text Books

1. Kari T.Ulrich and Steven D.Eppinger,"Product Design and Development", McGraw-Hill International Edns.
2. Stephen Rosenthal, "Effective Product Design and Development", Business One Orwin, Homewood,
3. Otto, K. N. Product design: techniques in reverse engineering and new product development.

Reference Books

1. Ashby, M. F., & Johnson, K... Materials and design: the art and science of material selection in product design. Butterworth-Heinemann.
2. Kevin Otto and Kristin Wood, “Techniques in Reverse Engineering and New Product Development”, Pearson Education, Chennai, Edition III.
3. Chitale A.V. and Gupta R.C., “Product Design and Manufacturing”, 6th Edition, PHI.
4. Taurt Pugh,”Tool Design – Integrated Methods for Successful Product Engineering”, Addison Wesley Publishing, New york, NY
5. Kumar, A., Jain, P. K., & Pathak, P. M. Reverse engineering in product manufacturing: an overview. DAAAM international scientific book.

Web Resources

1. http://www.worldcat.org/title/product-design-and-development/oclc/904505863
2. https://www.pdfdrive.com/product-design-and-development-e38289913.html
3. https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/
4. https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/
5. https://ocw.mit.edu/courses/sloan-school-of-management/15-783j-product-design-and-development-spring-2006/lecture-notes/clas1_int_crse_6.pdf
6. https://swayam.gov.in/nd1_noc20_de05/preview

COs/POs/PSOs Mapping

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1	3	-	3	-	3	-	-	-	-	-	-	2	-	-	-
2	1	-	2	-	3	-	-	-	-	-	-	3	-	-	-
3	1	-	3	-	2	-	-	-	-	-	-	2	-	-	-
4	3	-	1	-	3	-	-	-	-	-	-	1	-	-	-
5	1	-	3	-	3	-	-	-	-	-	-	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C	Hrs
U20HSO602	(Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To introduce fundamental aspects of Intellectual Property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- Awareness about current trends in IPR and Government steps in fostering IPR

Course Outcomes

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

CO1: Complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works **(K2)**

CO2: Presenting useful insight on novelty of their idea from state-of-the art search during their project work period. **(K3)**

CO3: Posting Intellectual Property as a career option like R&D IP Counsel, Government Jobs – Patent Examiner, Private Jobs, Patent agent and/or Trademark agent and Entrepreneur **(K5)**

CO4: To disseminate knowledge on Design, Geographical Indication, Plant Variety and Layout Design Protection and their registration aspects **(K1)**

CO5: Organizing their idea or innovations and analyse ethical and professional issues which arise in the intellectual property law context. **(K4)**

UNIT I OVERVIEW OF INTELLECTUAL PROPERTY (9 Hrs)

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

UNIT II PATENTS (9 Hrs)

Patents - Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board.

UNIT III COPYRIGHTS (9 Hrs)

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights.

UNIT IV TRADEMARKS (9 Hrs)

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board.

UNIT V OTHER FORMS OF IP **(9 Hrs)**

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.

Text Books

1. Nithyananda, K V. Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited, 2019.
2. Neeraj, P., & Khusdeep, D. Intellectual Property Rights. India, IN: PHI learning Private Limited. 2014.

Reference Books

1. Ahuja, V K. Law relating to Intellectual Property Rights. India, IN: Lexis Nexis, 2017.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
4. Prabuddha Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
5. S.V. Satakar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
6. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012.

Web Resources

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
2. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub _489.pdf
3. Cell for IPR Promotion and Management (http://cipam.gov.in/)
4. World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
5. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)
6. Journal of Intellectual Property Rights (JIPR): NISCAIR.

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1	1	-	3	-	2	-	1	2	-	-	-	2	-	-	-
2	1	-	3	-	2	-	2	2	-	-	-	2	-	-	-
3	-	-	2	-	1	-	3	3	-	-	-	2	-	-	-
4	2	-	3	-	2	-	2	2	-	-	-	2	-	-	-
5	1	-	1	-	2	-	1	2	-	-	-	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20HSO603	**MARKETING MANAGEMENT AND RESEARCH** (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	3	0	0	3	45

Course Objectives

- To facilitate understanding of the conceptual framework of marketing in engineering.
- To understand the concepts of product and market segmentation for engineering services and technological products.
- Analyzing the various pricing concepts and promotional strategies for engineering and technology markets.
- Learn to focus on a research problem using scientific methods in engineering and technological enterprises.
- To be able to design and execute a basic survey research reports in in engineering and technological enterprises

Course Outcomes

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

CO1 - Analyze the fundamental principles involved in managing engineering and technological markets **(K3)**
CO2 - Understand and develop product, and Market Segmentation for engineering services and technological Products **(K4)**
CO3 - Develop pricing and promotional strategies for engineering and technology markets **(K6)**
CO4 - Analyze market problems and be capable of applying relevant models to generate appropriate solutions to meet challenges in engineering and technological enterprises **(K3)**
CO5 - Identify the interrelationships between market trends, innovation, sustainability and communication in engineering and technological enterprises **(K5)**

UNIT I MARKETING – AN OVERVIEW (9 Hrs)

Definition, Marketing Process, Dynamics, Needs, Wants and Demands, Marketing Concepts, Environment, Mix, Types, Philosophies, Selling vs Marketing, Consumer Goods, Industrial Goods.

UNIT II PRODUCT AND MARKET SEGMENTATION (9 Hrs)

Product, Classifications of product, Product Life Cycle, New product development, Branding, Segmentation factors, Demographic, Psycho graphic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III PRICING AND PROMOTIONAL STRATEGIES (9 Hrs)

Price: Objectives, Pricing Decisions and Pricing Methods, Pricing Management. Advertising-Characteristics, Impact, Goals, Types, Sales Promotion – Point of purchase, Unique Selling Propositions, Characteristics, Wholesaling, Retailing, Channel Design, Logistics.

UNIT IV RESEARCH AND ITS FUNDAMENTALS (9 Hrs)

Research: Meaning, Objectives of Research, Types of Research, Significance of Research - Methods Vs Methodology - Research Process – Components of Research Problem, Literature Survey – Primary Data and Secondary Data, Questionnaire design, Measurement and Scaling Techniques.

UNIT V BASIC STATISTICAL ANALYSIS AND REPORT WRITING (9 Hrs)

Fundamentals of Statistical Analysis and Inference- Measures of Central Tendency -Measures of Dispersion - Measures of Asymmetry - Report Writing: Types of research reports, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Report Writing, Layout of Research Report, Mechanics of Writing Research Report, Ethics in Research

Text Books

1. Philip Kolter & Keller, “Marketing Management”, Prentice Hall of India, 14th edition, 2012.
2. Lilien, Gary l., and Arvind Rangaswamy. “Marketing managers make ongoing decisions about product features, prices, distribution options”, The Handbook of Marketing Research: Uses, Misuses, and Future Advances (2006).

Reference Books

1. Chandrasekar. K.S., “Marketing Management Text and Cases”, 1st Edition, Tata McGraw Hill - Vijaynicole, 2010.
2. Kothari, C. “Research Methodology Methods and Techniques”, New Age International (P) Ltd., 2017
3. RajanSexena. Marketing Management: Text cases in Indian Context.(3rd edition) New Delhi, Tata McGraw hill, 2006
4. Moisander J, Valtonen A, “Qualitative marketing research: A cultural approach”, Sage Publisher, 2006.
5. Malhotra NK, Satyabhushan Dash, “Marketing Research: An Applied Orientation”, 7th ed, Pearson Education, 2019

Web Resources

1. https://swayam.gov.in/nd1_noc20_mg26/preview
2. https://swayam.gov.in/nd1_noc20_mg26/preview
3. https://www.entrepreneur.com/encyclopedia/market-research

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3	-	-	1	-	1	-	-	-	2	1	-	1	-	-	-
4	-	3	2	2	-	1	-	1	1	2	-	1	-	-	-
5	-	2	2	1	2	2	-	2	2	2	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20HSO604	**PROJECT MANAGEMENT FOR ENGINEERS** (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To understand the various concepts and steps in project management.
- To familiarize the students with the project feasibility studies and project life cycle
- To enable the students to prepare a project schedule
- To understand the risk management and project Control process.
- To learn about the closure of a project and strategies to be an effective project manager.

Course Outcomes

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

CO1 - Interpret the different concepts and the various steps in defining a project. **(K2)**
CO2 - Examining the feasibility of a project. **(K3)**
CO3 - Build a schedule for a Project. **(K6)**
CO4 - Predict the risk associated with a project and demonstrate the project audit. **(K2)**
CO5 - Analyse the project team and outline the Project closure. **(K4)**

UNIT I PROJECT MANAGEMENT CONCEPTS (9 Hrs)

Project: Meaning, Attributes of a project, Project Life cycle, Project Stakeholders, Classification, Importance of project management, Project Portfolio Management System, Different Project Management Structure, Steps in Defining the Project, Project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints

UNIT II PROJECT FEASIBILITY ANALYSIS (9 Hrs)

Opportunity Studies, Pre-Feasibility studies, and Feasibility Study: Market Feasibility, Technical Feasibility, Financial Feasibility and Economic Feasibility. Financial and Economic Appraisal of a project, Social Cost Benefit Analysis in India and Project Life Cycle.

UNIT III PROJECT SCHEDULING & NETWORK TECHNIQUES (9 Hrs)

Scheduling Resources and reducing Project duration: Types of project constraints, classification of scheduling problem, Resources allocation methods, Splitting, Multitasking, Benefits of scheduling resources, Rationale for reducing project duration, Options for accelerating Project completion
Developing and Constructing the Project Network (Problems), PERT, CPM; Crashing of Project Network,

UNIT IV PROJECT RISK MANAGEMENT AND PROJECT CONTROL (9 Hrs)

Project Risk management; Risk concept, Risk identification, Risk assessment, Risk response development, Contingency planning, Contingency funding and time buffers, Risk response control, and Change control management
Budgeting and Project Control Process, Control issues, Tendering and Contract Administration. Steps in Project Appraisal Process and Project Audits

UNIT V PROJECT CLOSURE AND MANAGING PROJECT (9 Hrs)

Project Closure: Team, Team Member and Project Manager Evaluations. Managing versus Leading a Project: Qualities of an Effective Project Manager, Managing Project Stakeholders, Managing Project Teams: Five Stage Team Development Model, Situational factors affecting team development and project team pitfalls.

Text Books

1. Erik Larson and Clifford Gray. “Project Management: The Managerial Process”. 6th Edn. McGraw Hill Education; 2017.
2. Harold Kerzner. “Project Management: A systems approach to Planning, Scheduling and Controlling. 12th Edn. John Wiley & Sons; 2017

Reference Books

1. Meredith, J.R. & Mantel, S. J. “Project Management- A Managerial Approach”. John Wiley.:2017
2. Prasanna Chandra. “Projects: Planning, Analysis, Selection, Financing, Implementation, and Review”. 9th Edn. McGraw Hill Education; 2019.
3. B C Punmia by K K Khandelwal. “Project Planning and Control with PERT and CPM”. 4th Edn. Laxmi Publications Private Limited; 2016.
4. Hira N Ahuja, S.P.Dozzi, S.M.Abourizk. “Project Management”. 2nd Edn. Wiley India Pvt Ltd; 2013.
5. “A guide to Project Management Body of Knowledge”. 6th Edn. Project Management Institute; 2017

Web Resources

1. www.pmi.org
2. www.projectmanagement.com
3. https://www.sciencedirect.com/journal/international-journal-of-project-management
4. https://nptel.ac.in/courses/110/107/110107081/
5. https://nptel.ac.in/courses/110/104/110104073/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	1	-	-	-	-	-	2	-	2	2	-	-	-
2	-	2	1	-	-	1	-	-	1	1	1	1	-	-	-
3	-	1	3	-	-	-	-	-	-	-	1	-	-	-	-
4	3	1	1	-	-	1	1	-	-	1	1	3	-	-	-
5	3	-	3	-	-	-	-	3	3	2	3	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20HSO605	**FINANCE FOR ENGINEERS** (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	**2**	**1**	**0**	**3**	**45**

Course Objectives

- To develop a deeper understanding of the fundamentals of Accounting and Finance
- To learn how to apply mathematical principles in Finance and the concepts of Risk and Return
- To understand the need and procedure for conducting Financial Analysis for better decision-making
- To be familiar with the modes of generating funds for business and their implications
- To understand the scientific ways to determine deployment of funds in business

Course Outcomes

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

CO1: Understand basic concepts in accounting and finance and their importance for engineers **(K2)**

CO2: Demonstrate knowledge and understanding of the applications of mathematics in finance **(K3)**

CO3: Conduct Financial Analysis and use the outcome in making informed decisions in investing **(K4)**

CO4: Identify and Appreciate various sources of procurement of funds in business and their critical evaluation **(K2)**

CO5: Know how to scientifically determine the investing in long-term and short-term assets in business **(K3)**

UNIT I: UNDERSTANDING THE FUNDAMENTALS **(9 hrs)**

Assets – Need and Functions of Assets – Types of Assets – Factors determining Investments in Assets. Liabilities – Meaning and Functions of Liabilities – Types of Liabilities – Capital as a Liability: Why and How — Concept and Meaning of Finance – Distinction between Accounting and Finance – Significance of Accounting and Finance for Engineers.

UNIT II: MATHEMATICS OF FINANCE **(9 hrs)**

Time Value of Money – Computation of Present Value and Future Value – Implications of TVM in Financial Decisions – Concept of Risk and Return – Measuring Risk and Return – Concept of Required Rate of Return and its significance in Investment Decisions.

UNIT III: FINANCIAL ANALYSIS **(9 hrs)**

Meaning and Objectives of Financial Analysis – Annual Report As an Input for Analysis – Basic Understanding of Annual Reports - Tools of Financial Analysis – Horizontal Analysis – Vertical Analysis – Trend Analysis – Accounting Ratios – Significance of Ratio Analysis in Decision-making – Snap-shot of the Past to predict the Future – Computation of Key Ratios – Liquidity Ratios – Profitability Ratios – Performance Ratios – Ratios that are helpful for Potential Investors.

UNIT IV: FUNDS PROCUREMENT **(9 hrs)**

Meaning of Funds – Sources of Funds – Long-Term Sources – Short-Term Sources – Financing Decisions in Business – Capital Structure – Need and Importance of Capital Structure – Determining Optimum Capital Structure – Concept and Computation of Earnings Before Interest and Tax (EBIT), Earnings Before Tax (EBT), and Earnings After Tax (EAT)(Simple Problems) - Leverage in Finance – Types and Computation of Leverages – Operating Leverage, Financial Leverage, and Combined Leverage.

UNIT V: FUNDS DEPLOYMENT **(9 hrs)**

Investment Decisions – Types of Investment Decisions: Long-Term Investment Decisions. Significance – Methods: Pay-Back Period Method, Net Present Value Method and Benefit-Cost Ratio Method. Short-Term Investment Decisions – Concept of Working Capital – Need and Importance of Working Capital in Business – Determinants of Working Capital in a Business. Components of Working Capital. Dividends: Concept and Meaning – Implications of Dividend Decisions on Liquidity Management.

Text Books

1. R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi. (2015 or later edition)
2. C. Paramasivan and T. Subramanian. Financial Management. New Age International, New Delhi. (2015 or later edition)

Reference Books

1. S.N. Maheswari, Sharad K. Maheswari & Suneel K. Maheswari. Accounting For Management. Vikas Publishing (2017 or later edition)
2. Varun Dawar & Narendar L. Ahuja. Financial Accounting and Analysis. Taxmann Publications. (2018 or later edition)
3. Athma. P. Financial Accounting and Analysis. Himalaya Publishing House. (2017 or later edtion)
4. Prasanna Chandra. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
5. S.C. Kuchhal. Financial Management. Chaitanya Publishing House, Allahabad. (2014 or later edition)

Web Resources

1. http://www.annualreports.com/
2. http://www.mmachennai.org/
3. https://finance.yahoo.com/
4. https://icmai.in/icmai/
5. https://nptel.ac.in/courses/110/107/110107144/
6. https://web.utk.edu/~jwachowi/wacho_world.html
7. https://www.icai.org/indexbkp.html
8. https://www.icsi.edu/home/
9. https://www.investopedia.com/
10. https://www.moneycontrol.com/
11. https://www.rbi.org.in/

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	1	-	-	-	2	-	-	1	2	1	-	-	-
2	-	1	2	-	1	-	3	-	-	2	2	1	-	-	-
3	-	-	1	-	1	-	-	-	2	1	2	1	-	-	-
4	-	3	2	2	-	1	-	1	1	2	2	1	-	-	-
5	-	2	2	1	2	2	-	2	2	2	2	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

SEMESTER VII

U20ITCM03	IOT AND EDGE COMPUTING (Common to CSE and IT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Introduce the basic of IoT and various domains that utilize IoT
- Understand the concepts of management of IOT systems that leads to platform design
- Identify various physical devices , endpoints and servers used in IOT
- Infer the role of Data Analytics & security in IT
- Explore various tools and develop IoT design for certain Applications.

Course Outcomes

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

CO1 - Explain the basic concepts of IOT and distinguish between IOT & M2M. **(K2)**

CO2 - Explore IoT system Management leading to platform design. **(K2)**

CO3 - Recognize IoT Devices and connect them to cloud servers. **(K2)**

CO4 - Illustrate the use of Data analytics and need for security in IoT. **(K3)**

CO5 – Identify the IoT tools and explore to create a real time example **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction :Definition and Characteristics of IoT - Physical Design of IoT - Things in IoT - Logical Design of IoT - IoT Communication Models - IoT Communication APIs - IoT Enabling Technologies. IoT Levels and deployment template. Domain specific IoTs – IoT and M2M - Introduction to M2M - Difference between IoT and M2M - SDN and NFV for IoT

UNIT II SYSTEM MANAGEMENT AND PLATFORM DESIGN (9 Hrs)

Need for IoT Systems Management- SNMP- Network Operator Requirements NETCONF - YANG- IoT System Management with NETCONF-YANG.

IoT Platforms Design Methodology - Case study on Weather Monitoring.

UNIT III DEVICES END POINTS AND SERVERS (9 Hrs)

IoT Physical Devices and Endpoints: Basic building blocks - Exemplary Device: Raspberry Pi andArduino – interfaces - Programming with python- Python Packages for IOT- other devices: pcDuino -BeagleBone Black - Cubieboard. IoT physical servers and cloud offerings.

UNIT IV DATA ANALYTICS AND SECURITY OF IOT (9 Hrs)

Data and Analytics for IoT: An Introduction to Data Analytics for IoT- Big Data Analytics Tools and Technology Edge Streaming Analytics-Network Analytics

Securing IoT- A Brief History of IOT Security - Common Challenges in OT Security - Security Practices and Systems Variation-Formal Risk Analysis Structures: OCTAVE and FAIR- Phased Application of Security in an Operational Environment.

UNIT V TOOLS FOR IOT AND CASE STUDIES (9 Hrs)

Tools- CHEF- CHEF Case Study,PUPPET. **Casestudies Illustrating IOT design:** Home Automation Environment – Agriculture - Productivity Application IoT in Industry: Smart and Connected Cities-Transportation-Public Safety.

Text Books

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things, A Hands -on Approach”, 1st Edition 2015, University Press, ISBN: 978-81-7371- 954-7
2. Oliver Hersent, David Boswarthick, Omar Elloumy, “The Internet of Things”,1st Edition, 2017,ISBN: 978-81-265-5686-1

Reference Books

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, —"Architecting the Internet of Things", Springer, 2011.
2. Donald Norris, —"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", Mc.Graw Hill, 2015.
3. CunoPfister, —"Getting Started with the Internet of Things", O'Reilly Media, Inc.,2011
4. Olivier Hersent, David Boswarthick, Omar Elloumi, —"The Internet of Things,Key applications and Protocols", Wiley, 2012
5. Dieter Uckelmann et.al, —"Architecting the Internet of Things", Springer, 2011.

Web Resources

1. https:\\www.abouttheInternetofThings.com

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
3	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
4	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
5	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

U20CST718	DATA SCIENCE AND DIGITAL MARKETING ANALYTICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce data science and social media.
- To learn about connecting, capturing and cleaning the social data.
- To know about the branding of Facebook.
- To analyse about the sentiments in twitter.
- To Learn how Google Tools using for consumer's reactions

Course Outcomes

After completion of the course, students will be able to

CO1 – Understand the fundamentals of data science and social media. **(K2)**
CO2 – Interpret the connecting, capturing and cleaning the social data. **(K3)**
CO3 – Learn about the promoting of facebook. **(K2)**
CO4 – Analysis of sentiments in twitter. **(K3)**
CO5 – Learn how Google Tools using for consumer's reactions. **(K4)**

UNIT I INTRODUCTION TO DATA SCIENCE AND SOCIAL MEDIA (9 Hrs)

Introduction of Data science - Scope of Data Science – Data Science with other fields – Relationship between Data Science and Information Science. Data – Data Types – Data collection – Data pre-processing. Introduction to the Latest Social Media Landscape and Importance - Introducing social graph - Delving into social data - Understanding the process - Working environment - Collecting the data - Analyzing the data - Visualizing the data - Getting started with the toolset.

UNIT II HARNESSING SOCIAL DATA (9 Hrs)

APIs in a nutshell - Different types of API - Advantages and Limitations of social media APIs - Connecting principles of APIs - Introduction to authentication techniques - Parsing API outputs - Twitter - Facebook - GitHub - YouTube. Basic cleaning techniques - MongoDB to store and access social data - MongoDB using Python. Google Tools.

UNIT III UNCOVERING BRAND ACTIVITY, POPULARITY AND EMOTIONS ON FACEBOOK (9 Hrs)

Facebook brand page - The Facebook API - Project planning - Analysis - data extraction - data pull - feature extraction - content analysis - Keywords - Extracting verbatim for keywords - Noun phrases - Detecting trends in time series - Maximum shares - Maximum likes - Uncovering emotions - Extract emotions - Brands benefit from Emotions.

UNIT IV ANALYZING TWITTER USING SENTIMENT ANALYSIS AND ENTITY RECOGNITION (9 Hrs)

Scope and process - Getting the data - Getting Twitter API keys - Data extraction - REST API Search endpoint - Streaming API - Data pull - Data cleaning - Sentiment analysis - Customized sentiment analysis - Labeling the data - Creating the model - Model performance evaluation and cross-validation - K-fold cross-validation - Named entity recognition - Installing NER - Combining NER and sentiment analysis.

UNIT V CAMPAIGNS AND CONSUMER REACTION ANALYTICS AND GOOGLE TOOLS (9 Hrs)

Scope and process - Getting the data - Data pull - Data processing - Data analysis -Sentiment analysis in time - Comments in time - The Next Great Technology – Trends Mining on GitHub - Top technologies.
Google Tools: Google Ad Manager - Google Ads - Google Marketing Platform. Digital Marketing Tools: Data Shorts - Test My Site - Grow My Store - Find My Audience - Market Finder - Google Trends..

Text Books

1. Chirag Shah " A Hands-On Introduction to Data Science" Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystyanczuk "Python Social Media Analytics ", Packt Publishing, 2017.
3. Jesus Rogel-Salazar, "Data science and Analystics", CRC Press, 2017.

Reference Books

1. Chuck Hemann, Ken Burbary "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World", Que Publishing, 2013.
2. Wolfgang Jank, "Business Analytics for Managers", Springer, 2011.
3. Wes McKinney,"Python for Data Analysis", O'Reilly Press, 2nd Edition, 2017.
4. Phil Spector, "Data Manipulation with R", Springer, 2018.
5. Christian Ritz, Jens Carl Streibig, "Nonlinear Regression with R", Springer, 2015.

Web Resources

1. https://www.analyticsinsight.net/data-science-in-digital-marketing/
2. https://www.simplilearn.com/pgp-data-science-certification-bootcamp-program?
3. https://emeritus.sdabocconi.it/big-data-ai-marketing?
4. https://www.thinkwithgoogle.com/intl/en-apac/?
5. https://www.upgrad.com/executive-management-in-digital-brand-advertise-mica/?

COs/POs/PSOs Mapping

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1	1	2	1	2	2	3	3	2	1	2	3	3	3	1	3
2	1	2	1	2	2	3	3	2	1	2	3	3	3	3	2
3	1	2	1	2	2	3	3	2	1	3	3	3	2	1	3
4	2	2	2	3	2	3	3	2	1	3	3	3	1	1	2
5	3	1	2	3	2	3	3	2	1	3	3	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20HSP703	BUSINESS BASICS FOR ENTREPRENEUR	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To develop a clear understanding on Business Plans and their significance.
- To be familiar with various forms of business appropriate for an individual entrepreneur
- To understand various ways of judging a successful opportunity for an entrepreneur
- To know the ways to formulate a successful Operation Plan
- To be aware of things to know to prepare effective financial and marketing plans

Course Outcomes

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

CO1: Impact comprehensive knowledge of an entrepreneurial ecosystem**. (K6)**

CO2: Understand the need and significance of Business Plan in the success of an Enterprise. **(K2)**

CO3: Understand the ways to judge the economic and business viability of proposed venture. **(K2)**

CO4: Utilize the elements of success of entrepreneurial ventures. **(K3)**

CO5: Evaluate the effectiveness of different entrepreneurial strategies. **(K5)**

UNIT I: THE ENTREPRENEURIAL PERSPECTIVE (6 Hrs)

Entrepreneurship and Family Business Management, Entrepreneurship theory and practice, The Nature and Importance of Entrepreneurs, The Entrepreneurial and Intrapreneurial Mind, The Individual Entrepreneur, International Entrepreneurship Opportunities

UNIT II: CREATING AND STARTING THE VENTURE (6 Hrs)

Creativity and the Business Idea, Legal Issues for the Entrepreneur, the Business Plan, the Marketing Plan, the Financial Plan, the Organizational Plan

UNIT III: FINANCING THE VENTURE (6 Hrs)

Raising Finance, scaling up the venture, NDA'S and term sheet, Sources of the Capital, Informal Risk Capital and Venture Capital

Report Submission:

- Grooming Entrepreneurial Mind-set
- Interaction with Business Leaders/Bankers/Venture Capitalists
- Finding and evaluating an idea
- Develop a business plan
- Financing for a company start-up
- Setting up a company-legal entity
- Entrepreneurial development and employment creation
- Effects of creativity and innovation on the entrepreneurial performance of family business

Text Books

1. Friend, G., & Zehle, S. (2004). *Guide to business planning*. Profile Books Limited.
2. Lasher, W. (2010). *The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business*. Broadway Books.
3. Arjun Kakkar. (2009). *Small Business Management: Concepts and Techniques for improving Decisions*. Global India Publications.

Reference Books

1. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
2. Arthur R. DeThomas – Writing a Convincing Business Plan.
3. Ben Horowitz – The Hard Thing About Hard Things.
4. Guy Kawasaki – The Art of Start 2.0
5. Hal Shelton – The Secrets to Writing a Successful Business Plan.

Web References

1. https://www.waveapps.com/blog/entrepreneurship/importance-of-a-business-plan
2. https://www.entrepreneur.com/article/200516
3. https://smallbusinessbc.ca/article/how-to-use-viability-to-test-if-you-should-invest-in-your-business/
4. https://www.infoentrepreneurs.org/en/guides/strategic-planning/
5. http://www.marketingmo.com/strategic-planning/marketing-plans-budgets/
6. https://www.mbda.gov/page/loan-documentation

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1	1	2	1	2	1	1	3	3	2	3	1	2	1	2	1
2	1	2	2	2	2	2	3	3	3	2	1	2	2	2	1
3	1	2	2	1	2	2	3	3	3	3	2	3	1	2	3
4	1	3	2	2	2	2	3	3	3	3	2	3	1	2	2
5	1	3	2	2	2	2	3	3	3	2	2	3	1	3	2

U20CSP712	IOT AND EDGE COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- Learn to analyse the performance of IOT devices
- Design and program IoT devices
- Be exposed to tool kits for cloud environment.
- Transfer IoT data to the cloud and in between cloud providers
- Learn to run virtual machines of different configuration.

Course outcomes

After completion of the course, students will be able to

CO1 - Analyse the performances of IOT devices. **(K2)**
CO2 - Design IoT applications in different domain. **(K6)**
CO3 - Implement basic IoT applications on embedded platform. **(K6)**
CO4 - Use of the cloud tool kits. **(K3)**
CO5 - Design and Implement applications on the Cloud. **(K6)**

List of Exercises

1. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run python programs on Pi
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Access an image trhough a Pi web cam
5. Implement an intruder system that sends an alert to the given email.
6. Get the status of a bulb at a remote place (on the LAN) through web.
7. Show the virtual machine migration based on the certain condition from one node to the other.
8. Find procedure to install storage controller and interact with it.
9. Install Google App Engine. Create hello world app and other simple web applications using python/java.
10. Find a procedure to transfer the files from one virtual machine to another virtual machine.
11. Find a procedure to launch virtual machine using trystack
12. Install Hadoop single node cluster and run simple applications like wordcount.

Reference Books

1. Jonathan Follett, “Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies”, O’Reilly, 2014.
2. Charalampos Doukas, — “Building Internet of Things with the Arduinoǁ”, Create space, April 2012.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —”Architecting the Internet of Things”, Springer, 2011.
4. Michael Margolis, “Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects”, 2nd Edition, O’Reilly Media, 2011.

Web Resources

1. https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot
2. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
3. https://www.geeksforgeeks.org/edge-computing/
4. https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/

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3	1	2	1	2	2	3	3	2	1	3	3	3	2	1	3
4	2	2	2	3	2	3	3	2	1	3	3	3	1	1	2
5	3	1	2	3	2	3	3	2	1	3	3	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSP713	DATA SCIENCE AND DIGITAL MARKETING ANALYTICS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To describe common Python functionality and features used for data science.
- To learn the Query Data Frame structures for cleaning and processing.
- To configure your programming environment to analysis Facebook.
- To analyse about the sentiments in twitter.
- To learn how YouTube promotions and analysis of consumer's reactions are made.

Course Outcomes

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

CO1 – Design programs using Python functionality and features. **(K3)**
CO2 – Developing Query Data Frame structures for cleaning and processing. **(K4)**
CO3 – Construct programming environment to analysis Facebook. **(K4)**
CO4 – Analyse about the sentiments in twitter. **(K4)**
CO5 – Learn how Google Tools using for consumer's reactions. **(K5)**

List of Exercises

1. Demonstrate Aggregation.
2. Demonstrate Indexing and Sorting.
3. Demonstrate handling of missing data.
4. Demonstrate hierarchical indexing.
5. Demonstrate usage of Pivot table.
6. Demonstrate use of eval () and query ().
7. Demonstrate Scatter Plot and 3D plotting.
8. Implement an analytic application for facebook to demonstrate the number of likes, emotions.
9. Implement an analytic application for twitter to demonstrate Sentiment Analysis and Entity Recognition.
10. Implement an analytic application for Google Tools such as Find My Audience - Market Finder - Google? Trends.

Reference Books

1. Chirag Shah " A Hands-On Introduction to Data Science" Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystyanczuk "Python Social Media Analytics ", Packt Publishing, 2017.
3. Jesus Rogel-Salazar, "Data science and Analystics", CRC Press, 2017.

Web Resources

1. https://www.searchlaboratory.com/analytics-data-science/
2. https://www.analyticsinsight.net/data-science-in-digital-marketing/
3. https://www.simplilearn.com/pgp-data-science-certification-bootcamp-program?
4. https://emeritus.sdabocconi.it/big-data-ai-marketing?

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4	2	2	2	3	2	3	2	2	1	3	3	3	1	1	2
5	3	1	2	3	2	3	3	2	1	3	3	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSP714	COMPREHENSIVE VIVA-VOCE	L	T	P	C	Hrs
		0	0	2	1	30

The student will be tested for his understanding of basic principles of the core Computer Science and Engineering subjects. The objective of comprehensive viva-voce is to assess the overall knowledge of the student in the relevant field of Engineering acquired over 4 years of study in the undergraduate program.

U20CSW701	PROJECT PHASE - I	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.
- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - State the problem definition clearly. **(K3)**

CO2 - Prepare SRS for projects. **(K3)**

CO3 - Prepare SDS for projects. **(K3)**

CO4 - Develop presentation skills. **(K3)**

CO5 - Develop project management skills. **(K3)**

Exercises

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

- Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	3	3	2	2	3
2	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
3	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
4	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
5	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSW702	INTERNSHIP/ INPLANT TRAINING	L	T	P	C	Hrs
		0	0	0	2	0

Inplant training is a short duration training course for students to develop their skills and get industrial knowledge which will help you to understand what is actually happens in industry. Inplant training is important for Engineering students as it gives industry exposure to them while studying. Inplant training adds credits to the students during their placements. They provide inplant training and internships for the students of engineering and arts. Its usefulness varies depending on which branch you are, and which company you did an InPlant Training.

U20CSM707	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

- To enable the students to create an awareness on Engineering Ethics and Human Values,
- To instil Moral and Social Values and Loyalty and to appreciate the rights of others.
- To develop a firm ethical base.
- To make the students to realize the significance of ethics in professional environment.
- To acquaint students with latest intellectual property rights

Course Outcomes

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

CO1 - Apply ethics in society. **(K3)**

CO2 - Discuss the ethical issues related to engineering. **(K2)**

CO3 - Act as a responsible Experimenter and to follow the codes of Ethics. **(K3)**

CO4 - Realize the responsibilities and rights in the society. **(K2)**

CO5 - Familiarize with the Multinational Corporations and its Social Responsibility. **(K3)**

UNIT I HUMAN VALUES (6 Hrs)

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 (6 Hrs)

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION (6 Hrs)

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS SAFETY (6 Hrs)

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 (6 Hrs)

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility

Reference Books

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

Web Resources

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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3	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
4	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
5	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

PROFESSIONAL ELECTIVES

U20ITCM01	NETWORK SECURITY (Common to CSE and IT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide students with contemporary knowledge in Cryptography and Security and various threats and attacks in a network
- To introduce fundamental concepts of symmetric and asymmetric cipher model.
- To know the concepts of Key management techniques and Cryptographic Hash algorithms
- To understand the various authentication schemes and system control mechanisms
- To understand necessary approaches and techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes

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

CO1 - Classify cryptographic techniques using a mathematical approach by examining nature of attack. **(K2)**
CO2 - Apply the different cryptographic operations using public and private key cryptography **(K3)**
CO3 - Summarize solutions for effective key management distribution and maintain message integrity **(K2)**
CO4 - Identify and use appropriate algorithms for assuring System security and authentication. **(K3)**
CO5 - Outline the security requirements and solutions for wireless networks and distributed systems. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Security Attack - Non-cryptographic Protocol Vulnerabilities - Software Vulnerabilities - The need for security - Security services - Security Mechanisms- Classical encryption: Classical Techniques

UNIT II SYMMETRIC AND ASYMMETRIC CIPHER (9 Hrs)

Symmetric Ciphers: Symmetric and asymmetric cryptography- Key size and Key Range- DES - Triple DES - AES - Blowfish - RC5- Pseudorandom Number Generators - Asymmetric Ciphers: RSA Algorithms - Security of RSA - Knapsack Algorithm - Differential and Linear Cryptanalysis-Number Theory

UNIT III KEY MANAGEMENT AND DATA INTEGRITY ALGORITHMS (9 Hrs)

Diffie Hellman key exchange -Elgamal Cryptographic System - Elliptic Curve Arithmetic - Elliptic Curve Cryptography - Cryptographic Hash Functions: Secure Hash Algorithm (SHA-1) -Message authentication codes: HMAC.

UNIT IV AUTHENTICATION (9 Hrs)

Digital Signatures -Elgamal Digital Signature Scheme - NIST Digital Signature Algorithm - Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature - Biometric Authentication – Kerberos - X.509 Authentication Service - Public Key Infrastructure.

UNIT V NETWORK AND WIRELESS SECURITY'S (9 Hrs)

Email Security: Pretty good privacy – S/MIME-IP Security - Web Security: SSL/ Transport Layer Security - Secure electronic transaction (SET) –System Security- Firewalls design principles. Intrusion detection System - Virtual Private Networks - Wireless security: IEEE 802.11 overview and its security – WEP - WPA.
Case Studies: Snort and Stenographic tools - Bit coin and Crypto currency system.

Text Books

1. William Stallings, "Cryptography & Network Security- Principles and Practices",Pearson Publishers, Seventh Edition, 2017.
2. AtulKahate, ''Cryptography and Network Security",McGraw Hill, 3rd Edition, 2011.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger , “Security in computing”, Prentice Hall of India,Fifth Edition,2015.
2. Charlie Kaufman, Radia Perlman, and Mike Speciner, “Network Security: PRIVATE Communication in a PUBLIC World”, Prentice Hall, ISBN 0-13-046019-2
3. Wenbo Mao, “Modern Cryptography: Theory and Practice”,Prentice Hall PTR, First Edition,2003.
4. William Stallings, “Network Security Essentials: Applications and Standards”,Prentice Hall, Fourth Edition 2007.
5. Douglas R. Stinson, “Cryptography: Theory and Practice”,CRC press, Third Edition,2006.

Web References

1. https://www.coursera.org/learn/crypto
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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2	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
3	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
4	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
5	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSE717	DATA MINING AND WAREHOUSING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the Fundamental Concept of Data mining.
- To describe the OLAP technology.
- To understand the Classification Techniques.
- To understand the Cluster Analysis.
- To develop Data Mining Object.

Course Outcomes

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

CO1 - Understand the Data mining and Data warehousing fundamentals. **(K1)**
CO2 - Describe the OLAP technology for Data Mining. **(K3)**
CO3 - Understand the Classification Techniques. **(K1)**
CO4 - Understand the Cluster Analysis. **(K1)**
CO5 - Develop Data Mining Object. **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Pre-processing: Need for Pre-processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II DATA WAREHOUSING AND OLAP TECHNOLOGY (9 Hrs)

Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT III CLASSIFICATION AND PREDICTION (9 Hrs)

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

UNIT IV CLUSTER ANALYSIS (9 Hrs)

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT V SPATIAL, MULTIMEDIA, TEXT AND WEB MINING (9 Hrs)

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web. Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

Text Books

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Second Edition, Pearson education, 2016.
3. Jared Dean, “Big Data Mining, and Machine Learning: value Creation for Business Leaders and Practitioners”, Second Edition, Wiley, 2019.

Reference Books

1. 1. Arun K Pujari, ”Data Mining Techniques”, Second Edition, Universities Press, 2010.
2. Sam Aanhory and Dennis Murray,”Data Warehousing in the Real World”, Second Edition, Pearson Edn Asia, 1997.
3. K.P.Soman, S.Diwakar and V.Ajay, “Insight into Data Mining”, Second Edition, PHI, 2008.
4. Paulraj Ponnaiah, “Data Warehousing Fundamentals” Third Edition, Wiley student Edition, 2017.
5. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data Mining Theory and Practice”, Third Edition, Prentice Hall of India, 2006.

Web Resources

1. https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/
2. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
3. https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining
4. https://nptel.ac.in/courses/106/105/106105174/
5. https://www.guru99.com/data-warehousing-tutorial.html

COs/POs/PSOs Mapping

Co’s	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	1	2	2	3	1	2	1	2	3	3	3	1	3
2	1	2	1	2	2	3	2	2	1	2	3	3	3	3	2
3	1	2	1	2	2	3	1	2	1	3	3	3	2	1	3
4	2	2	2	3	2	3	2	2	1	3	3	3	1	1	2
5	3	1	2	3	2	3	3	2	1	3	3	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSCM04	VIRTUAL REALITY (Common to CSE and CSBS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concept of Virtual Reality.
- To develop Geometry for Virtual Reality.
- To develop Physiology of Human models using VR.
- To create visual perception and rendering with Virtual World.
- To test the audio.

Course Outcomes

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

CO1 - Understand the concept of Virtual Reality. **(K2)**
CO2 - Develop Geometry for Virtual Reality. **(K3)**
CO3 - Develop Physiology of Human models using VR. **(K3)**
CO4 - Create visual perception and rendering with Virtual World. **(K3)**
CO5 - Test the audio. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Virtual Reality: What is Virtual Reality - Modern VR Experiences - History Repeats. Bird's-Eye View: Hardware - Software - Human Physiology and Perception.

UNIT II GEOMETRY AND LIGHT AND OPTICS (9 Hrs)

Geometric Models - Changing Position and Orientation - Axis-Angle Representation of Rotation - Viewing Transformations - Chaining the Transformations.
Light and Optics: Basic Behavior - Lenses - Optical Aberrations - The Human Eye - Cameras – Displays.

UNIT III PHYSIOLOGY OF HUMAN VISION (9 Hrs)

From the Cornea to Photoreceptors - From Photoreceptors to the Visual Cortex - Eye Movements - Implications for VR.

UNIT IV VISUAL PERCEPTION, VISUAL RENDERING AND MOTION IN REAL AND VIRTUAL WORLD (9 Hrs)

Perception: Depth - Motion - Color - Combined sources of Information. Rendering: Ray Tracing and Shading Models - Rasterization - Correcting Optical Distortions. Motion: Velocities and Accelerations - The Vestibular System - Physics in the Virtual World - Mismatched Motion and Vection.

UNIT V TRACKING, INTERACTION AND AUDIO (9 Hrs)

Tracking: Tracking 2D Orientation - Tracking 3D Orientation - Tracking Position and Orientation - 3D Scanning of Environments. Interaction: Motor Programs and Remapping - Locomotion - Social Interaction.
Audio: The Physics of Sound - The Physiology of Human Hearing - Auditory Perception - Auditory Rendering - Perceptual Training - Recommendations for Developers.

Text Books

1. Stevan M.LaValle, "Virtual Reality", Cambridge University Press, 2020.
2. Burdea, "Virtual Reality Technology", Wiley India, 2nd edition, 2008.
3. John Vince, "Virtual Reality Systems", Pearson Edition, 2012.

Reference Books

1. Jonathan Linowes, "Unity Virtual Reality Projects", Packt publications, Second Edition, 2016.
2. Woodrow Barfield, Marc J. Blitz, "Research Handbook on the Law of Virtual Reality and Augmented Reality", Edward Elgar Publishing, 2020.
3. Jeff W Murray, "Building Virtual Reality with Unity and SteamVR", CRC Press, 2nd edition, 2020.
4. Erin Pangilinan, Steve Lukas, Vasanth Mohan, "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", O'Reilly Media, 1st edition, 2019.
5. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", Morgan & Claypool Publishers, 2015.

Web Resources

1. https://www.investopedia.com/terms/v/virtual-reality.asp
2. https://www.iberdrola.com/innovation/virtual-reality
3. https://www.marxentlabs.com/what-is-virtual-reality
4. https://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html
5. https://arvr.google.com/vr

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	1	2	2	3	1	2	1	2	3	3	3	1	3
2	1	2	1	2	2	3	2	2	1	2	3	3	3	3	2
3	1	2	1	2	2	3	1	2	1	3	3	3	2	1	3
4	2	2	2	3	2	3	2	2	1	3	3	3	1	1	2
5	3	1	2	3	2	3	3	2	1	3	3	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSE719	ROBOTICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the fundamental concepts of Robotics
- To outline sensors and vision system
- To design of controlling in robotics
- To extend the robot Actuation systems
- To design and control hardware & interfacing in robot

Course Outcomes

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

CO1 - Explain the robotic kinematic and dynamic analysis. **(K2)**
CO2 - Discover various sensors and vision system. **(K1)**
CO3 - Apply linear and non-linear controls of robotics. **(K3)**
CO4 - Make use of various actuators. **(K2)**
CO5 - Develop robotics using embedded systems and AI. **(K4)**

UNIT I INTRODUCTION TO ROBOTICS (9 Hrs)

Types and components of a robot, Classification of robots, Kinematics systems; Definition of mechanisms and manipulators, Degrees of Freedom.
Robot Kinematics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics

UNIT II ROBOT DYNAMICS, SENSORS AND VISION SYSTEM (9 Hrs)

Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation
Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.

UNIT III ROBOT CONTROL (9 Hrs)

Basics of control: open loop- closed loop, Transfer functions, Control laws: P, PD, PID, Linear and Non-linear controls

UNIT IV ROBOT ACTUATION SYSTEMS (9 Hrs)

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

UNIT V CONTROL HARDWARE AND INTERFACING (9 Hrs)

Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming for robot applications.AI in Robotics: Applications in unmanned systems, defense, medical, industries, etc.

Text Books

1. Craig,J.J.,"Introduction to Robotics: Mechanics and Control", 4th Edition, Pearson, 2017.
2. Spong, Vidyasagar, "Robot Dynamics and Control", 2nd Edition, Wiley India Pvt. Ltd, 2009.
3. R. Klafter, "Robotics Engineering", 3rd edition, PHI, 2012.
4. Saha, S.K, "Introduction to Robotics". 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
5. M. P. Groover, AshishDutta, "Industrial Robotics", 2nd edition, McGraw Hill, 2013.

Reference Books

1. Steve Heath, “Embedded System Design”, 2nd Edition, Newnes, Burlington, 2003
2. NikuSaeed B., “Introduction to Robotics: Analysis, Systems, Applications”, 3rd edition, PHI,New Delhi.2008
3. Mittal R.K. and Nagrath I.J., “Robotics and Control”, 2nd edition, Tata McGrawHill, 2011
4. Mukherjee S., “Robotics and Automation”, Khanna Publishing House,Delhi.
5. Mark W. Spong, Sdeth Hutchinson, and M. Vidyasagar, “Robot Modelling andControl”, John Wiley and Sons Inc, 2005.

Web Resources

1. http://www.cs.cornell.edu/courses/cs4750
2. https://www.coursera.org/specializations/robotics
3. https://cmsx.cs.cornell.edu
4. https://www.edx.org/
5. https://builtin.com/robotics

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO 3
1	3	3	2	1	2	2	2	-	-	3	-	3	2	3	2
2	3	2	3	2	3	2	2	-	-	-	-	3	3	3	2
3	3	3	3	2	3	2	2	-	-	2	-	3	3	3	3
4	2	2	2	2	2	2	2	-	-	3	-	2	2	2	2
5	3	3	2	2	2	2	2	-	2	3	3	3	2	3	2

U20CSE720	HAPTIC COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basics of Haptics Principles and Applications
- To learn the concept of Human Haptic Perception and Machine Haptics
- To study the Computer Haptics
- To learn the Multimedia Haptics
- To understand the designing purpose of Haptics System

Course Outcomes

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

CO1 – Analyze the basic Principles and Applications of Haptics.**(K3)**
CO2 – Understand the Human Haptic Perception and Machine Haptics. **(K1)**
CO3 – Analyze the concept of Computer Haptics. **(K3)**
CO4 – Make use of the Multimedia Haptics. **(K2)**
CO5 – Ability to design the Haptic Systems. **(K2)**

UNIT I HAPTICS: GENERAL PRINCIPLES AND APPLICATIONS (9Hrs)

Introduction - Human Senses - Haptics Exploration - Concepts and Terminology - Roadmap to Multimedia Haptics.- Haptic-Audio-Visual Multimedia System. Haptic Evolution: From Psychophysics to Multimedia - Haptics for Medical Applications - Tele-Robotics and Tele-Operation – Media - Mobile Haptics - Haptics and Virtual reality - Education and Learning - Haptics for Security.

UNIT II HUMAN HAPTIC PERCEPTION AND MACHINE HAPTICS (9Hrs)

Introduction - Touch and Cognition - Human Haptic System - Concept of Illusion. Haptic Interfaces - HAVE Sensors - HAVE Actuators - Performance Specifications - State-of-the-Art Haptic Interfaces.

UNIT III COMPUTER HAPTICS (9Hrs)

Haptic Rendering Subsystem - Polygon-Based Representation and Scene Graph - Collision Detection Techniques and Bounding Volumes - Penetration Depth and Collision Response - Haptic Rendering of Surface Properties - Control Methods for Haptic Systems - Benchmarking Haptic Rendering Systems - Haptic Software Frameworks.

UNIT IV MULTIMEDIA HAPTICS (9Hrs)

Haptics as a New Media - HAVE Content Creation - HAVE Content Representation - Haptic Media Transmission - Architectures for C-HAVE - Communication Frameworks for C-HAVE Systems - Quality of Experience in Multimedia Haptics – Haptics Watermarking.

UNIT V DESIGNING HAPTIC SYSTEMS (9Hrs)

Kinematic Design: Basics - Serial Mechanisms - Parallel Mechanisms. Actuator Design: General Facts about Actuator Design - Electrodynamics Actuators - Electromagnetic Actuators - Piezoelectric Actuators – Electrostatic Actuators. Sensor Design: Constraints - Sensing Principles.

Text Books

1. Abdulmotaleb El Saddik, Mauricio Orozco, Mohamad Eid, Jongeun Cha, “Haptics Technologies: Bringing Touch to Multimedia, Springer-Verlag Berlin Heidelberg”, 1st Edition, 2011.
2. Natalia Roberts,” Haptic Technology and Applications Hardcover – Import”, 12 March 2015.
3. Robert Jütte, “Martin Grunwald (eds.), Human Haptic Perception: Basics and Applications”, Birkhäuser Base, 1st Edition, 2008.

Reference Books

1. Troy McDaniel and Sethuraman Panchanathan,"Haptic Interfaces for Accessibility, Health, and Enhanced Quality of Life" springer, 2020.
2. Natalia Roberts," Haptic Technology and Applications Hardcover – Import", 12 March 2015.
3. Robert Jütte, "Martin Grunwald (eds.), Human Haptic Perception: Basics and Applications", Birkhäuser Base, 1st Edition, 2008.
4. Haptic Rendering: Foundations, Algorithms, and Applications Hardcover – Import, 25 July 2008 by Ming C. Lin, Miguel Otaduy
5. Human Haptic Perception Basics And Applications by Martin Grunwald, Birkhauser Verlag AG, Publisher Birkhauser Verlag AG, December 2008.

Web Resources

1. https://www.azosensors.com/article.aspx?ArticleID=1435
2. https://www.sciencedirect.com/topics/neuroscience/haptic-perception
3. https://electronics.howstuffworks.com/everyday-tech/haptic-technology.htm
4. https://www.rfwireless-world.com/Terminology/haptic-sensor.html
5. https://www.architectmagazine.com/technology/the-role-of-haptics-in-design_o

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1	2	1	1	1	2	3	2	1	2	3	1	2
2	1	2	3	2	3	1	1	2	3	2	3	2	3	1	2
3	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Open Elective Courses offered to other Department students

U20CSO705	ARTIFICIAL INTELLIGENCE (Common to EEE, ICE, CIVIL, CCE, MECH, FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To cover fundamentals of Artificial Intelligence,
- To understand various knowledge representation techniques.
- To provide knowledge of AI systems and its variants
- To understand the planning and different learning.
- To understand the communication process of language translator.

course outcomes

On successful completion of this course students will be able to

CO1 - Understand the basics of Artificial Intelligence. **(K1)**

CO2 - Apply AI problem solving techniques, knowledge representation, and reasoning methods in Knowledge based systems **(K3)**

CO3 - Develop simple intelligent / expert system using available tools and techniques of AI to analyze and interpret domain knowledge. **(K3)**

CO4 - Become familiar with planning and different learning methods. **(K3)**

CO5 - Understanding the human language to Machine language and Robotics. **(K1)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction - Foundations of AI – History of AI –Structure of AI agents, Problem solving - Informed and uninformed search techniques.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING **(9 Hrs)**

Logical Agents –Propositional logic - First-Order Logic - Forward and backward chaining - Knowledge Representation

UNIT III UNCERTAIN KNOWLEDGE AND REASONING **(9 Hrs)**

Basic probability notations - Bayes rule – Wumpus world revisited - Bayesian network.

UNIT IV PLANNING AND LEARNING **(9 Hrs)**

Introduction to planning, Planning in situational calculus - Representation for planning – Partial order planning algorithm- Learning from examples- Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning.

UNIT V COMMUNICATING, PERCEIVING AND ACTING **(9 Hrs)**

Natural Language Processing – Natural Language for communication – Perception - Robotics.

Text Books

1. Stuart Russel, Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
2. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill2008.
3. Patrick Henry Winston,” Artificial Intelligence”, Addison Wesley, Books Third edition, 2000.

Reference Books

1. Patrick Henry Winston," Artificial Intelligence", Addison Wesley, Books Third edition, 2000.
2. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
3. George F Luger, Artificial Intelligence, Pearson Education, 6th edition, 2009.
4. EngeneCharniak and Drew Mc Dermott," Introduction to Artificial intelligence, Addison Wesley 2000.
5. Nils J. Nilsson,"Principles of Artificial Intelligence", Narosa Publishing House, 2000.

Web Resources

- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- https://www.javatpoint.com/artificial-intelligence-tutorial
- https://www.w3schools.com/ai/
- https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/
- https://nptel.ac.in/courses/112/103/112103280/

COs/POs/PSOs Mapping

CO'S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

		L	T	P	C	Hrs
U20CSO706	**CLOUD TECHNOLOGY AND ITS APPLICATIONS** (Common to EEE, ICE, MECH, CIVIL, BME, CCE, Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To Relate cloud storage technologies and relevant distributed file systems.
- To Explain the Cloud Applications.
- To Define the Future of Cloud.

Course Outcomes

After completion of the course, the students should be able to

CO1 - Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. **(K1)**

CO2 - Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacentres to build and deploy cloud applications that are resilient, elastic and cost-efficient. **(K3)**

CO3 - Illustrate the fundamental concepts of Cloud Applications. **(K4)**

CO4 - Explain the Applications of cloud. **(K3)**

CO5 - Advancing towards a Cloud. **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network.

UNIT II CLOUD INFORMATION SYSTEMS (9 Hrs)

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing.

UNIT III CLOUD INFRASTRUCTURE (9 Hrs)

Introduction– Evolving IT infrastructure – Evolving Software Applications –Service Oriented Architecture – Interoperability Standards for Data Center Management - Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment.

UNIT IV CLOUD APPLICATIONS (9 Hrs)

Software Utility Application Architecture - Characteristics of a SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework - Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture - Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT V FUTURE OF CLOUD (9 Hrs)

Other Design Considerations - Design of a Web Services Metering Interface - Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

Text Books

1. Sandeep Bhowmik, & quot; Cloud Computing & quot;,Cambridge University Press; First edition,2017..
2. Erl ,'Cloud Computing: Concepts, Technology & Architecture', Pearson Education India,1st edition (1 January 2014).
3. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

Reference Books

1. Sanjiva Shankar Dubey ,' Cloud Computing and Beyond', Dreamtech Press 2edition,2019.
2. John W. Rittinghouse and james F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
3. George Reese, "Cloud Application Architectures", O'reilly Publications, 2009.
4. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
5. Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd.2006.

Web Resources

1. www.coltdatacentres.net/Cloud Technology.
2. www.zdnet.com.
3. https://www.cloudbakers.com/blog/what-is-a-cloud-application
4. https://www.cloudbakers.com/blog/what-is-a-cloud-application
5. https://blog.servermania.com/what-is-a-cloud-application/

COs/POs/PSOs Mapping

CO'S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	1	-	2	1	3	1	2	3	2
2	1	1	2	1	1	3	1	-	2	1	3	1	3	3	2
3	2	2	1	1	-	3	1	1	2	1	3	1	3	3	3
4	1	1	1	1	2	2	1	-	2	1	3	1	2	2	2
5	2	1	1	1	1	3	1	-	2	1	3	1	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN ELECTIVES

U20ECO705	IOT AND ITS APPLICATIONS (Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE and FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

Course Outcomes

After completion of the course, students will be able to

CO1-Understand internet of Things and its hardware and software components**. (K2)**
CO2-Demonstrate the Interfacing of I/O devices, sensors & communication modules**. (K3)**
CO3-Understand the concepts of remotely monitor data and control devices**. (K2)**
CO4-Build and deploy an various architecture with their elements**. (K3)**
CO5-Can develop real time IoT based projects**. (K3)**

UNIT I INTRODUCTION TO INTERNET OF THINGS (9 Hrs)

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

UNIT II ARCHITECTURE OF IoT (9 Hrs)

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT III ELEMENTS OF IoT (9 Hrs)

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT IV IoT APPLICATION DEVELOPMENT (9 Hrs)

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

UNIT V IoT APPLICATIONS (9 Hrs)

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, "Ïnternet of Things, A Hands on Approach", University Press ,3rd/e ,Aug 2018.
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill ISBN: 9789352605224, 9789352605224,2nd edition, May 2017.
3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs 2014.

Reference Books

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2012.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2007.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013.
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015.
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.

Web Resources

1. https://www.i-scoop.eu/internet-of-things-guide/
2. https://www.theinternetofthings.eu/
3. https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/
4. https://www.coursera.org/learn/iot
5. https://onlinecourses.nptel.ac.in/noc21_ee85/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	2	-	-	-	-	-	-	-	-			
2	3	-	3	2	-	-	-	-	-	-	-	-			
3	2	3	2	-	-	-	-	-	-	-	-	-			
4	2	2	2	-	-	-	-	-	-	-	3	-			
5	2	3	2	-	3	-	-	-	-	-	3	-			

Correlation Level: 1-Low, 2-Medium, 3-High

U20ECO706	SENSORS FOR INDUSTRIAL APPLICATIONS	L	T	P	C	Hrs
		3	0	0	3	45

(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME and Mechatronics)

Course Objectives

- To study principles of sensor and calibration
- To understand different types of motion sensors
- To demonstrate force, magnetic and heading sensors with its application to the learners
- To enhance students to understand the concept of optical, pressure and temperature sensor
- To select suitable sensor for industrial application

Course Outcomes

After completion of the course, students will be able to

CO1 - Explain principles of sensor and illustrate the calibration (K2)

CO2 - Demonstrate different types of range and sensors (K3)

CO3 - Determine the principles of Force, magnetic and heading sensors (K3)

CO4 - Describe different optical and thermal sensors (K2)

CO5 - Select suitable sensor for real time applications (K3)

UNIT I INTRODUCTION (9 Hrs)

Principles of Physical and Chemical Sensors: Sensor classification, Sensing mechanism of Mechanical,Electrical, Thermal, Magnetic, Optical, Chemical and Biological Sensors.

Sensor Characterization and Calibration: Study of Static and Dynamic Characteristics, Sensor reliability,aging test, failure mechanisms and their evaluation and stability study.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS (9 Hrs)

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS (9 Hrs)

Strain Gage, Load Cell and Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive –Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS (9 Hrs)

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement. Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V APPLICATIONS OF SENSORS (9 Hrs)

Applications of Sensors for Industry Automation - Design of smart Industry using Temperature, Humidity and Pressure sensors - Applications of Flow sensors in Industries-Applications of Gyro sensor. Applications of Position sensors.

Text Books

1. Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., second edition 2005(revised).
2. Renganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2005(revised).
3. Ernest O. Doebelin, "Measurement systems Application and Design", International Student Edition, VIEdition, Tata McGraw-Hill Book Company, 2012.

Reference Books

1. Kr.Iniewski, "Smart Sensors for Industrial Applications" ,CRC Press ,2017
2. Bolton W, "Mechatronics", Thomson Press, third edition, 2004.
3. Ian R Sinclair, —Sensors and Transducersl, Third Edition, Newnes publishers, 2001.
4. Robert B. Northrop, "Introduction to Instrumentation and Measurement", 3rd Edition", CRC – Press –Taylor and Francis Group, 2005
5. Curtis D. Johnson, "Process Control Instrumentation Technology", Prentice Hall International Edition,2015.

Web Resources

1. https://www.first-sensor.com/en/applications/industrial/
2. https://www.finoit.com/blog/top-15-sensor-types-used-iot/
3. https://www.iaasiaonline.com/smart-sensors-for-industrial-applications-2/
4. https://www.plantautomation-technology.com/articles/types-of-sensors-used-in-industrial-automation
5. https://www.thomasnet.com/articles/instruments-controls/sensors/

COs /POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	-	-	-	-	-	-	-	1			
2	3	-	3	-	-	-	-	-	-	-	-	1			
3	2	2	3	-	-	-	1	-	-	-	-	-			
4	2	2	3	-	-	-	1	-	-	-	-	1			
5	2	2	3	-	-	-	1	-	-	-	-	1			

Correlation Level: 1-Low, 2-Medium, 3- High

		L	T	P	C	Hrs
U20ITCM08	**AUTOMATION TECHNIQUES & TOOLS - DEVOPS** (Common to EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME and Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- The Background and mindset of Devops
- To enable students appreciate the agile led development environment.
- To give the students a perspective to grasp the need for Minimum viable product led development using Sprints.
- To enable students acquire fundamental knowledge of CI/CD and CAMS.
- To enable learners realize various aspects of DevOps Ecosystem.

Course Outcomes

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

CO1 - Explain traditional software development methodologies like waterfall.
CO2 - Apply the Agile Methodology and comparing various other software development models with agile.
CO3 - Explain implementing Continuous Integration and Continuous Delivery.
CO4 - Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing).
CO5 - Create quick MVP prototypes for modules and functionalities.

UNIT I TRADITIONAL SOFTWARE DEVELOPMENT (9 Hrs)

The Advent of Software Engineering - Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation - Developers vs IT Operations conflict.

UNIT II RISE OF AGILE METHODOLOGIES (9 Hrs)

Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan

UNIT III INTRODUCTION DEVOPS (9 Hrs)

Introduction to DevOps - Version control - Automated testing - Continuous integration - Continuous delivery - Deployment pipeline - Infrastructure management – Databases

UNIT IV PURPOSE OF DEVOPS (9 Hrs)

Minimum Viable Product- Application Deployment- Continuous Integration- Continuous Delivery.

UNIT V CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING) (9 Hrs)

CAMS – Culture, CAMS – Automation, CAMS – Measurement, CAMS – Sharing, Test-Driven Development, Configuration Management-Infrastructure Automation- Root Cause Analysis- Blamelessness- Organizational Learning

Text Books

1. Dev Ops – Volume 1 , Pearson and Xebia Press
2. Grig Gheorghiu, Alfredo Deza, Kennedy Behrman, Noah Gift, Python for DevOps,2019

Reference Books

1. The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
2. What is DevOps? - by Mike Loukides
3. Joakim Verona, Practical DevOps ,2016.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
4	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20ITO706	AUGMENTED AND VIRTUAL REALITY (Common to EEE, ICE, MECH, CIVIL, CCE and BME)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn basics of VR and AR systems
- To know about basic Augment reality functions
- To know about basic Virtual reality functions
- To know about Virtual reality environment and steps to work on it
- To learn various application on AR and VR

Course Outcomes

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

CO1 - Understand the concepts of VR
CO2 - Work on different VR modelling Process
CO3- Learn applications of virtual reality environment
CO4- Understand and work on Augmented Reality environment
CO5 - Work on applications related to VR and AR

UNIT I VIRTUAL REALITY AND 3D COMPUTER GRAPHICS (9Hrs)

Introduction - Benefits of virtual reality - The Virtual world space – Positioning the virtual observer – Stereo perspective projection – 3D clipping – Color Theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms

UNIT II VR MODELLING PROCESS (9Hrs)

Geometric modeling – kinematics modeling- physical modeling – behaviour modeling – model Management.

UNIT III CONTENT CREATION CONSIDERATIONS FOR VR (9Hrs)

Methodology and terminology - user performance studies - VR health and safety issues – Usability of virtual reality system - cyber sickness -side effects of exposures to virtual reality environment

UNIT IV AUGMENTED REALITY (AR) (9Hrs)

Introduction – Benefits of AR – Key players of AR technology - Understanding Augmented reality - Working with AR and System structure

UNIT -V APPLICATIONS ON VR (9Hrs)

Medical applications- robotics applications- Advanced Real time Tracking-other applications- games, movies, simulations

Text Books

1. Kelly S. Hale , Kay M. Stanney," Handbook of Virtual Environments: Design, Implementation, and Applications", Human Factors and Ergonomics ,Second Edition , 2014.
2. C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Gregory, John Wiley and Sons, Inc., Second Edition, 2008.
3. Jason Jerald, "The VR Book: Human-Centred Design for Virtual Reality". Association for Computing Machinery and Morgan and Claypool, New York, 2015.

Reference Books

1. Dieter Schmalstieg and Tobias Hollerer ,"Augmented Reality: Principles and Practice (Usability) " , Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016.
2. Steve Aukstakalnis , "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability)", Addison-Wesley Professional; 1 edition, 2016.
3. Tony Parisi , "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", OReilly Media, 1st edition, 2015.

4. Tony Parisi ,"Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages", OReilly Media, 1st edition, 2014.

Web References

1. https://www.coursera.org/courses?query=augmented%20reality
2. https://nptel.ac.in/courses/106/106/106106138/
3. http://www.vrmedia.it/en/xvr.html
4. http://www.hitl.washington.edu/artoolkit/

COs/POs/PSOs Mapping

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2	2	1	-	-	2	-	-	-	-	2	-	2	1	2	3
3	2	1	-	-	2	-	-	-	-	2	-	2	1	2	3
4	2	1	-	-	2	-	-	-	-	2	-	2	1	2	3
5	2	1	-	-	2	-	-	-	-	2	-	2	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20ICO705	INDUSTRIAL AUTOMATION	L	T	P	C	Hrs
		3	0	0	3	45

(Common to EEE, ECE, CSE, MECH, IT, CIVIL, CCE, BME and Mechatronics)

Course Objectives

- To know about the design of a system using PLC.
- To study about PLC Programming
- To study knowledge on application of PLC
- To have an exposure SCADA architecture
- To know about the fundamentals of DCS.

Course Outcomes

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

CO1- Know the fundamentals of data networks and Understand working of PLC,I/O modules of PLC, automation and applications in industry.

CO2- Know about the design of systems using PLC and PLC programming.

CO3- Acquire knowledge on application of PLC

CO4- Know about the SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software.

CO5- Know the fundamentals of DCS.

UNIT I PLC ARCHITECTURE (9 Hrs)

Introduction and overview of Industrial automation – Block diagram of PLC – different types of PLC – Type of input and output – Introduction to relay logic- Application of PLC.

UNIT II PLC PROGRAMMING (9 Hrs)

Introduction to Ladder logic programming – Basic instructions – Timer and Counter instruction Arithmetic and logical instruction – MCR, PID controller and other essential instruction sets - Case studies and examples for each instruction set.

UNIT III APPLICATION OF PLC (9 Hrs)

Introduction to high level PLC language – Programming of PLC using simulation software – Real time interface and control of process rig/switches using PLC.

UNIT IV INTRODUCTION OF SCADA (9 Hrs)

Introduction to DCS and SCADA - Block diagram – function of each component – Security objective – Operation and engineering station interface – Communication requirements.

UNIT V DISTRIBUTED CONTROL SYSTEM (9 Hrs)

Development of different control block using DCS simulation software – Real time control of test rigs using DCS. Introduction to HART, Field bus and PROFIBUS – Application and case studies of large scale process control using DCS.

Text Books

1. John W. Webb and Ronald A Reis, “Programmable Logic Controllers - Principles and Applications”, Prentice Hall Inc., New Jersey, 5th Edition, 2002.
2. Lukcas M.P, “Distributed Control Systems”, Van Nostrand Reinhold Co., New York, 1986.
3. Frank D. Petruzella, “Programmable Logic Controllers”, McGraw Hill, New York, 4th Edition, 2010.

Reference Books

1. Deshpande P.B and Ash R.H, Elements of Process Control Applications, ISA Press, New York, 1995.
2. Curtis D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi, 8th Edition, 2005.
3. Krishna Kant, Computer-based Industrial Control, Prentice Hall, New Delhi, 2 nd Edition, 2011.

Web Resources

1. https://nptel.ac.in/courses/108105063/
2. https://www.google.com/amp/s/controlstation.com/what-is-a-distributed-control-system/amp/
3. https://nptel.ac.in/courses/108/105/108105088/
4. https://onlinecourses.nptel.ac.in/noc20_me39/preview
5. https://nptel.ac.in/content/syllabus_pdf/108105088.pdf.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	-	-	1	-	-	-	1	1	2	2	3	2
2	3	3	1	-	-	1	-	-	-	1	1	2	2	3	2
3	3	2	1	-	-	1	-	-	-	1	1	2	2	3	2
4	2	3	1	-	-	1	-	-	-	1	1	2	2	3	2
5	3	2	1	-	-	1	-	-	-	1	1	3	2	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

U20CEO706	GLOBAL WARMING AND CLIMATE CHANGE (Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS and FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basics and importance of global warming.
- Gain adequate knowledge about the characteristic of atmosphere components.
- Gain knowledge about impart of climate change.
- Gain knowledge about the Changes in Climate and Environment
- Impart knowledge about the mitigation measures

Course Outcomes

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

CO1 - Understand the concept and effects of global warming **(K2)**
CO2 - Understand Climate system, earth's atmosphere and its components**.(K2)**
CO3 - Analyze the Impacts of Climate Change on various sectors **(K4)**
CO4 - Assess the concept about carbon credit and clean development mechanism.**(K3)**
CO5 - Understand climate changes, its impact and mitigation activities.**(K2)**

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I EARTH'S CLIMATE SYSTEM (9 Hrs)

Ozone layer-Role of ozone in environment-ozone depleting -Green House gases- Effects of Greenhouse Gases-Global Warming -Hydrological Cycle – Radiative Effects and Carbon Cycle.

UNIT II ATMOSPHERE AND ITS COMPONENTS (9 Hrs)

Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE (9 Hrs)

Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV OBSERVED CHANGES AND ITS CAUSES (9 Hrs)

Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks –The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India .

UNIT V CLIMATE CHANGE AND MITIGATION MEASURES (9 Hrs)

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels ––Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices–Carbon sequestration – Carbon capture and storage (CCS) – International and Regional cooperation- Remedial measures.

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.
2. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
3. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
4. Andrew Dessler and Edward A. Parson "The Science and Politics of Global Climate Change" 2009
5. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. JasonSmerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. van Dam,(2003) Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press,.

Web References

1. https://nptel.ac.in/courses/105102089/
2. https://www.warmheartworldwide
3. https://nptel.ac.in/content/storage

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	3	3	3	3	3	3	3	3	3	2	2	3
2	3	3	2	3	3	3	3	3	3	2	3	3	3	3	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	2	3	3	2	3	3	3	3	3	3	3	3	2	3	3
5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

		L	T	P	C	Hrs
U20ADO705	**DATA SCIENCE APPLICATION OF NLP** (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME and Mechatronics)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To introduce the fundamental concepts and techniques of Natural language Processing(NLP)
- To analyzing words based on Text processing.
- To analyzing words based on Morphology.
- To examine the syntax and language modeling
- To get acquainted with syntax and semantics

Course Outcomes

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

CO1 - Understand the principles and process the Human Languages such as English using computers. **(K2)**

CO2 - Creating CORPUS linguistics based on digestive approach (Text Corpus method). **(K2)**

CO3 - Demonstrate the techniques for text-based Processing of NLP with respect to morphology. **(K4)**

CO4 - Perform POS tagging for a given natural language. **(K3)**

CO5 - Check the syntactic and semantic correctness of sentences using grammars and labelling. **(K3)**

UNIT I INTRODUCTION TO NLP (9 Hrs)

Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, and machine translation.

UNIT II TEXT PROCESSING (9 Hrs)

Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis.

UNIT III MORPHOLOGY (9 Hrs)

Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers.

UNIT IV LEXICAL SYNTAX AND LANGUAGE MODELING (9 Hrs)

Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multi-word Expressions - The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

UNIT V SYNTAX AND SEMANTICS (9 Hrs)

Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense. Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs. Applications of NLP.

Text Books

1. Dan Jurafsky, James H. Martin, “Speech and Language Processing”, Third Edition, Prentice Hall, 2018.
2. Emily Bender, “Linguistics Fundamentals for NLP”, Morgan Claypool Publishers, 2013.
3. Jacob Eisenstein, “Introduction to Natural Language Processing”, MIT Press, 2019.

Reference Books

1. Chris Manning, Hinrich Schuetze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.
2. Cole Howard, Hobson Lane, Hannes Hapke, “Natural Language Processing in Action” Manning Publication 2019.
3. Li Deng, Yang Liu “Deep Learning in Natural Language Processing” Springer, 2018.

4. Tom Hoobyar, Tom Dotz, Susan Sanders, “NLP The Essential Guide to Neuro-Linguistic Programming”, William Morrow Paperbacks, 2013.
5. Kate Burton, “Coaching With NLP For Dummies”, Wiley, 2011.

Web Resources

1. https://machinelearningmastery.com/natural-language-processing/
2. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1
3. https://www.nlp.com/what-is-nlp/

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2	2	2	1	–	–	-	-	-	-	-	-	-	1	1	1
3	2	2	1	2	–	-	-	-	-	-	-	-	-	1	1
4	1	2	2	2	1	-	-	-	-	-	-	-	1	-	2
5	2	1	2	2	1	-	-	-	-	-	-	-	1	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

	ARTIFICIAL INTELLIGENCE APPLICATIONS	L	T	P	C	Hrs
U20ADO706	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE and BME)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To study the basic design concept of AI.
- To understand the Machine learning concepts.
- To learn the concept of Deep learning and its applications
- To learn the concept of RPA.
- To acquire the skill to design a chatbot using NLP.

Course Outcomes

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

CO1 - Apply the concept of data science. **(K3)**

CO2 - Understand the concept of Machine learning. **(K2)**

CO3 - Understand the concept of Deep Learning. **(K2)**

CO4 - Apply the design ideas in RPA. **(K3)**

CO5 - Make use of NLP concepts to create chatbot. **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction – Alan Turing and Turing test - The rise and fall of expert system - technological drivers of modern AI -Structure of AI - Data: types of Data - Big Data - Database and other tools - Data Process - Ethics and Governance - Data terms.

UNIT II MACHINE LEARNING (9 Hrs)

Machine learning - Standard deviation - the normal distribution - Naive Bayes Classifier - K-Nearest Neighbor - Linear regression - K-Means Clustering.

UNIT III DEEP LEARNING (9 Hrs)

Deep Learning - Difference between Deep Learning and Machine learning – ANN – Backpropagation – RNN – CNN – GAN - Deep Learning Applications - Use Case: detecting Alzheimer's Disease - Deep Learning Hardware - When to use Deep Leaning? - Drawbacks of deep learning.

UNIT IV ROBOTIC PROCESS AUTOMATION (9 Hrs)

RPA - pros and cons of RPA - Determine the right function to automate - assess the processes - RAP and AI - RPA in the real world.

UNIT V NATURAL LANGUAGE PROCESSING (9 Hrs)

Challenges of NLP - Understanding How AI translated Language - NLP in real World - Voice Commerce - Virtual assistants – Chatbot - Future of NLP - The Future of AI.

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing" Third Edition. 2000.
2. S. Kanimozhi Suguna, M. Dhivya, Sara Paiva, "Artificial Intelligence (AI) Recent Trends and Applications" CRC Press, 2021.
3. Navin Sabharwal; Amit Agrawal, "Cognitive Virtual Assistants Using Google Dialogflow" Apress, 2020.

Reference Books

1. Durkin, J., “Expert systems Design and Development”, Macmillan, 1994.
2. Peter Jackson, “Introduction to Expert Systems”, Addison Wesley Longman, 1999.
3. Amir Shevat,” Designing Bots: Creating Conversational Experiences” O'Reilly, 2017.
4. Anik Das and Rashid Khan,“Build Better Chatbots: A Complete Guide to Getting Started with Chatbots” Apress,2017.
5. Akhil Mittal “Getting Started with Chatbots: Learn and create your own chatbot with deep understanding of Artificial Intelligence and Machine Learning” BPB Publications,2019

Web Resources

1. https://www.javatpoint.com/application-of-ai
2. https://pytorch.org/tutorials/beginner/chatbot_tutorial.html
3. https://www.mygreatlearning.com/blog/basics-of-building-an-artificial-intelligence-chatbot/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-3-reasoning-goal-trees-and-rule-based-expert-systems/
5. http://www.umsl.edu/~joshik/msis480/chapt11.htm

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	1	-	-	-	-	-	-	-	-	1	2
2	2	1	1	1	2	-	-	-	-	-	-	-	1	1	1
3	2	2	1	2	2	-	-	-	-	-	-	-	-	1	1
4	1	2	2	2	1	-	-	-	-	-	-	-	2	-	1
5	2	2	2	2	1	-	-	-	-	-	-	-	1	1	-

Correlation Level: 1-Low, 2-Medium, 3- High

SEMESTER VIII

U20ADCM02 BLOCK CHAIN AND CRYPTOGRAPHY

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn about Block Chain concept.
- To understand the concept of Smart Contracts.
- To learn various concepts of Cryptography and Other Technologies.
- To understand and implementation of blockchain .
- To understand various concept and implementation of Bitcoin.

Course Outcomes

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

CO1 - Learn about Block Chain concept.
CO2 - Concept of Smart Contracts.
CO3 - Various concepts of Cryptography and Other Technologies.
CO4 - Implementation of blockchain.
CO5 - Various concept and implementation of Bitcoin.

UNIT 1 BLOCK CHAIN **9Hrs.**

Introduction to crypto economics - Byzantine agreement - Extensions of BFT (Ripple, Stellar) - Blockchain Dynamics - Public and private blockchains - Hard and soft forks - Sharding Side chain - Verifiers – trust, cost and speed - Proof of work and other models.

UNIT 2 SMART CONTRACTS **9Hrs.**

Distributed Virtual Machines, Smart Contracts, Oracles - Basics of contract law - Smartcontracts and their potential Trust in Algorithms, - Integration with existing legal systems - OpenZeplin, OpenLaw- Writing smart contracts.

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UNIT 3 CRYPTOGRAPY AND OTHER TECHNOLOGIES. **9Hrs.**

Application of Cryptography to Blockchain - Using hash functions to chain blocks - Digital Signatures to sign transactions - Using hash functions for Proof-of-Work. - Putting the technology together – examples of implementations with their tradeoffs.

UNIT 4 IMPLEMENTATION. **9Hrs.**

Supply Chain and Identity on Blockchain - Blockchain interaction with existing infrastructure – Trust in blockchain data - Scaling Blockchain – reading and writing data. Differentiate nodes, sparse data and Merkle trees - Fixing on the fly – Layer 2 solutions - Lightning and Ethereum state channels

UNIT 5 BITCOIN. **9Hrs.**

- The big picture of the industry – size, growth, structure, players - Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT) - Strategic analysis of the space –Major players: Blockchain platforms, regulators, application providers, etc. - Bitcoin, HyperLedger, Ethereum, Litecoin, Zcash .

TEXT BOOKS

1. Don Tapscott, Alex Tapscott, “Blockchain Revolution”, Portfolio, 2018.
2. Paul Vigna, Michael J. Casey, “The Age of Cryptocurrency”, Picador,2016.
3. Alan T. Norman, “Blockchain Technology Explained”, CreateSpace Independent Publishing Platform, 2017.
4. Bahga, Vijay Madisetti, “Block chain Applications: A Hands-On Approach”, Arshdeep Bahga, Vijay Madisetti publishers 2017.
5. Roger Wattenhofer, The Science of the Blockchain, First Edition, CreateSpace 2017

REFERENCE BOOKS

1. Mark Gates, “Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, “Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer”, 2018.
3. Joseph Bonneau and Arvind Narayanan, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, First Edition, Princeton University Press, 2016.
4. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Crypto currencies”, O'Reilly Media, Inc. 2014.
5. Melanie Swa, “Block chain”, O’Reilly Media 2014.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106105184/
2. https://www.simplilearn.com/tutorials/blockchain-tutorial
3. https://www.edureka.co/blog/blockchain-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	1	1	1	2	1	-
2	3	2	1	1	-	-	-	-	-	1	1	1	2	1	-
3	3	2	1	1	-	-	-	-	-	1	1	1	2	1	-
4	3	2	1	1	-	-	-	-	-	1	1	1	2	1	-
5	3	2	1	1	-	-	-	-	-	1	1	1	2	1	-

U20HSP804 ENTREPRENEURSHIP MANAGEMENT

L	T	P	C	Hrs
0	0	2	1	45

Course Objectives

- To develop an ability to identify the critical challenges hindering growth of entrepreneurs
- To understand the significance of Finance Skills, Branding, and Sales Skills for an Entrepreneur
- To be aware of various Government Schemes and Subsidies available for Entrepreneurs

Course Outcomes

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

CO1: Develop and demonstrate the business models. **(K2)**

CO2: Practice cash management, brand building and enhancing turnover. **(K6)**

CO3: Understand various schemes and subsidies that are offered by various Government agencies. **(K2)**

CO4: Effectively tackle growth challenges of their venture. **(K5)**

CO5: Manage and grow their business in terms of expansion and look for partnerships. **(K3)**

UNIT I: ENTRPRENEURIAL SKILLS 1 (6 Hrs)

Introduction to Business Model Generation , Developing Lean Business Model for the Business Idea, Developing Prototype and Evaluating assumptions in Business Model using prototype cheaply, Presentation of Business Model, Business Fair

UNIT II: ENTREPRENEURIAL SKILLS 2 (6 Hrs)

Financial Skills – Cash Management – Problems of Poor Cash Management – Learning to be Frugal. Branding – Building a 'niche' follower for your product/service – Developing and Establishing a Brand, Sales skills – KPI of Success of Entrepreneurship – Ensuring Growth in Turnover

UNIT III: ENTREPRENEURIAL OPPORTUNITIES (6 Hrs)

Awareness of Government Schemes and Subsidies for various Entrepreneurial Categories – Special Schemes for Women Entrepreneurs – Understanding the Procedure and Documentation Process for availing the Government Schemes – Venture Capital – Crowdfunding – Angel Investors.

Report Submission:

1. How can I get first 100 customers to pay for my products/services?
2. Information technology as a resource
3. Marketing skill and promotion for entrepreneurs
4. Assessment of factors affecting performance of women entrepreneurs
5. Entrepreneurship as a tool for sustainable employment
6. Examination of problem facing small scale business
7. Survival strategies in small business
8. The role of insurance in minimizing business risk

Text Books

1. Storey, D. J., & Greene, F. J. (2010). *Small business and entrepreneurship*. Financial Times/Prentice Hall.
2. Scarborough, N. M. (2011). *Essentials of entrepreneurship and small business management*. Prentice Hall.
3. Gupta C.B., & Srinivasan N.P. (2020). *Entrepreneurial Development*. Sultan Chand and Sons

Reference Books

1. Brian Tracy – The Psychology of Selling.
2. Dale Carnegie – How to Win Friends & Influence People.
3. Robert Kiyosaki and Sharon Lechter – Rich Dad, Poor Dad.
4. Reid Hoffman – The Startup of You: Adapt to the Future, Invest in Yourself, and Transform Your Career.
5. Michael E. Gerber – The E-Myth Revisited.
6. Chris Guillebeau – The Art of Non-Conformity.
7. Eric Ries – The Lean Startup.
8. Kevin D. Johnson – The Entrepreneur Mind.

Web References

1. https://www.helpguide.org/articles/stress/stress-management.htm
2. https://bscdesigner.com/8-entrepreneurial-kpis.htm
3. https://www.inc.com/ilya-pozin/5-problems-most-entrepreneurs-face.html
4. https://www.inc.com/jessica-stillman/how-to-network-with-super-successful-people.html
5. https://www.entrepreneur.com/article/251603
6. https://seraf-investor.com/compass/article/understanding-crowdfunding

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	3	1	2	2	1	3	1	1	3	2	2	2	3	3
2	1	1	2	2	1	1	3	2	2	3	3	2	2	2	2
3	1	2	1	1	1	2	3	2	2	3	3	2	1	2	3
4	1	2	2	2	2	3	3	3	3	3	2	3	2	2	2
5	1	2	2	2	2	3	3	3	3	3	2	3	2	2	2

U20CSW803	PROJECT PHASE-II	L	T	P	C	Hrs
		0	0	16	8	60

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.
- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - Use the techniques and skills for the project. **(K3)**

CO2 - Identify, formulate, and solve engineering problems**.(K3)**

CO3 - Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health care, safety and sustainability **(K4)**

CO4 - Develop presentation skills. **(K4)**

CO5 - Develop project management skills. **(K4)**

Exercises

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

- Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

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1	3	2	1	1	-	-	-	-	-	-	3	3	2	2	3
2	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
3	3	3	2	2	3	-	-	3	-	-	3	3	2	2	3
4	3	3	2	2	3	-	-	-	-	-	3	3	2	2	3
5	3	3	2	2	3	-	-	-	-	-	3	3	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSS809	SKILL DEVELOPMENT COURSE 9 (NPTEL / MOOC - II)	L	T	P	C	Hrs
		0	0	0	-	30

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

PROFESSIONAL ELECTIVES - V

		L	T	P	C	Hrs
U20CSE821	**ETHICAL HACKING**	3	-	-	3	45

Course Objectives

- Investigate how to attack a computer system.
- Explore low tech hacking techniques Investigate web-based hacking.
- Explore wireless network hacking.
- Investigate Trojans and other attacks.
- Perform penetration testing.

Course Outcomes

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

CO1 - Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system.

CO2 - Identify tools and techniques to carry out a penetration testing.

CO3 - Critically evaluate security techniques used to protect system and user data.

CO4 - Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.

CO5 - Develop a practical understanding of the current cyber security issues.

UNIT I **(9 Hrs)**

Ethical Hacking Introduction - Attack Scenarios - Emulating Cyber Attacks - Cyber Laws - Programming (C, Python, Assembly Language Basics, Computer Memory)

UNIT II **(9 Hrs)**

Scope of Hacking Red Team Operations - Purple Team Operation - Bug Bounty Programs- Vulnerability Data Resources – Exploit Databases – Network Sniffing – Types of Sniffing -Promiscuous versus Nonpromiscuous Mode – MITM Attacks – ARP Attacks – Denial of Service Attacks -Hijacking Session with MITM Attack.

UNIT III **(9 Hrs)**

System Exploitation Basic System Exploits - Windows Exploits - Powershell Exploitation - Web Application Exploitation

UNIT IV **(9 Hrs)**

Malware Analysis Study of Malware - Mobile Malware –Ransomware.- Penetration Test – Vulnerability Assessments versus Penetration Test – Pre-Engagement – Rules of Engagement -Penetration Testing Methodologies – OSSTMM – NIST – OWASP.

UNIT V **(9 Hrs)**

Internet-of-Things Introduction - Embedded Devices – Exploitation - Wireless Hacking – Introducing Aircrack-Cracking the WEP – Cracking a WPA/WPA2 Wireless Network Using Aircrack-ng – Evil Twin Attack – Causing Denial of Service on the Original AP – Web Hacking – Attacking the Authentication – Brute Force and Dictionary Attacks.

Text Books

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, Gray Hat Hacking The Ethical Hacker's Handbook, McGraw-Hill, 5th Edition, 2018.
2. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010.
3. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide”, CRC Press, 2014.

Reference Books

1. Sean-Philip Oriyano, Hacker Techniques, Tools, and Incident Handling, Jones and Bartlett Learning LLC, 3rd Edition, 2018.
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010.
3. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007.
4. Rajat Khare, "Network Seuciryt and Ethical Hacking", Luniver Press, 2006.
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003.

Web Resources

1. https://freedomhacker.net › Internet Security.
2. https://www.guru99.com/c-sharp-tutorial.html.
3. https://www.w3schools.in/ethical-hacking/
4. https://www.javatpoint.com/ethical-hacking-tutorial
5. https://www.tutorialspoint.com/ethical_hacking/index.htm

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CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	3	3	2	2	3
2	3	2	1	1	3	-	-	-	-	-	3	3	2	2	3
3	3	3	2	2	3	-	-	3	-	-	3	3	2	2	3
4	3	3	2	2	3	-	-	-	-	-	3	3	2	2	3
5	3	3	2	2	3	-	-	-	-	-	3	3	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20ITCM09	DEEP LEARNING (Common to IT, CSE and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand Neural Network basics and Types
- To understand Convolutional Neural Networks and its architecture
- To understand and implement Recurrent Neural Network
- To understand the Boltzmann Machine Spin Glass Model and Deep Belief Networks
- To learn various Applications of Deep Learning

Course Outcomes

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

CO1 - Discuss the basics of Neural Network and its types **(K2)**
CO2 - Describe Convolutional Neural Networks and its architecture **(K2)**
CO3 - Implement Recurrent Neural Network and different Neural network model **(K3)**
CO4 - Describe the Spin Glass Model and Deep Belief Networks **(K2)**
CO5 - Apply Deep Learning Techniques **(K3)**

UNIT I INTRODUCTION TO NEURAL NETWORK(NN) (9 Hrs)

Introduction to NN - Neural Networks and types - Gradient descent - Training Neural Networks - Sentiment Analysis - Deep Learning With Pytorch

UNIT II CONVOLUTIONAL NEURAL NETWORK(CNN) (9 Hrs)

Convolutional Neural Network - CNNs Architectures - Weight Initialization - Autoencoders - Transfer Learning in PyTorch - Deep Learning for Cancer Detection

UNIT III RECURRENT NEURAL NETWORK(RNN) (9 Hrs)

Recurrent Neural Network - Long Short-Term Memory Network - Implementation of RNN & LSTM - Hyperparameters - Embeddings & Word2vec - Sentiment Prediction RNN

UNIT IV BOLTZMANN MACHINES (9 Hrs)

Introduction to Boltzmann Machine - Energy-Based Models - Restricted Boltzmann Machine - Contrastive Divergence - Deep Belief Networks - Deep Boltzmann Machine

UNIT V DEEP LEARNING APPLICATIONS (9 Hrs)

Image Processing - Natural Language Processing - Speech Recognition - Video Analytics

Text Books

1. Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, “Dive into Deep Learning”, Amazon Science,2022
2. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017
3. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018

Reference Books

1. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018
2. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018
3. Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016

Website References

1. https://link.springer.com/book/10.1007/978-3-319-73004-2
2. http://deeplearning.net/reading-list/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	2	-	-	-	-	-	-	2	2	2	3
2	3	2	1	1	2	-	-	-	-	-	-	2	2	2	3
3	2	2	-	-	2	-	-	-	-	-	-	2	2	2	3
4	3	2	1	1	2	-	-	-	-	-	-	2	2	2	3
5	3	2	2	1	2	-	-	-	-	-	-	2	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20ITCM02	MOBILE COMPUTING (Common to IT and CSE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basic concepts of mobile computing
- To be familiar with the network protocol stack
- To learn the basics of mobile telecommunication system
- To be exposed to Ad-Hoc networks
- To gain knowledge about different mobile platforms and application development

Course Outcomes

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

CO1 - Explain the basics of mobile telecommunication system **(K2)**
CO2 - Articulate the required functionality at each layer for given application **(K2)**
CO3 - Identify solution for all functionality at each layer. **(K1)**
CO4 - Use simulator tools and design Ad hoc networks **(K3)**
CO5 - Develop a mobile application **(K6)**

UNIT I INTRODUCTION (9 Hrs)

Mobile Computing – Mobile Computing vs. Wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER (9 Hrs)

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Mobile TCP – WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT III MOBILE TELECOMMUNICATION SYSTEM (9 Hrs)

Global System for Mobile Communication (GSM) – Services & Architecture- Protocol-Connection Establishment – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS) – Handover - Security.

UNIT IV MOBILE AD-HOC NETWORKS (9 Hrs)

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET vs. VANET – Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS (9 Hrs)

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M- Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

Text Books

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.
2. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007
3. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

Reference Books

1. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

Web Resources

1. Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter: http://developer.windowsphone.com 9. BlackBerry Developer : http://developer.blackberry.com/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
2	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
3	2	1	-	-	2	2	3	2	2	2	2	2	2	3	2
4	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
5	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20CSE824	PERVASIVE COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study the pervasive computing and its applications
- To study the pervasive computing web based applications
- To study voice enabling pervasive computing
- To study PDA in pervasive computing
- To study user interface issues in pervasive computing

Course Outcomes

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

CO1 - Be able to learn pervasive computing devices and interfaces.
CO2 - Be able to learn XML role in pervasive computing.
CO3 - To get clear idea about WAP architecture and security.
CO4 - Be able to learn speech application in pervasive computing.
CO5 - Become familiar with different voice standards. Identify user interface issues in pervasive computing.

UNIT I INFRASTRUCTURE (9 Hrs)

Pervasive computing infrastructure-applications-Device Technology -Hardware, Human-machine Interfaces, Biometrics, and Operating systems–Device Connectivity –Protocols, Security, and Device Management

UNIT II WEB BASED APPLICATIONS (9 Hrs)

Pervasive Computing and web based Applications: - XML, XML Schema and DTD document definitions - XSLT transformations and programming - XML and its role in Pervasive Computing - Wireless Application Protocol (WAP) Architecture and Security - Wireless Mark-Up language (WML).

UNIT III VOICE ENABLING PERVASIVE COMPUTING (9 Hrs)

Voice Enabling Pervasive Computing: - Voice Standards - Speech Applications in Pervasive Computing and security. Middleware for Pervasive: Adaptive middleware, Context aware middleware, Mobile middleware, Service Discovery, Mobile Agents.

UNIT IV PDA IN PERVASIVE COMPUTING (9 Hrs)

PDA in Pervasive Computing: – Introduction - PDA software Components, Standards, emerging trends - PDA Device characteristics - PDA Based Access Architecture. Security in Pervasive Computing: Security and Privacy in Pervasive Networks, Experimental Comparison of Collaborative Defence Strategies for Network Security.

UNIT V DESIGN OF PERVASIVE COMPUTING SYSTEMS (9 Hrs)

Design of pervasive computing systems, The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, User Interface Issues in Pervasive Computing, Architecture: - Smart Card- based Authentication Mechanisms - Wearable computing Architecture.

Text Books

1. JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaec& Klaus Rindtorff. --- Pervasive Computing Technology and Architecture of Mobile Internet Applications, Addision Wesley, Reading, 2002.
2. Uwe Hansman, LothatMerk, Martin S Nicklous& Thomas Stober: Principles of Mobile Computing, Second Edition, Springer- Verlag, New Delhi, 2003.
3. Jochen Burkhardt, “Pervasive Computing - Technology and Architecture of Mobile Internet Applications”, 14th Edition, 2004

Reference Books

1. Rahul Banerjee: Internetworking Technologies: An Engineering Perspective, Prentice –Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5)
2. Rahul Banerjee: Lecture Notes in Pervasive Computing, Outline Notes, BITS-Pilani, 2003.
3. Mohammad S. Obaidat, Mieso Denko, Isaac Woungang, “Pervasive Computing and Networking”, 2011.
4. A. Genco and S. Sorce, “Pervasive Systems and Ubiquitous Computin”, University of Palermo, 2010.
5. Varuna Godara, “Strategic Pervasive Computing Applications: Emerging Trends”,Ist Edition, 2017.

Web Resources

1. https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing
2. https://navveenbalani.dev/index.php/articles/the-complete-pervasive-computing-tutorial/
3. https://www.goodreads.com

COs/POs/PSOsMapping

COs	ProgramOutcomes(POs)												Program SpecificOutcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
2	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
3	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
4	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
5	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2

CorrelationLevel:1-Low,2-Medium,3-High

		L	T	P	C	Hrs
U20CSE825	CYBER SECURITY AND DIGITAL FORENSICS	3	0	0	3	45

Course Objectives

- To define the fundamental ideas behind Cyber Security.
- To define the fundamental ideas behind Cybercrime and cyber Investigations.
- To explain the basic ideas behind Digital Forensics.
- To relate windows systems and artifacts, Linux systems and artifacts.
- To Define Current Computer Forensics Tools.

Course Outcomes

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

CO1 - Explain the core concepts of the cyber security including systems vulnerability scanning and network defence tools.
CO2 - Explain the core concepts of the Cybercrime and cyber Investigations.
CO3 - Illustrate the fundamental concepts of Digital Forensics and demonstrate their use Cyber Security.
CO4 - Relate windows systems and artifacts, Linux systems and artifacts.
CO5 - Advancing towards a Current Computer Forensics Tools.

UNIT I SYSTEMS VULNERABILITY SCANNING AND NETWORK DEFENCE TOOLS (9 Hrs)

Overview of vulnerability scanning - Networks Vulnerability Scanning - Network Sniffers and Injection tools = Firewalls and Packet Filters: Firewall Basics - Packet Filter Vs Firewall - Stateless Vs Stateful Firewalls - Network Address Translation (NAT) and Port Forwarding - Basic of Virtual Private Networks - Linux Firewall - Windows Firewall.

UNIT II INTRODUCTION TO CYBER CRIME, LAW AND CYBER CRIME INVESTIGATION (9 Hrs)

Cyber Crimes - Types of Cybercrime - Traditional Problems Associated with Computer Crime - Introduction to Incident Response - Realms of the Cyber world - Recognizing and Defining Computer Crime - Contemporary Crimes - Contaminants and Destruction of Data - Indian IT ACT 2000 - password Cracking - Keyloggers and Spyware - Virus and Warms - Trojan and backdoors..

UNIT III DIGITAL FORENSIC (9 Hrs)

Computer forensics and investigations as a profession - Understanding computer forensics - Understanding case laws - Developing computer forensics resources - Preparing for computer investigations - Understanding law enforcement agency investigations - Following the legal process - Understanding corporate investigations - Establishing company policies - Displaying warning Banners.

UNIT IV WINDOWS SYSTEMS AND ARTIFACTS, LINUX SYSTEMS AND ARTIFACTS (9 Hrs)

Windows Systems and Artifacts: Introduction - Windows File Systems - File Allocation Table - New Technology File System - File System Summary – Registry - Event Logs - Prefetch Files - Shortcut Files - Windows Executables - Linux Systems and Artifacts: Introduction - Linux File Systems - File System Layer - File Name Layer - Metadata Layer - Data Unit Layer - Journal Tools - Deleted Data - Linux Logical Volume Manager - Linux Boot Process and Services.

UNIT V Current Computer Forensics Tools (9 Hrs)

Evaluating Computer Forensics Tool Needs - Types of Computer Forensics Tools - Tasks Performed by Computer Forensics Tools - Tool Comparisons - Other Considerations for Tools - Computer Forensics Software Tools - Command-Line Forensics Tools - UNIX/Linux Forensics Tools - Other GUI Forensics Tools - Computer Forensics Hardware Tools - Forensic Workstations - Using a Write-Blocker.

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Text Books

1. John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, Syngress , 2nd edition,2014
2. Mike Shema , “Anti-Hacker Tool Kit “, Publication Mc Graw Hill Indian Edition,2014.
3. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, Syngress imprint of Elsevier.2011.

Reference Books

1. Gerard Johansen ,’Digital Forensics and Incident Response: Incident response techniques and procedures to respond to modern cyber threats’, Packt Publishing Limited; 2nd edition (29 January 2020)
2. William Oettinger,’Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence’, Packt Publishing Limited,2020
3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina God bole and Sunit Belpure, Publication Wiley.2011.
4. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Fourth Edition, Course Technology.2009.
5. Angus M.Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.

Web Resources

1. https://www.britannica.com/topic/cybercrime
2. https://www.guru99.com/digital-forensics
3. https://resources.infosecinstitute.com/computer-forensics-tools
4. https://resources.infosecinstitute.com/topic/computer-forensics-tools
5. https://www.utc.edu/document/71921

COs/POs/PSOs Mapping

CO’S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	3	1	1	1	2	1	-	1	2	3	2
2	1	1	1	1	-	1	1	1	2	1	-	1	3	3	2
3	2	1	2	1	3	3	1	1	2	1	-	1	3	3	3
4	1	1	1	1	1	-	1	1	2	1	1	1	2	2	2
5	3	1	2	1	1	2	1	1	2	1	-	1	2	3	2

PROFESSIONAL ELECTIVES - VI

U20CSE826	QUANTUM COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To explain the major concepts in Quantum computing
- To extend quantum circuits and algorithms
- To describe the building blocks of a quantum computer
- To understand the principles, quantum information and limitations of quantum operations formalism
- To discuss the quantum errors and its correction.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1 - Outline the key concepts of Quantum computing
CO2 - Develop logic gate circuits and quantum algorithms
CO3 - List the various quantum computers
CO4 - Discover quantum noise and its operations
CO5 - Illustrate errors and corrections in quantum computing

UNIT I FUNDAMENTAL CONCEPTS (9 Hrs)

Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II QUANTUM COMPUTATION (9 Hrs)

Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III QUANTUM COMPUTERS (9 Hrs)

Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance

UNIT IV QUANTUM INFORMATIONS (9 Hrs)

Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information

UNIT V QUANTUM ERROR CORRECTION (9 Hrs)

Introduction, Short code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub-Additivity, Data Compression, Entanglement as a physical resource

Text Books

1. Micheal A. Nielsen and Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian Edition, 2002.
2. Bennett C.H., Bernstein E., Brassard G., Vazirani U., The strengths and weaknesses of quantum computation. SIAM Journal on Computing.
3. Phillip Kaye Raymond Laflamme Michele Mosca, “An Introduction to Quantum Computing”, Oxford University Press, 2007.

Reference Books

1. Nayak, Chetan; Simon, Steven; Stern, Ady; Das Sarma, Sankar, “Nonabelian Anyons and Quantum Computation”, 2008.
2. P. Kaye, R. Laflamme, and M. Mosca, “An introduction to Quantum Computing”, Oxford University Press, 1999.
3. Clarke, John; Wilhelm, Frank, “Superconducting quantum bits”, 2008.
4. William M Kaminsky, “Scalable Superconducting Architecture for Adiabatic Quantum Computation”, 2004.
5. V. Sahni, “Quantum Computing”, Tata McGraw-Hill Publishing Company, 2007.

Web Resources

1. https://nptel.ac.in/courses/115101092/Quantumcomputation.
2. https://nptel.ac.in/courses/104104082/Quantumcomputing and information.
3. https://www.futurelearn.com/courses/intro-to-quantum-computing.

COs/POs/ PSOs Mapping

COs	ProgramOutcomes(POs)												Program SpecificOutcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	2	2	-	3	2	3
2	3	2	2	-	-	-	-	-	-	2	2	-	3	2	3
3	3	2	2	-	-	-	-	-	-	2	2	-	3	2	3
4	3	2	2	-	-	-	-	-	-	2	2	-	3	2	3
5	3	2	2	-	-	-	-	-	-	2	2	-	3	2	3

CorrelationLevel:1-Low,2-Medium,3-High

U20CSE827	TRUSTED COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To design the goals in the trusted platforms.
- To understand the comprehensive overview of the trust architecture and its applications.
- To experiment with TCG and to implement different tools.
- To demonstrate different encryption algorithms for security purposes.
- To learn about the trusted devices and their maintenance.

Course Outcomes

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

CO1 – Summarize the concept of trust categories.
CO2 – Demonstrate trust architecture and formalization of security architecture.
CO3 – Analyse about the TPM and TCG.
CO4 – Understand about the cryptographic standards.
CO5 – Summarize trusted computing and its administration.

UNIT I INTRODUCTION TO TRUST COMPUTING (9Hrs)

Introduction – Trust and Computing – Instantiations – Design and Applications – Progression – Motivating scenarios – Attacks. Design goals of the trusted platform modules. Introduction to simulators – Implementation of attacks.

UNIT II TRUST ARCHITECTURE (9Hrs)

Foundations – Design challenges – Platform Architecture – Security architecture – erasing secrets – sources – software threats – code integrity and code loading. Outbound Authentication – Problem – Theory – Design and Implementation - Validation – Process – strategy – Formalizing security properties – Formal verification – other validation tasks – reflection.

UNIT III TCG TCPA (9Hrs)

Programming Interfaces To TCG. Experimenting with TCPA/TCG – Desired properties- Lifetime mismatch – Architecture – Implementation – Applications. Writing a TPM device driver- Low level software – Trusted boot – TCG software stack – Using TPM keys. Implementation using simulator tools.

UNIT IV CRYPTOGRAPHIC STANDARDS (9Hrs)

TSS core service – Public key cryptography standard – Architecture – Trusted computing and secure storage – Linking to encryption algorithms – encrypting files and locking data to specific PCs-content protection – secure printing and faxing. Simulation analysis of symmetric and public key cryptographic standards - performance evaluation of these trust models.

UNIT V ADMINISTRATION OF TRUSTED DEVICES (9Hrs)

Trusted Computing And Secure Identification Administration of trusted devices – Secure /backup maintenance – assignment of key certificates-secure time reporting-key recovery – TPM tools- Ancillary hardware.

Text Books

1. Xujan Zhou, YueXu, Yuefeng Li, Audun Josang, and Clive Cox. “The state of-the-art in personalized recommender systems for social networking. Artificial Intelligence Review”, Issue C, pp.1-14, Springer, 2011.
2. Challener D., Yoder K., Catherman R., Safford D., Van Doorn L. “A Practical Guide to Trusted Computing”, IBM press, 2008.
3. Sean W. Smith, “Trusted Computing Platforms: Design and Applications”, Springer Science and Business media, 2005.

Reference Books

1. Dengguo Feng, “Trusted Computing” Tsinghua University Tsinghua University Press Released December Publisher(s): De Gruyter, 2017.
2. A Practical Guide to Trusted Computing (IBM Press), December 2007.
3. Trusted Computing Platforms Design and Applications, 2005.
4. Trusted Computing Platforms: TCPA Technology in Context by Pearson Education , July 2002.
5. John Linn, “Trust Models and management in Public Key Infrastructures”, November 2000.

Web Resources

1. https://trustedcomputinggroup.org/
2. https://en.wikipedia.org/wiki/Trusted_Computing
3. https://www.techopedia.com/definition/16523/trusted-computing
4. https://webstore.ansi.org/industry/software/encryption-cryptography
5. https://csrc.nist.rip/Projects/Cryptographic-Standards-and-Guidelines.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	2	3	-	3	3	3
2	3	3	3	3	-	3	-	3	-	2	-	2	2	2	-
3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

CorrelationLevel:1-Low,2-Medium,3-High

		L	T	P	C
U20CSE828	**CLIENT SERVER COMPUTING**	3	0	0	3

Course Objectives

- Comprehend the basic concepts of the client-server model
- Describe how the hardware and software are combined to implement client/server computing.
- To expose terminology, concepts and types of servers in client/server architecture.
- Explore the different server operating systems and its components
- Explore about the Impact of Technology & Training and Testing Technology

Course Outcomes

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

CO1 - Understand and analyze about the history of C/S computing.

CO2 - Analyze the different client/server models.

CO3 - Be familiar with the types, features and components of Server in C/S systems.

CO4 - Analyze the different server operating systems and its components.

CO5 - Known about the impact of Technology, Training and Testing Technology.

UNIT I INTRODUCTION TO CLIENT/SERVER COMPUTING (9 Hrs)

Introduction to client/server computing-What is client/server computing-Benefits of client/server computing-Evolution of C/S computing-Hardware trends-Software trends-Evolution of operating systems-Networking (N/W) trends-Business considerations.

UNIT II CLASSIFICATION OF CLIENT / SERVER SYSTEMS (9Hrs)

Two-tire client / Server Model: Hardware and Software Requirements operating system services – Types of clients – Server tier.

Three- Tier client / Server Model: Hardware and Software Requirements – Netware connectivity – Types of Middleware – Database Middleware.

N- Tier client / Server Model:Overview – Benefits – Disadvantages – Components – Tier separations and interaction.

UNIT III SERVERS (9Hrs)

Server Hardware, Categories - Features classes of Server Machines - Server Environment - Network management environment - network Computing Environment - Network Operating Systems - Server requirements, Platform Independence - Transaction Processing and Connectivity - Server Data Management and Access Tools

UNIT IV SERVER OPERATING SYSTEM (9Hrs)

Server operating system: OS/2 2. 0-Windows new technology-Unix based OS-Server requirements: Platform independence-Transaction processing-Connectivity-Intelligent database-Stored procedure-Triggers-Load leveling-Optimizer-Testing and diagnostic tools – Backup&recovery mechanisms.

UNIT V IMPACT OF TESTING TECHNOLOGY (9Hrs)

Client / Server Administration and Management – Client /Server Software – Testing techniques – Testing aspects – Measures of Completeness – Testing Client / Server Application.

Text Books

1. Munesh Chandra Trivedi,"Client/Server Computing", Khanna Book Publishing Company, Second edition,2014.
2. Chandra YadavSubhash, "Introductions to Client Server Computing", New Age International, 2009.
3. Dawana Travis Dewire, "Client/Server Computing", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

Reference Books

1. Dr. S.T. Deepa, Mrs.T.Yegammai,"Client Server Computing", Charulatha Publications Private Limited, 2019.
2. Patrick Smith, Steve Guengerich," Client/Server Computing, Prentice Hall India Learning Private Limited, 2nd edition, 2011.
3. Robert Orfali, Dan Harkey and Jeri Edwards, "Essential Client/Server SurvivalGuide", Galgotia Publications, New Delhi, 2001.
4. Joel P Kaster, "Understanding Thin Client/Server Computing", Prentice Hall of India, New Delhi, 2001.
5. Karen Watterson, "Client/Server Technology for Managers ", Addition-Wesley, USA, 1996.

Web Resources

1. http://www.studentshangout.com/topic/142825-client-server-computing-notes
2. http://www.slideshare.net/jayasreep3/client-servercomputing
3. http://www.infomotions.com/musings/waves/clientservercomputing.html
4. https://teachcomputerscience.com/client-server-architecture/
5. https://nptel.ac.in/content/storage2/courses/106105087/pdf/m17L41.pdf

COs/POs/ PSOs Mapping

COs	Program Outcomes(POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	3	3	1	-	-	2	2	-	3	3	3
2	2	3	2	3	3	1	1	-	-	2	2	-	3	3	3
3	3	2	2	2	2	2	1	-	-	2	2	-	3	3	3
4	2	2	3	3	3	2	1	-	-	2	2	-	2	2	3
5	3	2	3	3	3	3	1	-	-	2	2	-	2	2	2

Correlation Level: 1-Low, 2-Medium, 3-High

U20CSCM05	HUMAN COMPUTER INTERACTION (Common to CSE and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Learn the foundations of Human Computer Interaction
- To be familiar with the design technologies for individuals and persons with disabilities
- Todemonstrate the communication using multimedia and www.
- To study about mobile ecosystem.
- To learn about user interface.

Course Outcomes

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

CO1 - Collect fundamentals of human interaction and problem solving
CO2 - Design effective HCI for individuals..
CO3 - Enumerate the cognitive computerized models for HCI
CO4 - Design mobile application framework using HCI tools.
CO5 - Develop web interface using various tools

UNIT I INTRODUCTION (9 Hrs)

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.

UNIT II INTERACTIVE DESIGN AND RULE (9Hrs)

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 COGNITIVE COMPUTERIZED MODELS (9Hrs)

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV APPLICATION FRAMEWORK (9Hrs)

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.

UNIT V DESIGNING WEB INTERFACES (9Hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Text Books

1. Interaction Design: Beyond Human-Computer Interaction by Helen Sharp & Jenny Preece & Yvonne Rogers 2019.
2. Interaction Design - Beyond Human-Computer Interaction, 4th Edition, 2016
3. Computer-Human Interaction. Cognitive Effects of Spatial Interaction, Learning, and Ability by Theodor Wyeld & Paul Calder & Haifeng Shen (eds.) ,2015
4. Designing Interactive Systems: A Comprehensive Guide to HCI, UX and Interaction Design. by David R. Benyon 2013.
5. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004.

Reference Books

1. Brian Fling, “Mobile Design and Development”, Fourth Edition, O’Reilly Media Inc., 2018.
2. Modular Design Frameworks: A Projects-based Guide for UI/UX Designers by Cabrera & James 2017.
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edit ion, O’Reilly 2009.
4. Research Methods in Human-Computer Interaction by Jonathan Lazar, 2009.
5. Interaction Design: Beyond Human-Computer Interaction by Yvonne Rogers, 2001.

Web Resources

1. https://www.interaction-design.org/literature/topics/human-computer-interaction
2. https://www.hcii.cmu.edu/academics/mhci
3. https://www.rit.edu/study/human-computer-interaction-ms
4. https://www.udacity.com/course/human-computer-interaction--ud400
5. https://xd.adobe.com/ideas/principles/human-computer-interaction/

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3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE830 NATURAL LANGUAGE PROCESSING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the syntax and semantics of Natural Language Processing.
- To apply transformations morphology and part of speech tagging
- To design various transforming models.
- To learn the syntax parsing techniques.
- To acquire the knowledge of applications of NLP.

Course Outcomes

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

CO1 – Outline Natural Language Processing tasks in syntax, semantics and pragmatics.
CO2 – Explain morphology and Part of Speech Tagging.
CO3 – Explain various Transformations based Models.
CO4 – Demonstrate the usage of syntax parsing techniques.
CO5 – Explain the use of semantic analysis methods and summarize the application of NLP.

UNIT I INTRODUCTION OF NLP (9 Hrs)

Natural Language processing tasks in syntax, semantics and pragmatics–Issues- Applications-The role of machine learning-Probability Basics–Information theory– Collocations- N-gram Language Models –Estimating parameters and smoothing- Evaluating language models

UNIT II MORPHOLOGY AND PART OF SPEECH TAGGING (9 Hrs)

Linguistic essentials-Lexical syntax – Morphology and Finite State Transducers –Part of speech Tagging - Rule-Based Part of Speech Tagging -Markov Models - Hidden Markov Models–Transformation based Models-Maximum Entropy Models –Conditional Random Fields.

UNITIII SYNTAX PARSING (9 Hrs)

Syntax Parsing-Grammar formalisms and tree banks –Parsing with Context Free Grammars- Features and Unification –Statistical parsing and probabilistic CFGs (PCFGs)Lexicalized PCFGs

UNIT IV SEMATIC ANALYSIS (9 Hrs)

Representing Meaning – Semantic Analysis - Lexical semantics – Word-sense disambiguation – Supervised – Dictionary based and Unsupervised Approaches – Compositional semantics-Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT V APPLICATIONS OF NLP (9 Hrs)

Named entity recognition and relation extraction- IE using sequence labelling - Machine Translation(MT)-Basic issues in MT - Statistical translation-word alignment - phrase-based translation–Question Answering.

Text Books

1. NitinIndurkhya, Fred J. Damerau “Handbook of Natural Language Processing”, Second Edition, CRC Press, 2010.

2. Steven Bird, Ewan Klein and Edward Lopper, “Natural Language Processing with Python”, O'Reilly Media, First Edition, 2009.
3. James Allen, “Natural Language Understanding”, Pearson Education, 2003.

Reference Books

1. Roland R. Hausser, “Foundations of Computational Linguistics: Human- Computer Communication in Natural Language”, Paperback, MIT Press, 2011.
2. Pierre M.Nugues, “An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German(Cognitive Technologies)”, Soft cover reprint, 2010.
3. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O'Reilly Media, First Edition, 2009.
4. Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Second Edition, Prentice Hall, 2008.
5. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:, 1999.

Web Resources

1. https://nptel.ac.in/courses/106/105/106105158/
2. https://www.kaggle.com/learn/natural-language-processing
3. https://www.javatpoint.com/nlp
4. https://www.coursera.org/in
5. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-863j-natural-language-and-the-computer-representation-of-knowledge-spring-2003/

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3	2	2	2	2	2	2	3	3	-	3	3	-	2	2	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	3	-
5	3	3	3	3	3	3	3	3	-	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

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