SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS 2020
(R-2020)

CURRICULUM AND SYLLABI

VISION AND MISSION OF THE INSTITUTE

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 growth of society

VISION AND MISSION OF THE DEPARTMENT

Vision

To promote students with latest technology and research in the field of Computer and Communication Engineering to meet global socio-economic needs

Mission

M1: Technical Knowledge	To provide academic excellence in the field of computer and communication engineering to meet the needs of the Society.
M2 - Innovation and Research Exposure	To conduct recognized research analytically in multi-disciplinary areas of the framework at National and International levels
M3: Employability and Entrepreneurship	To provide complementary technical, inter and intrapersonal skills for employability and entrepreneurship
M4 - Ethics	To instruct integrity, ethical principles and interactive skills among the students to form a better nation

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.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Technical Knowledge	To satisfy the requirements of industry, Research and Development organizations by employing technological knowledge in Computer and Communication Engineering.
PEO2: Leadership Skill	To lead, contribute and innovate new technologies and systems in the key domains of Computer and Communication Engineering
PEO3: Research and Development	To get exposed to collaborative work that can be implemented for society's well-being through advance research expertise
PEO4: Professional Behavior	Gains code of conduct, etiquettes to establish boundaries in environment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1- Basic Knowledge in CCE	Use the latest tools and technologies to apply the fundamental concepts of computer and communication engineering principles to software development, mobile communication and computing
PSO 2-Network Design and Security	Design and Interpret computer networks, Internet of Things with efficient data analytics and security.
PSO 3- Algorithmic Thinking and Programming Skill	Develop efficient algorithms to solve real time problems through powerful programming and problem solving skills

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Science (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 (PW)	12
8	Employability Enhancement Courses (EEC*)	-
9	Mandatory courses (MC*)	-
Total		**164**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science (HS)		-	1	1	3		1	1	**7**
2	Basic Sciences (BS)	3	3	3	3	4				**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		**9**
7	Project Work (PW)							2	8	**10**
8	Internship (PW)							2		**2**
9	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-	-	**-**
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	**-**
Total		**18**	**21**	**22**	**22**	**22**	**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	U20EST122	Elements of Engineering	ES	3	0	0	3	25	75	100
3	U20EST110	Programming in Python	ES	3	0	0	3	25	75	100
4	U20EST109	Problem Solving Approach	ES	3	0	0	3	25	75	100
5	U20EST123	Basics of Electronics Engineering	ES	3	0	0	3	25	75	100
Practical										
6	U20ESP124	Basic Electronics Engineering 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	U20CCC1XX	Certification Course – I**	EEC	0	0	4	-	100	-	100
Mandatory Course										
10	U20CCM101	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	U20CCT201	Introduction to Web Technologies	PC	3	0	0	3	25	75	100
4	U20CCT202	Electronic Circuits	PC	3	0	0	3	25	75	100
5	U20CCT203	Digital Electronics	PC	3	0	0	3	25	75	100
6	U20CCT204	Computer Organization	PC	3	0	0	3	25	75	100
Practical										
7	U20ESP202	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U20CCP201	Electronic Circuits Laboratory	PC	0	0	2	1	50	50	100
9	U20CCP202	Digital Electronics Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CCC2XX	Certification Course – II**	EEC	0	0	4	-	100	-	100
11	U20CCS201	Skill Development Course 1: Demonstration of Workshop Practice	EEC	0	0	2	-	100	-	100
Mandatory Course										
12	U20CCM202	Environmental Science	MC	2	0	0	-	100	-	100
							21	600	600	1200

***** Certification Courses are to be selected from the list given in Annexure III***

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST325	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U20EST359	Programming in C++	ES	3	0	0	3	25	75	100
3	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
4	U20CCT305	Communication Systems	PC	3	0	0	3	25	75	100
5	U20CCT306	Signal Processing	PC	2	2	0	3	25	75	100
6	U20CCT307	Software Engineering	PC	3	0	0	3	25	75	100
Practical										
7	U20HSP301	General Proficiency – I	HS	0	0	2	1	50	50	100
8	U20ESP360	Programming in C++ Laboratory	ES	0	0	2	1	50	50	100
9	U20ESP357	Data Structures Laboratory	ES	0	0	2	1	50	50	100
10	U20CCP303	Communication Systems Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CCC3XX	Certification Course –III**	EEC	0	0	4	-	100	-	100
12	U20CCS302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CCM303	Physical Education	MC	0	0	2	-	100	-	100
							22	650	650	1300

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST436	Probability and Stochastic Process	BS	2	2	0	3	25	75	100
2	U20EST467	Programming in Java	ES	3	0	0	3	25	75	100
3	U20CCT408	Principles of Data Communication	PC	3	0	0	3	25	75	100
4	U20CCT409	Design and Analysis of algorithms	PC	2	2	0	3	25	75	100
5	U20CCE4XX	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	U20CCP404	Data Communication Laboratory	PC	0	0	2	1	50	50	100
10	U20CCP405	Design and Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CCC4XX	Certification Course –IV**	EEC	0	0	4	-	100	-	100
12	U20CCS403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CCM404	NSS	MC	0	0	2	-	100	-	100
							22	650	650	1300

[#]***Professional Electives are to be selected from the list given in Annexure I***

[$]***Open Electives are to be selected from the list given in Annexure II***

****** *Certification Courses are to be selected from the list given in Annexure III*

***** *Skill Development Courses (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	U20BST548	Numerical Methods and Statistics	BS	3	0	0	3	25	75	100
2	U20CCT510	Database Systems	PC	3	0	0	3	25	75	100
3	U20CCT511	Cryptography and Network Security	PC	3	0	0	3	25	75	100
4	U20CCT512	Microcontroller and Interfacing	PC	3	0	0	3	25	75	100
5	U20CCE5XX	Professional Elective - II[#]	PE	3	0	0	3	25	75	100
6	U20XXO5XX	Open Elective-II[$]	HS	3	0	0	3	25	75	100
Practical											
7	U20BSP550	Numerical and Statistical Laboratory	BS	0	0	2	1	50	50	100
8	U20CCP506	Cryptography and Network Security Laboratory	PC	0	0	2	1	50	50	100
9	U20CCP507	Microcontroller and Interfacing Laboratory	PC	0	0	2	1	50	50	100
10	U20CCP508	Database Systems Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course											
11	U20CCC5XX	Certification Course – V**	EEC	0	0	4	-	100	-	100
12	U20CCS504	Skill Development Course 4: Foreign Language/ IELTS – I	EEC	0	0	2	-	100	-	100
13	U20CCS505	Skill Development Course 5: Presentation Skill using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course											
14	U20CCM505	Indian Constitution	MC	2	0	0	-	100	-	100
							22	750	650	1400

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20ECCM04	Internet of Things	PC	3	0	0	3	25	75	100
2	U20CCT614	Internet Programming	PC	3	0	0	3	25	75	100
3	U20CCT615	Wireless Communication Systems	PC	3	0	0	3	25	75	100
4	U20CCT616	Data Science	PC	3	0	0	3	25	75	100
5	U20CCE6XX	Professional Elective - III[#]	PE	3	0	0	3	25	75	100
6	U20XXO6XX	Open Elective-III[$]	OE	3	0	0	3	25	75	100
Practical										
7	U20CCP609	Internet of Things Applications Laboratory	PC	0	0	2	1	50	50	100
8	U20CCP610	Internet Programming Laboratory	PC	0	0	2	1	50	50	100
9	U20CCP611	Wireless Communication Systems Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CCC6XX	Certification Course – VI**	EEC	0	0	4	-	100	-	100
11	U20CCS606	Skill Development Course 6: Foreign Language / IELTS – II	EEC	0	0	2	-	100	-	100
12	U20CCS607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
13	U20CCS608	Skill Development Course 8: NPTEL / MOOC – I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U20CCM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	800	600	1400

[#]***Professional Electives are to be selected from the list given in Annexure I***

[$]***Open Electives are to be selected from the list given in Annexure II***

*** Certification Courses are to be selected from the list given in Annexure III***

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CCT717	Machine Learning and Artificial Intelligence	PC	3	0	0	3	25	75	100
2	U20CCT718	Cloud Computing and Distributed Systems	PC	3	0	0	3	25	75	100
3	U20CCE7XX	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	U20CCP712	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
7	U20CCP713	Cloud Computing and Distributed Systems Laboratory	PC	0	0	2	1	50	50	100
8	U20CCP714	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20CCW701	Project Phase – I	PW	0	0	4	2	50	50	100
10	U20CCW702	Internship / Inplant Training	PW	-	-	-	2	100	-	100
Mandatory Course										
11	U20CCM707	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	U20CCT819	Blockchain Technology and Application	PC	3	0	0	3	25	75	100
2	U20CCE8XX	Professional Elective – V[#]	PE	3	0	0	3	25	75	100
3	U20CCE8XX	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	U20CCW803	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U20CCS809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							18	315	285	600

[#]***Professional Electives are to be selected from the list given in Annexure I***
[$]***Open Electives are to be selected from the list given in Annexure II***

Annexure – I

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U20CCE401	Spread Spectrum Communication
2	U20CCE402	Network Analysis and Management
3	U20CCE403	Information Coding Theory
4	U20CCE404	Computer Graphics
5	U20CCE405	Operating Systems
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U20ECCM01	Vehicular Communication
2	U20CCE507	Wireless Adhoc and Sensor Networks
3	U20CCE508	Data Mining and Warehouse
4	U20CCE509	Computer Vision Technology
5	U20ICCM01	Fuzzy Logic and Neural Networks
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U20ECCM03	Digital Image Processing
2	U20CCE612	Wireless Networking
3	U20CCE613	Information Retrieval
4	U20CSCM05	Human Computer Interaction
5	U20BMCM01	Soft computing
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CCE716	OFDM Systems
2	U20ITCM07	Social Network Analysis
3	U20CSCM01	Software Project Management
4	U20ECCM05	Satellite Communication
5	U20ITCM06	Green Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CCE821	Multiple Input Multiple Output Communication
2	U20CCE822	Software Defined Networks
3	U20CCE823	Information Security
4	U20CCE824	Bigdata Analytics
5	U20ITCM09	Deep Learning
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CCE826	Millimeter Wave Personal Communication Systems
2	U20CCE827	Advanced Telecommunication Networks
3	U20ADCM01	Mobile Application Development
4	U20CCE829	Pattern Recognition
5	U20ITCM10	Business Intelligence

Annexure – II

OPEN ELECTIVE COURSES

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, CCE, BME, AI&DS
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, AI&DS
9	U20ICCM02	Fuzzy logic and neural networks	ICE	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	Sensors 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, CSE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS
8	U20ITO706	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS
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	U20CCCX01	3ds Max
2	U20CCCX02	Advance Structural Analysis of Building using Etabs
3	U20CCCX03	Advanced Java Programming
4	U20CCCX04	Advanced Python Programming
5	U20CCCX05	Analog System Lab Kit
6	U20CCCX06	Android Medical app development
7	U20CCCX07	Android Programming
8	U20CCCX08	Ansys -Multiphysics
9	U20CCCX09	Artificial Intelligence
10	U20CCCX10	Artificial Intelligence And Edge Computing
11	U20CCCX11	Artificial Intelligence in Medicines
12	U20CCCX12	AutoCAD For Architecture
13	U20CCCX13	AutoCAD for Civil
14	U20CCCX14	AutoCAD for Electrical
15	U20CCCX15	AutoCAD for Mechanical
16	U20CCCX16	Azure DevOps
17	U20CCCX17	Basic Course on EPlan
18	U20CCCX18	Basic Electro Pneumatics
19	U20CCCX19	Basic Hydraulics
20	U20CCCX20	Bio signal and Image processing development system
21	U20CCCX21	Blockchain
22	U20CCCX22	Bridge Analysis
23	U20CCCX23	Building Analysis and construction Management
24	U20CCCX24	Building Design & Analysis Using AECO sim Building Designer
25	U20CCCX25	CATIA
26	U20CCCX26	CCNA (Routing and Switching)
27	U20CCCX27	CCNA (Wireless)
28	U20CCCX28	Cloud Computing
29	U20CCCX29	Computer Programming for Medical Equipments
30	U20CCCX30	Corel Draw
31	U20CCCX31	Creo (Modeling and Simulation)
32	U20CCCX32	Cyber Security
33	U20CCCX33	Data Science and Data Analytics
34	U20CCCX34	Data Science using Python

35	U20CCCX35	Data Science Using R
36	U20CCCX36	Deep Learning
37	U20CCCX37	Design & Documentation Using Eplan Electric P8
38	U20CCCX38	Design of Biomedical Devices and systems
39	U20CCCX39	Digital Marketing
40	U20CCCX40	Digital Signal Processing Development System
41	U20CCCX41	Digsilent Power Factory
42	U20CCCX42	Electro Hydraulic Automation With PLC
43	U20CCCX43	Embedded System Using Arduino
44	U20CCCX44	Embedded System Using C
45	U20CCCX45	Embedded System With IoT
46	U20CCCX46	Eplan Data Portal
47	U20CCCX47	E-Plan Electric P8
48	U20CCCX48	Eplan Fluid
49	U20CCCX49	Eplan PPE
50	U20CCCX50	Fusion 360
51	U20CCCX51	Fuzzy logic and neural networks
52	U20CCCX52	Google Analytics
53	U20CCCX53	Hydraulic Automation
54	U20CCCX54	Industrial Automation
55	U20CCCX55	Industry 4.0
56	U20CCCX56	Internet of Things
57	U20CCCX57	Introduction to C Programming
58	U20CCCX58	Introduction to C++ Programming
59	U20CCCX59	IoT using Python
60	U20CCCX60	Java Programming
61	U20CCCX61	Machine Learning
62	U20CCCX62	Machine Learning and Deep Learning
63	U20CCCX63	Machine Learning for Medical Diagnosis
64	U20CCCX64	Mechatronics
65	U20CCCX65	Medical Robotics
66	U20CCCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20CCCX67	Mobile Edge Computing
68	U20CCCX68	Modeling and Visualization Using Micro station
69	U20CCCX69	MX Road
70	U20CCCX70	Photoshop
71	U20CCCX71	PLC
72	U20CCCX72	Pneumatics Automation
73	U20CCCX73	Project Management
74	U20CCCX74	Python Programming
75	U20CCCX75	Revit Architecture
76	U20CCCX76	Revit Inventor
77	U20CCCX77	Revit MEP
78	U20CCCX78	Robotics
79	U20CCCX79	Search Engine Optimization
80	U20CCCX80	Software Testing
81	U20CCCX81	Solar and Smart Energy System with IOT

82	U20CCCX82	Solid Works
83	U20CCCX83	Solid works with Electrical Schematics
84	U20CCCX84	Speech Processing
85	U20CCCX85	STAAD PRO V8i
86	U20CCCX86	Structural Design & Analysis using Bentley
87	U20CCCX87	Total Station
88	U20CCCX88	Video and Image Processing Development System
89	U20CCCX89	VLSI Design
90	U20CCCX90	Web Programming -I
91	U20CCCX91	Web Programming-II

Annexure – IV

EMPLOYABILITY ENHANCEMENT COURSES – (B). SKILL DEVELOPMENT COURSES

Sl. No	Course Code	Course Title
1	U20CCS201	Skill Development Course 1 : Demonstration of Workshop
2	U20CCS302	Skill Development Course 2 *
		1)Computer on Office Automation
		2)Animation Practice
3	U20CCS403	Skill Development Course 3 *
		1)Computer Hardware and Troubleshooting
		2)Mobile Servicing
		3)PCB and Circuit Design
4	U20CCS504	Skill Development Course 4 : Foreign Language/ IELTS -I
5	U20CCS505	Skill Development Course 5 : Presentation Skills using ICT
6	U20CCS606	Skill Development Course 6 : Foreign Language/ IELTS - II
7	U20CCS607	Skill Development Course 7 : Technical Seminar
8	U20CCS608	Skill Development Course 8 : NPTEL / MOOC - I
9	U20CCS809	Skill Development Course 9 : NPTEL / MOOC-II

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

		L	T	P	C	Hrs
U20BST101	ENGINEERING MATHEMATICS-I CALCULUS AND LINEAR ALGEBRA	2	2	0	3	60

(Common to all branches except CSBS)

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 – Able to Understand the 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 (12 Hrs)

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 Stoke's Theorem.

Text Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, Tenth edition, 2019
2. B.V.Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, Sixth edition 2018.
3. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, Ninth Edition, 2018

Reference Books

1. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3th Edition, 2019
2. Singaravelu. A., "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019
3. M.K. Venkataraman, "Engineering Mathematics (Third Year-Part A)", The National Publishing Company, Madras, 2016.
4. S. Narayanan**,"** Differential Equations and Its Applications**",** Viswanathan, S., Printers & Publishers Pvt Ltd , 2009
5. Dr.G Balaji., " Engineering Mathematics-I", G.Balaji publishers, 2017

Web References

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

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

U20EST122	ELEMENTS OF ENGINEERING (Common to CSE, IT and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

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 and engineering development, change and impacts of engineering(**K2**)
CO2 - Define a problem, list criteria and constraints, brainstorm potential solutions and document the ideas. (**K1, K3**)
CO3 - Communicate possible solutions through drawings, testing and prepare project report(**K3**)
CO4 - Use project management skills and ethics in doing projects(**K3**)
CO5 - Explore ethics in engineering. (**K3**)

UNITIINTRODUCTION TO ENGINEERING (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

Communicating 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 (9 Hrs)

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

- Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: "Engineering Fundamentals: Design, Principles, and Careers", Goodheart-Willcox Publisher, Second Edition, 2018.
- Charles D.Fleddermann, "Engineering Ethics",Fourth Edition, Pearson, education New Mexico, 2014.
- Brian Tracy, " Creativity & Problem Solving ", Manjul Publishing House, 2018

Reference Books

1. Saeed Moaveni ,"Engineering Fundamentals: An Introduction to Engineering", Cengage learning, Fourth Edition, 2011.
2. Mike W. Martin, Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2005
3. Joep Cornelissen, " Corporate Communication, A Guide to theory and Practice", 3rd edition, SAGE Publications Ltd., 2011
4. Clifford F.Gray, Erik W.Larson, Gautam V.Desai, "Project Management: The Managerial Process", 6th edition, McGraw Hill Education, 2017
5. P. Gopalakrishnan & V E Ramamoorthy, " Textbook of Project Management", Laxmi Publications, 2014

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1. https://nptel.ac.in/courses/110106124/
2. https://www.open.edu/openlearn/science-maths-technology/introducing-engineering/content-section-0?active-tab=description-tab
3. https://www.edx.org/micromasters/ritx-project-management
4. https://pdhonline.com/courses/r102/r102_new.htm
5. https://www.coursera.org/learn/ethics-technology-engineering

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

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.**(K3)**

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 PROGRAMMINGLANGUAGE (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 - The if Statement – if else – elif – Nested.

UNIT III LOOPING (9 Hrs)

Loop: The while Loop -break and continue – nested while Loop - the for Loop – Nested for Loop. Functions: parameters - return values - local and global scope - function composition – recursion and lambda functions

UNITIV LIST, TUPLE,SETS, 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,ANDPACKAGE (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 – Europe, 4th Edition,2018
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016(http://greenteapress.com/wp/thinkpython/).
3. Reema Thareja, “Python Programming Using Problem Solving Approach”, ISBN: 9780199480173, Publisher: Oxford University Press; First edition,2017.

Reference Books

1. Ben Stephenson, The Python Workbook A Brief Introduction with Exercises and Solutions, Springer International Publishing Switzerland 2014
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter- disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015

4. 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.

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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/
5. https://www.coursera.org/learn/python-programming-introduction

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

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

U20EST109	PROBLEM SOLVING APPROACH (Common to CSE, IT and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

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 Outcome

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)**

UNIT I INTRODUCTION (9 Hrs)

Computational Thinking - Information and Data - Converting Information into Data -Data Capacity - Data Types & Encoding - Logic-Solving Problems- Limits of Computation- pseudocode & flow chart

UNIT II ALGORITHMIC THINKING AND DATA ORGANIZATION (9 Hrs)

Algorithmic thinking: Algorithms – Software and Programming Languages - Actions. Data organization: Name list, Graph hierarchies - spread sheets -text processing – patterns-solutions in pseudocode & flow chart.

UNIT III FUNDAMENTAL ALGORITHMS AND FACTORING METHOD (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 - pseudo random number - raising to large power - computing nth Fibonacci number-solutions in pseudocode & flow chart.

UNIT IV ARRAY, MERGING, SORTING AND SEARCHING (9 Hrs)

Array Techniques: Introduction - array order reversal - array counting or histogramming – maximum and minimum of a set - removal of duplicate – partitioning - longest monotone. Merging Sorting and Searching: Two way merge - sorting by selection, insertion, exchanging, diminishing, increment, partitioning. Searching: binary – hashing-solutions in pseudocode & flow chart.

UNIT V TEXT PROCESSING, PATTERN SEARCHING AND RECURSIVE ALGORITHM (9 Hrs)

Key word searching - Text line adjustment - Linear pattern search - Sub linear pattern search. Recursion: Binary tree traversal - Recursive quick sort - Towers of Hanoi - Sample generation - Combination generation - Permutation generation-Solutions in pseudocode & flow chart.

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.

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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
4. https://www.coursera.org/learn/problem-solving
5. http://www.sso.sy/sites/default/files/competitive%20programming%203_1.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	-	-	1	1	1	2
2	2	1	-	-	1	-	-	-	-	-	-	1	1	1	2
3	2	1	-	-	1	-	-	-	-	-	-	1	1	1	2
4	2	1	-	-	1	-	-	-	-	-	-	1	1	1	2
5	3	2	1	1	1	-	-	-	-	-	-	1	1	1	2

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

U20EST123	BASICS OF ELECTRONICS ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce fundamental concepts, various laws and principles associated with electrical circuits and its analysis.
- To provide knowledge about the various factors in AC circuits and resonance condition.
- To provide the basic knowledge in semiconductor devices and its application
- To provide knowledge on semiconductor transistor
- To understand the purpose of communication and acquire knowledge on different communication systems.

Course Outcomes

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

CO1- Use basic concepts, various laws and theorems to solve DC circuits.(**K3**)
CO2- Solve the AC circuits and develop resonance circuits.(**K3**)
CO3 - Explain the importance of semiconductor devices and its applications.(**K2**)
CO4- Describe the working of transistor and its application.(**K2**)
CO5 - Paraphrase different Communication Systems. (**K2**)

UNIT I D.C CIRCUITS AND NETWORK THEOREMS (9 Hrs)

Concept of Potential difference, voltage, current, work, Power, Energy, Electric networks, voltage source and current sources, linear passive and active elements, current-voltage relation, ideal and practical sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Simplifications of networks using series-parallel, Network Theorem – Superposition, Thevenin's, Norton's and Maximum Power Transfer.

UNIT II AC CIRCUITS (9 Hrs)

AC waveform- definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, Resonance in series circuits, bandwidth and quality factors

UNIT - III SEMICONDUCTOR DIODES AND APPLICATIONS (9 Hrs)

Introduction semiconductor materials-Doping-Intrinsic and Extrinsic Semiconductor –PN junction diode, structure, characteristics-diffusion and depletion capacitance-clipper,Rectifier, Half wave and Full wave rectifier-zener diode characteristics-zener diode as regulator –Light Emitting Diode(LED)photo diode-Solar Panel

UNIT - IV TRANSISTORS (9 Hrs)

Bipolar Junction Transistor-construction-operation-Common Base, Common Emitter, Common collector Configuration-characteristics- -Junction Field Effect Transistor(JFET), Metal oxide semiconductor Field Effect Transistor, MOSFET operation characteristics-Numerical applications

UNIT V - COMMUNICATION SYSTEMS (9 Hrs)

Need for Modulation – Block diagram of analog communication System - AM, FM, PM Definitions and Waveforms – Comparison of digital and analog communication system- Block diagram of digital communication system – Electromagnetic Spectrum. Wired and wireless Channel – Block diagram of communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, “Electrical and Electronics Technology”, Pearson Education Limited, New Delhi, 2010.
2. Sudhakar.A and Shyam Mohan.S.P, “Circuits and Networks Analysis and Synthesis”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.
3. Wayne Tomasi, “Electronic Communication Systems- Fundamentals Theory Advanced”, Fourth Edition, Pearson Education, 2001.

Reference Books

1. ‘Kothari D P and Nagrath I J, “Basic Electrical Engineering”, Tata McGraw Hill, 2009.
2. S.K. Sahdev, “Fundamentals of Electrical Engineering and Electronics”, Dhanpat Rai & Co, 2013.
3. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Private Limited, Ninth Edition, 2008
4. David A. Bell, “Electronic Devices and Circuits”, Oxford Higher Education Press, 5th Edition, 2010
5. R.S.Sedha, “Applied Electronics”, S.Chand& co, 2000

Web References

1. http://www.electronics-tutorials.ws
2. http://www.eeweb.com/articles
3. https://onlinecourses.nptel.ac.in/noc20_ee16/preview
4. https://alison.com/course/introduction-to-network-theorems
5. https://www.classcentral.com/course/transistor-field-effect-transistor-bipol-12135

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

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

U20ESP124	BASIC ELECTRONICS ENGINEERING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basic electrical tools and accessories.
- To study electronic components and equipment.
- To study VI characteristics of Diodes
- To study application of diode
- To understand Input and output characteristics of Transistors

Course Outcome

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

CO 1-Utilize specific tools and accessories for electrical wiring(**K3**)
CO2-Describe characteristics of semiconductor diode and utilize it for different applications(**K3**)
CO 3-Impart characteristics of transistor for various applications(**K4**)
CO 4-Construct and verify application of diodes(**K4**)
CO 5-Verify Kichoff's law(**K4**)

LIST OF EXPERIMENTS

1. Electrical Safety, Precautions, study of tools and accessories
2. Study of Electronic components and equipment: Resistor, Capacitor
3. Measurement of AC signal parameter (Peak-Peak, rms period, frequency) using CRO.
4. Soldering Practice: Soldering Components Devices and Circuits Using general purpose PCB.
5. VI Characteristics of PN junction diode, Zener diode
6. Input and output characteristics of Common Emitter configuration of BJT
7. Characteristics of JFET
8. Characteristics of MOSFET
9. VI characteristics of LED and Photo diode
10. Study of clipper circuits
11. Measurement of Ripple factor of HWR
12. Determine the voltage and current in given circuits using Kirchoff"s laws theoretically and verify the laws experimentally

Reference Books

- 'Kothari D P and Nagrath I J, "Basic Electrical Engineering", Tata McGraw Hill, 2009.
- S.K. Sahdev, "Fundamentals of Electrical Engineering and Electronics", Dhanpat Rai & Co, 2013.
- R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Private Limited, Ninth Edition, 2008
- David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
- R.S.Sedha, "Applied Electronics", S.Chand& co, 2000

Web References

1. http://www.electronics-tutorials.ws
2. http://www.eeweb.com/articles
3. https://onlinecourses.nptel.ac.in/noc20_ee16/preview
4. https://alison.com/course/introduction-to-network-theorems
5. https://www.classcentral.com/course/transistor-field-effect-transistor-bipol-12135

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

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

		L	T	P	C	Hrs
U20ESP111	PROGRAMMING IN PYTHON LABORATORY	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. Ben Stephenson, “The Python Workbook A Brief Introduction with Exercises and Solutions”, Springer International Publishing Switzerland 2014.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Mark Lutz, “Programming Python”, O'Reilly Media, Third Edition, 2006.
5. Wesley J Chun, “Core Python Applications Programming”, Prentice Hall, Third Edition, 2012.

Web References

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/
5. https://www.coursera.org/learn/python-programming-introduction

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

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

		L	T	P	C	Hrs
U20ESP112	**ENGINEERING GRAPHICS USING AUTOCAD** (Common to ECE, CSE, IT, ICE, CCE, Mechatronics, BME)	**0**	**0**	**2**	**1**	**30**

Course Objectives

- To understand the basic principles of engineering drawing
- To develop graphical skills using the concepts, ideas and design of engineering products
- To generate the pictorial views and development of surfaces
- To expose the technical existing national standards related to drawing
- To develop software skills for creating 2D and 3D models.

Course Outcomes

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

CO1 –Define the fundamentals and standards of engineering graphics. **(K2)**
CO2–Compare freehand sketching of basic geometrical constructions and multiple view of objects **(K3)**
CO3 - Relate and draw orthographic projections of lines & plane surfaces and development of surfaces. **(K2)**
CO4–Sketch the isometric and perspective sections of simple solids. **(K3)**
CO5- Usage of software packages for drafting and modeling**. (K3)**

LIST OF EXPERIMENTS

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 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-Dmodel.

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 A Spectrum book”, 1st Edition, Macromedia Press, Pearson, 2020
2. NS Parthasarathy and Vela Murali, “Engineering Drawing”, Oxford university press, 2015.
3. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017.
4. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, 7th Edition, Vikas Publishing House Pvt Ltd., New Delhi, 2016
5. C M Agrawal, BasantAgrawal, “Engineering Graphics”, McGraw Hill, 2012

Web References

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php

2. https://www.autodesk.com/solutions/technical-drawing
3. https://www.mbit.org/domain/44
4. https://dl.acm.org/doi/book/10.5555/580969
5. https://www.brooklinebooksmith.com/book/9781133960393

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

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

		L	T	P	C	Hrs
U20CCC1XX	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.

U20CCM101 **INDUCTION PROGRAM** **3 Weeks**

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 and Universal Human Values • Familiarization with College, Dept./Branch • Literary Activity • Proficiency Modules • Lectures and 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 chose 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 dont's, 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 and 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.

		L	T	P	C	Hrs
U20BST215	**ENGINEERNG MATHEMATICS – II MULTIPLE INTEGRALS AND TRANSFORMS** (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 themselves 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 - Find Laplace transform and inverse 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. Ravish R Singh and Mukul Bhatt, “Engineering Mathematics”, Tata McGraw Hill, 1st Edition, New Delhi, 2016.
2. Sivaramakrishna Das P. and Vijayakumar C., “Engineering Mathematics”, Pearsons, New Delhi, 2017.
3. M.D.Petale, “A text book on Z- Transforms (Engineering Mathematics)”, Bames and Noble, New Edition, 2020.

Reference Books

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

Web References

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

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

	PROGRAMMING IN C	L	T	P	C	Hrs
U20EST201	(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE)	3	0	0	3	45

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study about the programs using Control structures.
- To understand 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 INTRODUCTION TO 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 pre-processor – Macro substitution directives – File inclusion directives –conditional compilation directives – Miscellaneous directives.

Text Books

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

Reference Books

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

Web References

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

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

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

U20CCT201	INTRODUCTION TO WEB TECHNOLOGIES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

1. To understand the principles of creating an effective web page
2. To develop skills in analysing the usability of a web site.
3. To understand how to plan and conduct user research related to web usability
4. To learn the language of the web: HTML and CSS.
5. To gain basic knowledge on web publishing and hosting

Course Outcome

After completion of the course, the students are able to

CO 1- Explain Internet and basic HTML tags (**K2**)
CO 2- Build the website using CSS. (**K3**)
CO 3- Implement interactive and responsive website using JavaScript (**K3**)
CO 4- Explore cross platform websites using PHP(**K3**)
CO 5- Design a website and Host it (**K3**)

UNIT- I WEB TECHNOLOGY AND HTML (9 Hrs)

Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0.
Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

UNIT- II STYLE SHEETS (9 Hrs)

Need for CSS, introduction to 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, Overview and features of CSS3

UNIT- III JAVASCRIPT (9 Hrs)

Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons

UNIT- IV PHP (9 Hrs)

Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT-V WEB PUBLISHING AND HOSTING (9 Hrs)

Creating the Web Site, Saving the site, working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Text Books

1. Ralph Moseley, M.T. Savaliya, “Developing Web Applications”, BPB Publications, 2017.
2. Hirdesh Bhardwaj,, “Web Designing”, Pothi.com, 2016
3. Jon Duckett.HTML and CSS: Design and Build Websites”, Wiley, 2011

Reference Books

1. Ralph Moseley, “Developing Web Applications”, Wiley India Pvt. Ltd, 2013
2. Joel Sklar, “ Principles of Web Design”, 6th edition, Cengage Learning, Inc, 2014
3. B. M. Harwani,” Developing Web Applications in PHP and AJAX”, Tata McGraw-Hill Education, 2010
4. Robert Peterson, “PHP and My-SQL a Full Basics & Advanced”, Independently Published, 2019
5. Kogent, “Web Technologies Black Book”, Dreamtech Press, 2009

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1. https://nptel.ac.in/courses/106/106/106106156/
2. https://www.coursera.org/learn/html-css-javascript-for-web-developers
3. https://code.tutsplus.com/courses/how-to-become-a-web-developer
4. https://webdesignerwall.com/
5. https://www.smashingmagazine.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	3	1	2	1	3	1	-	-	-	-	1	1	1	-	1
2	3	1	2	1	3	1	-	-	-	-	1	1	1	-	1
3	3	1	2	1	3	1	-	-	-	-	1	1	1	-	1
4	3	1	2	1	3	1	-	-	-	-	1	1	1	-	1
5	3	1	2	1	3	1	-	-	-	-	1	1	1	-	1

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

U20CCT202	ELECTRONIC CIRCUITS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn biasing concepts and design amplifier using BJT
- To infer needs of feedback amplifier and design audio and radio oscillator
- To study power amplifier and its efficiency
- To study features and functional block diagram of operational amplifier
- To learn application of operational amplifier

Course Outcome

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

CO1- Design BJT amplifier and analyze A.C load line (**K3**)
CO2- Design feedback amplifiers and oscillators (**K3)**
CO3- Explain classification and efficiency of power amplifiers (**K2**)
CO4-Explain characteristics of operational amplifier (**K2**)
CO5-Solve real time problems using operational amplifier (**K3**)

UNIT- I BJT AMPLIFIER (9 Hrs)

BJT– Need for biasing – DC Load Line and Bias Point – DC analysis of Transistor circuits – Various biasing methods of BJT – Bias Circuit Design – Thermal stability – Stability factors – Bias compensation techniques using Diode, thermistor and sensistor; Small Signal Hybrid π equivalent circuit of BJT – Early effect – Analysis of CE, CC and CB amplifiers using Hybrid π equivalent circuits

UNIT- II FEEDBACK AMPLIFIER AND OSCILLATORS (9 Hrs)

Feedback amplifiers: Effect of positive and negative feedback on gain, frequency response and distortion, Feedback topologies and its effect on input and output impedance, Feedback amplifier circuits in each feedback topologies

UNIT- III OSCILLATORS (9 Hrs)

Classification of oscillators, Barkhausen criterion, Analysis of RC phase shift and Wien bridge oscillators, Working of Hartley, Colpitts and Crystal oscillators

UNIT- IV OPERATIONAL AMPLIFIERS (9 Hrs)

Functional block diagram of Operational amplifier- Ideal Characteristics of an operational Amplifier , frequency response of OP-AMP–Common Mode Rejection Ratio-CMRR, Basic Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator, Summer ,Subtractor, V to I converter, I to V converter.

UNIT- V APPLICATIONS OF OPERATIONAL AMPLIFIERS (9 Hrs)

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, comparators, multivibrators, waveform generators, S and H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

Text Books

1. Adel .S. Sedra, Kenneth C. Smith, “Micro Electronic Circuits”, 6th Edition, Oxford University Press, 2013.
2. Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education /PHI, 2008.
3. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 5thEdition, 2018

Reference Books

1. David A., Bell “Electronic Devices and Circuits”, Oxford Higher Education Press, 5th Edition, 2010
2. D.Schilling and C.Belove, “Electronic Circuits”, 3rd Edition, McGraw Hill, 2009
3. Donald .A. Neamen, “Electronic Circuit Analysis and Design”, 2nd Edition,Tata McGraw Hill, 2009
4. Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010•
5. R.S.Sedha, “Applied Electronics”, S.Chand& co, 2000

Web References

1. http://www.build-electronic-circuits.com/
2. https://www.allaboutcircuits.com/
3. https://www.electronics-tutorials.ws/amplifier/amp_1.html
4. https://nptel.ac.in/courses/117/103/117103063/
5. https://www.electronics-lab.com/

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

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

U20CCT203	DIGITAL ELECTRONICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce digital fundamentals, Boolean algebra and its application to digital systems
- To enable design of various combinational circuits using logic gates
- To explain design procedure for synchronous sequential circuits
- To familiarize asynchronous sequential circuits
- To study programmable logic devices and design combinational logic circuits using PLD

Course Outcome

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

CO 1-Intrepret fundamental concepts of digital electronics like numbering system, Boolean theorems and reduction techniques (**K3**)
CO 2-Implement various combinational circuits using logic gates(**K3**)
CO 3-Illustrate design procedures for synchronous sequential circuits (**K3**)
CO 4-Explore design of asynchronous sequential circuits(**K3**)
CO 5-Design combinational circuits using programmable logic devices(**K3**)

UNIT- I INTRODUCTION (9 Hrs)

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization

UNIT- II COMBINATIONAL CIRCUIT DESIGN (9 Hrs)

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT- III SYNCHRONOUS SEQUENTIAL CIRCUITS (9 Hrs)

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT- IV LOGIC FAMILIES (9 Hrs)

Transistor as a switch, Definition of parameters-current voltage parameters, Fan in, Fan out, Noise Margin, Propagation Delay, Power Dissipation; Resistor Transistor Logic(RTL),Diode Transistor Logic (DTL), Transistor-Transistor Logic (TTL), Typical TTL NAND Gate,; Emitter Coupled Logic (ECL), Integrated Injection Logic (IIL) and MOS-logic, Comparison of Various Logic Families.

UNIT- V PROGRAMMABLE LOGIC DEVICES (9 Hrs)

Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL. Introduction to VHDL-statements- logic expression-Implementation of AND, OR, half adder and full adder and Flip-Flops

Text Books

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014.
2. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
3. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011

Reference Books

1. S.Salivahanan and S.Arivazhagan, “Digital Electronics”, Ist Edition, Vikas Publishing House pvt Ltd, 2012.
2. Anil K.Maini, “Digital Electronics”, Wiley, 2014.
3. A.Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI Learning Private Limited, 2016.
4. Soumitra Kumar Mandal, “Digital Electronics”, McGraw Hill Education Private Limited, 2016.
5. S. Salivahanan and S. Arivazhagan, “Digital Circuits and Design.”,Vikas Publisher, 2009

Web References

1. https://www.electronics-tutorials.ws/boolean/bool_1.html
2. https://www.electronics-tutorials.ws/logic/logic_1.html
3. https://nptel.ac.in/courses/117/103/117103064/
4. http://www.asic-world.com/digital/tutorial.html
5. 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	3	1	-	1	-	-	-	-	-	1	1	-	-
2	3	2	3	2	-	1	-	-	-	-	-	1	1	-	-
3	3	2	3	2	-	1	-	-	-	-	-	1	1	-	-
4	3	2	3	2	-	1	-	-	-	-	-	1	1	-	-
5	3	2	3	3	-	1	-	-	-	-	-	1	1	-	-

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

U20CCT204	COMPUTER ORGANIZATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce about basic system architecture
- To enrich knowledge in type of instructions and parallelism
- To solve 2's complement problems and gain knowledge about booths algorithm
- To study various semiconductor memories and programmable logic devices
- To familiarize about various computer peripherals.

Course Outcome

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

CO 1-Explain the basic functional blocks of computer (**K2**)
CO 2-Classify the type of instructions and addressing modes (**K3**)
CO 3-Solve arithmetic problems by 2's complement and booth algorithm (**K3**)
CO 4-Classify types of memory used for various applications(**K3**)
CO 5-Classify various interfacing buses used in computer organization and its application (**K3**)

UNIT- I INTRODUCTION (9 Hrs)

IAS Computer, Von Neumann Computer, System Bus. Instruction Cycle, Data Representation, Machine instruction and Assembly Language, CPU Organization: Arithmetic and Logic Unit, Control Unit, CPU Registers, Instruction Registers, Program Counter, Stack Pointer. CISC &RISC processors

UNIT- II INSTRUCTION AND CONTROL UNIT (9 Hrs)

Operation Code and Operand. Zero, One, Two and Three address instruction. Instruction types. Addressing modes. Stack organization. Control Structure and Behaviour, Hardwired Control and Micro programmed Control : Basic Concept, Parallelism in Microinstruction

UNIT- III ALU (9 Hrs)

Basic Structure of ALU, Addressing mode, Instruction Formats, Handling of interrupts and subroutines, Combinational ALU, 2's Complement Addition, Subtraction Unit, Booth's Algorithm for multiplication and division..

UNIT- IV MEMORY (9 Hrs)

Types of Memory, RAM, ROM, EPROM, EEPROM, DRAM, SRAM, SAM, PLA. Different storage technology; Memory Hierarchy: CPU Register, Cache Memory, Primary Memory, Secondary Memory and Virtual Memory

UNIT- V INPUT/OUTPUT AND COMPUTER PERIPHERALS (9 Hrs)

Polling, Interrupts, DMA, I/O Bus and Protocol, Memory mapped I/O and I/O mapped I/O,I/O system organization and interfacing, Bus: SCSI, PCI, USB, Bus arbitration. Computer peripherals :VDU, Keyboard, Mouse, Printer and Scanner

Text Books

1. J.P.Hayes, "Computer Architecture and Organization", 3rd edition, TMH, 2017.
2. Thomas C. Bartee, "Computer Architecture and Logic Design", Mc. Graw Hill, 2010
3. M. Morris Mano, "Computer System Architecture", 3rd edition PHI, 2007

Reference Books

1. William Stallings, " Computer Organization and Architecture", 10th edition, Pearson Education, 2015
2. V.P. Heuring, H.F. Jordan: Computer System design and architecture, 2 nd edition, Pearson Publisher, 2004
3. David A. Patterson and John L , "Computer Organization and Design: The Hardware/Software Interface" 5 th edition, MK publisher, 2014
4. V. Rajaraman, T. Radhakrishnan, "Computer Organization And Architecture", PHI Learning Pvt. Ltd, 2007
5. Sivaraama Dandamudi, "Fundamentals or Computer Organization and Design", Springer Int. Edition., 2003

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2. https://nptel.ac.in/courses/106/106/106106166/
3. https://nptel.ac.in/courses/106/105/106105163/

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

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

U20ESP202	PROGRAMMING IN C LABORATORY (Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS,CCE)	L	T	P	C	Hrs
		0	0	2	1	30

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.

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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- Develop C programs for simple applications making use of basic constructs, arrays and strings. (**K3**)

CO3 - Develop C programs involving functions, recursion, pointers, and structures. (**K3**)

CO4 - Design applications using sequential and random access file processing. (**K3**)

CO5 - Build solutions for online coding challenges. (**K3**)

List of Experiments

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", First edition, Pearson Education ,2011.
3. Yashvanth Kanethkar, "Let us C", 13th Edition, BPB Publications, 2008.
4. Maureen Sprankle,Jim Hubbard," Problem Solving and Programming Concepts," 9th Edition, Pearson, 2011.
5. B.W. Kernighan and D.M. Ritchie, "The C Programming language", 2nd Edition, Pearson Education, 2006.

Web References

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

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

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

U20CCP201	ELECTRONIC CIRCUITS LABORATARY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To design and analyze frequency response of CE amplifier with and without feedback
- To construct low frequency and high frequency oscillator
- To study efficiency of power amplifier
- To enable knowledge on multistage amplifier
- To study application of operational amplifier

Course Outcome

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

CO1- Design and verify frequency response of amplifier with and without feedback.(**K4**)
CO2- Design and verify oscillators.(**K4**)
CO3- Verify efficiency of power amplifier .(**K4**)
CO4-Demonstrate frequency response of multistage amplifier .(**K4**)
CO5- Apply op-amp for performing amplification, addition and subtraction .(**K3**)

LIST OF EXPERIMENTS

1. Study Frequency response characteristics of RC coupled CE amplifier
2. Study Frequency response and gain of current series feedback amplifier
3. Study Frequency response of voltage series feedback amplifier
4. Design and verify RC phase shift oscillator
5. Design and verify Wein bridge oscillator
6. Design and verify Colpitt's and Hartley oscillator
7. Frequency response of cascade amplifier
8. Frequency response of cascade amplifier
9. Frequency response of tuned amplifier
10. Voltage follower, Inverting and non inverting amplifier using op-amp
11. Adder and subtractor using op-amp
12. D/A converter using opamp

Reference Books

1. David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
2. D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 2009
3. Donald .A. Neamen, "Electronic Circuit Analysis and Design", 2nd Edition,Tata McGraw Hill, 2009
4. Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013
5. Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010•

Web References

1. http://www.build-electronic-circuits.com/
2. https://www.allaboutcircuits.com/
3. https://www.electronics-tutorials.ws/amplifier/amp_1.html
4. https://nptel.ac.in/courses/117/103/117103063/
5. https://www.electronics-lab.com/

COs/POs/PSOs Mapping

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

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

U20CCP202	DIGITAL ELECTRONICS LABORATARY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand various basic logic gates
- To design and implement various combinational circuits
- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits
- To write VHDL code for combinational circuits

Course Outcome

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

CO1- Verify Boolean laws using logic gates (**K3**)
CO2- Design and verify various combination circuits using logic gates.(**K4**)
CO3- Design and implement combinational circuits using MSI devices.(**K4**)
CO4-Design and verify sequential circuits.(**K4**)
CO5-Write VHDL code for combinational circuits.(**K4**)

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates.
2. Design and verify Half adder and Full adder using basic gates
3. Design and verify 4-bit Adder / Subtractor Circuits using IC 7483.
4. Design and testing of Code Converters for BCD to Gray conversion and Excess-3-code to BCD and vice versa
5. Design and testing of 2-bit ,4-bit Magnitude Comparator and 4x16 decoder using 3 to 8 decoder
6. Design and testing of 4 to 1 multiplexer and de-multiplexer using IC74153.
7. Design and testing of Shift Registers using D-flip-flops
8. Design and testing of magnitude comparator using IC7404, IC7408, and IC7486.
9. Design and testing of 4-bit Asynchronous Counters using IC 7476
10. Design and testing of 4-bit Synchronous Counter using IC 7476
11. Design and test sequence detector
12. VHDL code for Half adder, Full adder and decoder

Reference Books

1. S.Salivahanan and S.Arivazhagan, “Digital Electronics”, Ist Edition, Vikas Publishing House pvt Ltd, 2012.
2. Anil K.Maini, “Digital Electronics”, Wiley, 2014.
3. A.Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI Learning Private Limited, 2016.
4. Soumitra Kumar Mandal, “Digital Electronics”, McGraw Hill Education Private Limited, 2016.
5. S. Salivahanan and S. Arivazhagan, “Digital Circuits and Design.”,Vikas Publisher, 2009

Web References

1. https://www.electronics-tutorials.ws/boolean/bool_1.html
2. https://www.electronics-tutorials.ws/logic/logic_1.html
3. https://nptel.ac.in/courses/117/103/117103064/
4. http://www.asic-world.com/digital/tutorial.html
5. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U20CCC2XX	CERTIFICATION COURSE-II	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.

SKILL DEVELOPMENT COURSE-I

		L	T	P	C	Hours
U20CCS201	DEMONSTRATION OF WORKSHOP PRACTICES	0	0	2	-	30

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 gain a good basic working knowledge required for the production of various engineering products.
- 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 electrical components as per specific dimension. (**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. Troubleshooting of electrical appliances
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. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
5. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd.

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1. https://www.weld.com/
2. https://welding.com/
3. https://sciencing.com/soldering-desoldering-techniques-8288017.html
4. https://www.instructables.com/id/The-Ultimate-Guide-to-Desoldering/
5. https://electronicsclub.info/soldering.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	3	1	-	-	3	-	-	-	3	-	-	3	2	-	-
2	3	1	-	-	3	-	-	-	3	-	-	3	2	-	-
3	3	1	-	-	3	-	-	-	3	-	-	3	2	-	-
4	3	1	-	-	3	-	-	-	3	-	-	3	2	-	-
5	3	1	-	-	3	-	-	-	3	-	-	3	2	-	-

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

U20CCM202	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 type 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
viii) Shutting down the fans and ACs of the campus for an hour or so

U20BST325	DISCRETE MATHEMATICS AND GRAPH THEORY	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.
- To know the Mathematical induction methods in Combinatorics.
- Analyze the asymptotic performance of Lattices.
- To understand the fundamental concepts of Graph theory.

Course Outcome

After completion of the course, the students are able to

CO1 - Construct mathematical arguments using logical connectives and truth tables. (**K3**)
CO2 - Verify the correctness of an argument using propositional and predicate logic and quantifiers. (**K4**)
CO3 - Solve linear recurrence relations using generating functions. (**K3**)
CO4 - Demonstrate the ability to solve problems using counting techniques in Lattices. (**K3**)
CO5- Familiarize the different types of Graphs. (**K4)**

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS (12 Hrs)

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

UNIT II PREDICATE CALCULUS (12 Hrs)

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

UNIT III COMBINATORICS (12 Hrs)

Mathematical induction–Strong induction–The pigeon hole principle–Recurrence relations–Solving linear recurrence relations using generating functions –Inclusion and Exclusion Principle and its applications

UNIT IV LATTICES (12 Hrs)

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

UNIT V 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.

Text Books

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

Reference Books

1. C.L. Liu, "Elements of Discrete Mathematics", 3rd Edition, Tata McGraw - Hill Education Pvt. Ltd., 2008.
2. F. Harary, "Graph theory", Nrosa publishing house, New Delhi, 1988.
3. Douglas B. West, "Introduction to Graph theory", second edition Pearson Education, 2002.
4. Oscar Levin, "Discrete Mathematics An Open Introduction", 3rd Edition, 4th Printing: 2019 ISBN: 978-1792901690

5. Edgar C Coodare and Michael M Parmenter, “Discrete Mathematics with Graph Theory”, Pearson Education; 3rd Edition – 2015

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1. https://nptel.ac.in/courses/111/107/111107058/
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3. https://nptel.ac.in/courses/106/106/106106183/
4. http://www.math-cs.gordon.edu/courses/mat230/notes/graphs.pdf
5. https://www.cs.utexas.edu/~isil/cs311h/lecture-graph1b-6up.pdf

COs/POs/PSOs Mapping

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

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

U20EST359	PROGRAMMING IN C++ (Common to CSE, IT and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

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 Outcome

After completion of the course, the students are 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 Function.

UNIT II PRINCIPLES OF OBJECT ORIENTED PROGRAMMING (9 Hrs)

Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Classes objects - data members - member functions - This Pointer - Friends - Friend Functions - Friend Classes - Friend Scope - 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++",McGrawHill,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, Josee Lajoie , Barbara Moo , "C++ Primer", 5th Edition, 2012.
4. Bjarne Stroustrup, "The Design and Evolution of C++", Addison-Wesley , 2005
5. Alexander scu "Modern C++ Design" Pearson; 1st Edition, 2004.

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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/

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

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

		L	T	P	C	Hrs
U20EST356	**DATA STRUCTURES** **(Common to ECE, EEE, IT, ICE ,MECH, CIVIL ,BME, MECHATRONICS, CCE)**	3	0	0	3	45

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 Outcome

After completion of the course, the students are 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 and their 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: Types of Queue: Simple Queue- Circular Queue- Priority Queue -Deque.

UNIT III LINKED LIST OPERATIONS (9 Hrs)

Linked Lists: Singly linked lists: Representation in memory- Algorithms of several operations: Traversing- Searching- Insertion- Deletion in linked list- 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", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, 3rd Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", Pearson Education India, 4th Edition, 2009.

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1. Balagurusamy, "Data Structures". Tata McGraw-Hill Education , 2019
2. D.Samanta, "Classic Data Structures", Second Edition, Prentice-Hall of India, Pvt. Ltd., India 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in C",Prentice-Hall of India, PVt. Ltd., 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++”, Illustrated Edition, Addison-Wesley Publishing Company, 1995.

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3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

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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

U20CCT305	COMMUNICATION SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To understand the principles behind information theory and coding
- To study various spread spectrum techniques

Course Outcome

After completion of the course, the students are able to

CO1- Comprehend needs of modulation and various analog modulation techniques (**K2**)
CO2- Illustrate pulse modulation and multiplexing (**K3**)
CO3- Explain Digital transmission techniques (**K2**)
CO4- Interpret the principles behind information theory and coding (**K3**)
CO5- Describe spread spectrum communication and multiple access techniques(**K3**)

UNIT I ANALOG COMMUNICATION (9 Hrs)

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Anglemodulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNITII PULSE COMMUNICATION (9 Hrs)

Low pass sampling theorem – Quantization – PAM, PPM and PWM –– PCM, DPCM, DM, and ADPCM and ADM - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL COMMUNICATION (9 Hrs)

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING (9 Hrs)

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Linear Block codes- Cyclic codes and convolutional codes- Syndrome calculation

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS (9Hrs)

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronization and tracking – Multiple Access – FDMA, TDMA, CDMA

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.

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3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

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

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

U20CCT306	SIGNAL PROCESSING	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To introduce the concept of signals and systems and its classification based on properties
- To comprehend frequency domain representation discrete signal and various representation of discrete time LTI systems
- To analyze the frequency domain behavior of Discrete Time signal using Discrete Fourier Transform
- To design IIR filters for given specifications by following the suitable design procedures
- To design FIR filters for given specifications by following the suitable design procedures

Course Outcome

After completion of the course, the students are able to

CO1- Describe properties of signals and systems(**K2**)
CO2- Interpret Discrete time signal in frequency domain and realize discrete time systems in various methods (**K3**)
CO3- Estimate spectrum of discrete time signal using DFT through FFT algorithm (**K3**)
CO4- Design and realize IIR filter (**K3**)
CO5- Design and infer FIR filter(**K3**)

UNIT- I CLASSIFICATION OF SIGNALS AND SYSTEMS (12 Hrs)

Continuous time signals - Discrete time signals – Representation of signals – Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Classification of continuous and discrete time signals- Operations on the signals. Continuous time and discrete time systems: Classification of systems – Properties of systems.

UNIT- II DISCRETE TIME SIGNALS AND SYSTEMS (12 Hrs)

Discrete Time Fourier Transform: Properties; Z-Transformation: Properties -Difference Equations-Block diagram representation-Direct form, cascade and parallel form realization-Impulse response – Convolution sum

UNIT- DISCRETE FOURIER TRANSFORM (12 Hrs)

The Discrete Fourier Transform- Need for DFT, DFT as a linear transformation. Properties of DFT- Periodicity, Linearity, Symmetry, Multiplication-Circular Convolution, Efficient Computation of DFT-FFT algorithm-Implementation of Radix 2 FFT algorithm(DIT and DIF)-Applications of FFT algorithm.

UNIT- IV IIR FILTER DESIGN (12 Hrs)

Analog filter approximations-Butterworth, Design of IIR filter from analog filters. Impulse invariant techniques, Bilinear transformation method, spectral transformation

UNIT- V DESIGN OF FIR FILTERS (12 Hrs)

Linear phase FIR filters Design using Frequency sampling techniques using Windows- Hamming, Hanning, Blackman Window. Realization of FIR filters-Direct, Linear phase realization structures

Text Books

1. Simon Haykins and Barry Van Veen, “Signals and Systems”, Second Edition, John Wiley and Sons, 2002
2. Allan V. Oppenheim, Allan S.Willsky and S.Hamid Nawab, “Signals and Systems”, 2nd Edition, PHI Learning, New Delhi, 2007.
3. John G. Proakis and Dimitris K. Manolakis , “Digital Signal Processing” , 4th edition, Pearson, 2007

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1. B. P. Lathi, “Principles of Linear Systems and Signals”, 2nd Edition, Oxford, 2009
2. P.Ramesh Babu, “Digital Signal Processing”, Scitech Publications, 7th Edition, 2017
3. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems – Continuous and Discrete”, Pearson, 2007.
4. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
5. M.J.Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.

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2. http://freevideolectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur
3. http://www.analog.com/en/content/beginners_guide_to_dsp/fca.html
4. http://www.nptelvideos.in/2012/12/signals-and-system.html
5. https://nptel.ac.in/courses/117/101/117101055/

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

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

U20CCT307	SOFTWARE ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the Software Engineering concepts and Lifecycle Models.
- To learn the project management and cost estimation techniques.
- To gain knowledge of the System Analysis and Design concepts.
- To understand the Object Oriented modeling.
- To understand software testing approaches

Course Outcome

After completion of the course, the students are able to

CO1- Identify various Software Development Life Cycle Models. (**K3)**
CO2- Utilize Project Management and Requirement Analysis. (**K3**)
CO3- Apply the appropriate Software Design.(**K3)**
CO4- Apply various UML diagrams for the projects.(**K3**)
CO5- Use UI and testing strategies (**K3**)

UNIT- I INTRODUCTION (9 Hrs)

Software engineering concepts – Development activities – Software lifecycle models - Classical waterfall - Iterative waterfall – Prototyping – Evolutionary - Spiral – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management.

UNIT- II SOFTWARE PROJECT MANAGEMENT AND REQUIREMENTS ANALYSIS (9 Hrs)

Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Empirical Estimation Techniques – COCOMO – Halstead's Software Science – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Risk Management – Requirements Gathering and Analysis – Software Requirements specification – Formal System Specification – Axiomatic Specification - Algebraic Specification –4GL.

UNIT- III SOFTWARE DESIGN (9 Hrs)

Outcome of a Design Process – Characteristics of a Good Software Design – Coupling and Cohesion – Approaches to Software Design – Object Oriented Vs Function Oriented Software Design approaches – Structured Analysis – Data Flow Diagrams – Applying DFD to Real time systems – Structured and Detailed Design.

UNIT- IV OBJECT MODELLING AND OBJECT ORIENTED SOFTWARE DEVELOPMENT (9 Hrs)

Overview of Object Oriented concepts – UML – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams - Patterns – Types – Object Oriented Analysis and Design methodology – Interaction Modelling – OOD Goodness criteria.

UNIT- V USER INTERFACE DESIGN AND TESTING (9 Hrs)

Characteristics of a good User Interface – Types – Fundamentals of Component based GUI Development – A User Interface Design methodology – Coding – Software Documentation – Testing – Unit Testing – Black Box testing – White Box testing – Debugging – Program Analysis tools – Integration testing – Testing Object Oriented programs – System Testing –Issues

Text books

1. Ian Sommerville, "Software Engineering", Pearson Education, 10th Edition,2016.
2. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 5th Edition, 2018
3. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, 8th edition,2019

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1. S. L. Pfleeger and J.M. Atlee, “Software Engineering Theory and Practice”, Pearson Education, 4th edition, 2010.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, “Fundamentals of Software Engineering”, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. K.K Aggarwal and Yogesh Singh, “Software Engineering”, 3rd edition, New Age international Publishers, 2007
4. Waman S jawadekar, “Software Engineering Principles and Practices”, *McGraw-Hill*. *Companies*, 2007.
5. James F. Peters, Witold Pedrycz, “Software Engineering, An Engineering Approach”, John Wiley, 2000

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4. http://www.google.com/Top/Computers/Software/Software_Engineering/
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
2	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
3	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
4	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
5	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-

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

		L	T	P	C	Hrs
U20HSP301	**GENERAL PROFICIENCY–I** (Common to all branches except CSBS)	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 (6Hrs)

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 (6Hrs)

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 (6Hrs)

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 (6Hrs)

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 (6Hrs)

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, New Delhi, 2012.
2. Mn,Taylor, and Grant Taylor. “English Conversation Practice”. Tata McGraw-Hill Education, 1975.
3. Bailey, Stephen. “Academic writing: A practical guide for students”. Psychology Press, 2003.
4. Aggarwal, R. S. “A Modern Approach to Verbal & Non Verbal Reasoning”. S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. “High School English Grammar and Composition”. S Chand, 2005.

Web References

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

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

	PROGRAMMING IN C++ LABORATORY	L	T	P	C	Hrs
U20ESP360	(Common to CSE,IT, CCE)	0	0	2	1	30

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 Outcome

After completion of the course, the students are 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. File Stream 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,“ObjectOrientedProgrammingwithC++”,McGrawHill,7th Edition,2018.
3. HerbertSchildt,“C++-TheCompleteReference”,McGrawHillEducation,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 References

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

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

		L	T	P	C	Hrs
U20ESP357	**DATA STRUCTURES LABORATORY (Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHATRONICS, CCE)**	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 Outcome

After completion of the course, the students are 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)**

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List of Experiments

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. 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. b) 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, 3rdEdition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1stEdition, 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 References

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

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

U20CCP303	COMMUNICATION SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To visualize the effects of sampling and TDM
- To Implement AM & FM modulation and demodulation
- To implement PCM & DM
- To implement FSK, PSK and DPSK schemes
- To implement Error control coding schemes and Equalization algorithms

Course Outcome

After completion of the course, the students are able to

CO1- Demonstrate the effects of sampling and TDM(**K3**)
CO2- Implement AM & FM modulation and demodulation(**K3**)
CO3- Implement PCM & DM(**K3**)
CO4- Demonstrate base band signaling schemes through implementation of FSK, PSK and DPSK **(K3)**
CO5- Simulate and validate line coding and error control coding (**K3**)

LIST OF EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
8. Line coding schemes
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes – Linear Block Codes (Simulation)

Reference Books

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems”, 3/e, 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
4. H P Hsu, Schaum Outline Series, “Analog and Digital Communications”, TMH 2006
5. B.Sklar,” Digital Communications Fundamentals and Applications”, 2/e Pearson Education 2007.

Web References

1. www.allaboutcircuits.com
2. www.circuitstoday.com
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	3	3	1	1	-	-	-	-	-	1	2	2	-	-
2	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
3	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
4	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
5	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-

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

		L	T	P	C	Hrs
U20CCC3XX	CERTIFICATION COURSE-III	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.

SKILL DEVELOPMENT COURSE 2

(Choose anyone of the below two courses)

		L	T	P	C	Hrs
U20CCS302	1.COMPUTER ON OFFICE AUTOMATION	0	0	2	-	25

Microsoft Access

- Build custom applications to track any type of information your company needs: Contacts, Appointments, Sales, Employees, Expenses, Telemarketing, Service, Human Resources, Ordering, Inventory, Engineering, etc
- Create Word documents on the fly to populate letters, envelopes and custom reports based on data in a database
- Create functionality that can open up a Word template, fill the document with data, print the document and save the document with 1 click of a button
- Create functionality that can open up an Excel spreadsheet and populate it with data
- Create functionality that can open up an Excel spreadsheet and populate it with information as well as determine where to insert/delete rows if needed to keep the integrity of formulas in tact

Microsoft Excel

- Create worksheets that have to be validated before the system lets the user save the spreadsheet
- Create worksheets that can read information from another system (i.e. database) to populate dropdown boxes, etc
- Create company expense report that saves the information into a database for summary/analysis purposes
- Combine data from multiple Excels spreadsheets/worksheets to create a new formatted Excel spreadsheet
- Create automations that can open a master spreadsheet with many tabs and determine which of the tabs (single or multiple) need to be populated with data and which tabs need to be removed from the spreadsheet if they aren't needed
- Create automations to eliminate people having to re-key/massage/format data

Microsoft Word

- Create documents that can read information from another system (i.e. database) to populate dropdown boxes, etc
- Create documents that have to be validated before the system lets the user save the document
- Create documents that upon saving can save the information on the document into a database
- Create documents that can popup and format an Outlook email with data from the document to be sent out upon saving a document

Reference Books

1. Remya Chandran, "A Text Book of Introduction to Computers & Office Automation", Independently published, 2019
2. James W Driscoll, "Office Automation: The Dynamics of a Technological Boondoggle", Palala Press, 2018

Web References

1. https://www.referenceforbusiness.com/encyclopedia/Mor-Off/Office-Automation.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	2	-	-	-
2	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
3	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
4	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
5	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-

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

U20CCS302	2. ANIMATION PRACTICE	L	T	P	C	Hrs
		0	0	2	-	25

Course Objectives

- Understand graphics programming
- Be exposed to creation of 3D graphical scenes using open graphics library suits
- Be familiar with image manipulation, enhancement
- Learn to create animations
- To create a multimedia presentation/Game/Project.

Course Outcome

After completion of the course, the students are able to
CO1- Implement algorithm for drawing (**K3**)
CO2- Use 2D Geometric Transformation (**K3**)
CO3- Implement image manipulation and enhancement (**K3**)
CO4-Implement 2D animations using tools (**K3**)
CO5- Implement 3D graphical scenes using open graphics library suits (**K3**)

Implement the Exercises Using C / OPENGL / JAVA

- Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)
- 2D Geometric transformations: –
  Translation
  Rotation Scaling
  Reflection Shear
  Window-Viewport
- Composite 2D Transformations
- Line Clipping
- 3D Transformations – Translation, Rotation, Scaling.
- 3D Projections – Parallel, Perspective.
- Creating 3D Scenes.
- Image Editing and Manipulation – Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
- 2D Animation – To create Interactive animation using any authoring tool.

Reference Books

1. J. D. Foley, A. Van Dam, S. K. Feiner, J. F. Hughes, “Computer Graphics: Principles and Practice in C”, 3rd ed, Addison-Wesley, 2013
2. Eric Lengyel , “Mathematics for 3D Game Programming and Computer Graphics”, Course Technology PTR, 2012

Web References

1. https://www.cs.brandeis.edu/~cs155/

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

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

U20BST436	PROBABILITY AND STOCHASTIC PROCESS	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

6. To understand concepts of probability.
7. To acquire knowledge on Probability distributions.
8. Gain knowledge about the random processes.
9. Get exposed to discrete time Markov chain.
10. Gain strong knowledge in principles of Queuing theory.

Course Outcome

After completion of the course, the students are able to

CO1 - Apply the specialized knowledge in probability theory.(**K3**)
CO2 - Infer the fundamental of interrelationship between discrete and continuous random variables.(**K2**)
CO3 - Apply the fundamentals of probability theory and random process.(**K3**)
CO4 - Create mathematical models for practical design problems and determine theoretical solutions to the created models. (**K4**)
CO5- Apply the knowledge of Queuing theory.(**K3**).

UNITI 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& APPLICATION OF DISTRIBUTION (12Hrs)

Some important distributions: Exponential distribution - Gamma - Weibull and Gaussian distributions. Application of Distribution - Reliability - Failure density and Hazard function.

UNIT III STOCHASTIC PROCESS (12Hrs)

Definition - Classification of Stochastic Process - Strictly Stationary process - Wide Sense Stationary - Poisson process.

UNIT IV DISCRETE PARAMETER MARKOV CHAIN (12 Hrs)

Introduction - Computation of n-step transition Probabilities - Chapman - Kolmogorov equation State classification and limiting Probabilities - M/G/1 queuing system -Pollaczek Khinchine transform equation.

UNIT V CONTINUOUS PARAMETER MARKOV CHAIN (12 Hrs)

M/M/1 - M/M/C - M/M/1/N - M/M/C/N (C<N) - M/M/C/C - M/M/∞ models only - Derivation of mean number of customer in the system - in the queue and waiting time - Simple applications.

Text Books

1. T. Veerarajan, “Probability and Statistics, Random Process and Queuing Theory”, McGraw Hill Education,2018.
2. P. Sivaramakrishna Das, “Probability and Random Process”,Pearson Education, 6th Edition, 2019
3. Moorthy M.B.K., SubramaniK. and SanthaA., “Probability & Random Process”, Scitech PublicationPvt. Ltd.,2017.

Reference Books

1. P.Balaji, “Probability and Random Processes”, Balaji publishers, 5thEdition, 2018.
2. M. Bhatt and Ravish R. Singh, “Probability and Statistics”, McGraw Hill Education,2017.
3. P.Kandasamy, Thilagavathi. K and Gunavathi.K., “Probability Random variable and Random Process”, S.Chand&Co. Pvt. Ltd,2015
4. J.Ravichandran, “Probability& Random Process for Engineers”, I.K.International Publishing House Pvt. Ltd, 2014.
5. T.K.V Iyengar, “Probability and Statistics for Engineering and the Sciences”, S.Chand (G/L) & Company Ltd -January 2008.

Web References

1. https://nptel.ac.in/courses/117/105/117105085/
2. https://www.probabilitycourse.com/
3. https://people.eecs.berkeley.edu/~wlr/126notes.pdf
4. https://www.youtube.com/watch?v=AUth5ws75nk
5. https://www.youtube.com/watch?v=adfi2dHJw4o

COs/POs/PSOs Mapping

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

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

	PROGRAMMING IN JAVA	L	T	P	C	Hrs
U20EST467	(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHATRONICS, CCE)	3	0	0	3	45

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 Schil dt, “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. Nageshvarrao, “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 References

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

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

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

U20CCT408	PRINCIPLES OF DATA COMMUNICATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about data transmission media
- To understand the components required to build different types of network.
- To understand the routing in the network.
- To familiarize the functions and protocols of each layer of TCP/IP protocol suite.
- To understand application layer protocols

Course Outcomes

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

CO1- Explain Data Communications System and its components (**K2**)
CO2- Describe the concepts of layer models(**K3**)
CO3- Evaluate the routing in network layer(**K3**)
CO4 - Use functionalities and protocols of each layer of TCP/IP protocol suite. (**K3**)
CO5 -Interpret application layer protocols(**K3**)

UNIT I DATA COMMUNICATIONS (9 Hrs)

Transmission – Impairments – Bandwidth Limitations – Modulation – Frequency Spectrum – Multiplexing– Encoding Techniques – Transmission Media - Copper – Fiber – Optical – Radio (wireless) –Overview ofcommunication buses- Cable Pinouts – Crossover – Straight Through - Rollover

UNIT II LAYER MODELS (9 Hrs)

Evolution of Computer Networking – Layered Architecture – ISO/OSI Model –TCP/IP reference model Internet Architecture - Link Layer – Framing – Addressing – Error Detection/Correction – Multiple Access Protocols – Address Resolution Protocol (ARP)- B-ISDN- ATM

UNIT III NETWORK LAYER (9 Hrs)

Ethernet Basics – CSMA/CD – Frame Format – Switching – Types (datagram, virtual) – Hubs, Bridges, Switches – Virtual LAN (VLAN) – Wireless LAN (802.11) – WAN Technologies — Frame Relay – MPLS- Network Address Translation – BOOTP/DHCP-ICMP – Routing Principles – Distance Vector Routing(RIP)- Link State Routing (OSPF) – Path Vector Routing (BGP)

UNIT IV TRANSPORT LAYER (9 Hrs)

Transmission Control Protocol (TCP) /IP suite -End to End Protocols – Connectionless Transport – User Datagram Protocol (UDP) – Reliable Data Transfer – Connection Oriented Transport - - Flow Control – Congestion Control – Transport Layer Alternatives (RPC) – Transport for Real Time Application

UNIT V APPLICATION LAYER (9 Hrs)

Application Layer Protocols – HTTP – FTP – Telnet – Email – DNS – Application Performance – Performance Metrics Internet Protocol – IPV4 Packet Format – IP Addressing – Subnetting – Variable Length Subnet Mask(VLSM) – Classless Inter Domain Routing (CIDR) – Private Addressing –) – Router Internals – IPV6 – Quality of Service (QoS)

Text Books

1. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, 7th Edition, Pearson Education, 2017.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan Kaufmann Publishers Inc., 2011.
3. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education, 2013.

Reference Books

1. Douglas E. Comer, “Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture”,6th Edition, Pearson Education, 2013.
2. Nader F. Mir, “Computer and Communication Networks”, 2nd Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”,McGraw Hill Publisher, 2011.
4. Behrouz A. Forouzan and Firouz Mosharraf, “Computer Networks a Top Down Approach”, TataMcGraw-Hill, 2017.
5. Rich Seifert, James Edwards, ”The All New Switch Book: The Complete Guide to LAN SwitchingTechnology”, 2nd Edition , Wiley Publishing Inc, 2011

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1. https://tinyurl.com/ycy6x454
2. https://tinyurl.com/yapn9ac7
3. https://tinyurl.com/ydf33ye6
4. https://nptel.ac.in/courses/106/105/106105081/
5. https://nptel.ac.in/courses/106/105/106105183/

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

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

		L	T	P	C	Hrs
U20CCT409	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE,CCE)	3	0	0	3	45

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 Outcome

After completion of the course, the students are 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 (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, Probabilistic analysis, Amortized analysis.

UNIT II DIVIDE AND CONQUER, GREEDY METHOD (9 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 (9 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 (9 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 (9 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 References

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

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

	GENERAL PROFICIENCY–II	L	T	P	C	Hrs
U20HSP402	(Common to all branches except CSBS)	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- Maximise the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. (K2)

UNIT I -CAREER SKILLS (6Hrs)

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 (6Hrs)

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 (6Hrs)

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 (6Hrs)

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

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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

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1	1	-	-	-	-	-	-	1	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	1	-	3	-	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

		L	T	P	C	Hrs
U20ESP468	PROGRAMMING IN JAVA LABORATORY (Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHATRONICS, CCE)	0	0	2	1	30

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 IOstreams. **(K3)**

CO5 - Develop simple database programs.**(K3)**

LIST OF EXERCISES

1. Develop simple programs using java syntax and semantics.
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. E. Balaguruswamy, “Programming with Java”, TMH Publ, 2nd Edition, 2005.
2. Paul Deitel and Harvy Deitel, ‘JAVA How to programming’, Deitel Publisher,11th Edition, 2017
3. Herbert Schildt, “The Complete Reference JAVA 2”, TMH, Seventh Edition, 2006.
4. Cay.S.Horstmann and Gary Cornell, “Core Java 2”, Vol 2, Advanced Features, Pearson Education, Seventh Edition, 2010.
5. Sagayaraj, Denis, Karthik, Gajalakshmi, “JAVA Programming for core and advanced learners”, Universities Press Private Limited, 2018.

Web References

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

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

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

U20CCP404	DATA COMMUNICATION LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn and use network commands
- To learn socket programming
- To implement and analyse various protocols like TCP and UDP
- To learn and use network simulator tool
- To use simulation tools to analyze the performance of various routing protocols and perform error correction

Course Outcomes

After completion of the course, the students will able to

CO1- Effectively use of network commands(**K3**)

CO2-Compare the performance of different transport layer protocols(**K4**)

CO3- Implement various protocols using TCP and UDP(**K4**)

CO4- Demonstrate a network using NS2(**K4**)

CO5-Use simulation tools to analyse the performance of of various routing protocols and perform error correction (**K3**)

LIST OF EXPERIMENTS

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

Reference Books

1. Douglas E. Comer, “Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture”, 6th Edition, Pearson Education, 2013.
2. Nader F. Mir, “Computer and Communication Networks”, 2nd Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. Behrouz A. Forouzan and FirouzMosharraf, “Computer Networks a Top Down Approach”, Tata McGraw-Hill, 2017.
5. Rich Seifert, James Edwards, ”The All New Switch Book: The Complete Guide to LAN Switching Technology”, 2nd Edition , Wiley Publishing Inc, 2011

Web References

1. https://tinyurl.com/ycy6x454
2. https://tinyurl.com/yapn9ac7
3. https://tinyurl.com/ydf33ye6
4. https://nptel.ac.in/courses/106/105/106105081/
5. https://nptel.ac.in/courses/106/105/106105183/

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

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

U20CCP405	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY (Common to CSE and CCE)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To introduce the basic concepts of various algorithm design techniques.
- To solve 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.Divide and Conquer
- Binary Search using Divide and Conquer approach
- Implement Merge Implement Sort using Divide and Conquer approach

2.Divide and Conquer
- Implement Quick Sort using Divide and Conquer approach
- Find Maximum and Minimum element from an array of integer using Divide and Conquer approach

3. Dynamic Programming
- Find the minimum number of scalar multiplication needed for chain of matrix

4. Dynamic Programming
- Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm)
- Implement Traveling Salesman Problem

5. Dynamic Programming
6. Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford Algorithm)
7. Brunch and Bound
8. Implement 15 Puzzle Problem
9. Backtracking
10. Implement 8 Queen problem
11. Graph Coloring Problem
12. Hamiltonian Problem
13. Greedy method limitations
14. Knapsack Problem
15. Job sequencing with deadlines
16. Greedy method algorithms
17. Minimum Cost Spanning Tree by Prim's Algorithm
18. Minimum Cost Spanning Tree by Kruskal's Algorithm
19. Perform Travelling Salesman Problem

Reference Books

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, 3rdEdition, Pearson Education, 2012.
2. E. Horowitz and S.Sahni, Fundamentals of Algorithms, 2nd Edition, Galgotia Publications, 2010.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, PHI Learning Private Limited, 2012.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
5. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven

Web References

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

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

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

		L	T	P	C	Hrs
U20CCC4XX	CERTIFICATION COURSE-IV	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.

SKILL DEVELOPMENT COURSE 3

(Choose anyone of the below three courses)

		L	T	P	C	Hours
U20CCS403	1. COMPUTER HARDWARE AND TROUBLESHOOTING	0	0	2	-	25

Course Objectives

- Learn and identification of standard desktop personal computer components
- To understand and troubleshooting system related problems
- To understand the components on the motherboard and system components
- To understand the Installation and configure computer drivers
- To develop the ability to Install of various operating systems, peripherals with antivirus and configure it

Course Outcomes

After completion of the course, the students are able to

CO1 - Infer the fundamental of standard desktop personal computer components.
CO2 - Ability to analyze and troubleshooting system related problems.
CO3 - Ability to Installation and configure computer drivers
CO4 - Design and analyze sequential logic circuits along with its applications.
CO5 - Design and analyze ability to Install of various operating systems, peripherals with antivirus and configure it

LIST OF EXPERIMENTS

1. Study and identification of standard desktop personal computer.
2. Understanding of Motherboard and its interfacing component
3. Install and configure computer drivers and system components.
4. Disk formatting, partitioning and Disk operating system commands
5. Install, upgrade and configure Windows operating systems.
6. Remote desktop connections and file sharing.
7. Identify, install and manage network connections Configuring IP address and Domain name system.
8. Install, upgrade and configure Linux operating systems.
9. Installation Antivirus and configure the antivirus.
10. Installation of printer and scanner software.
11. Disassembly and Reassembly of hardware.
12. Troubleshooting and Managing Systems

Reference Books

1. Craig Zacker& John Rourke, “The complete reference :PC hardware”, Tata McGrawHill, New Delhi, 2001.
2. Mike Meyers, “Introduction to PC Hardware and Troubleshooting”, Tata McGrawHill, New Delhi, 2003.
3. B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill, New Delhi, 2002

Web References

1. https://nptel.ac.in/courses/117101055/

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

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

U20CCS403	2.MOBILE SERVICING	L	T	P	C	Hrs
		0	0	2	-	30

Course Objectives

6. Learn and identification of standard mobile components
7. To understand and troubleshooting hardware and software related problems
8. To study the various faults arising due to corrupt software
9. To understand the various flasher boxes and Flashing software for various brands.
10. To develop the ability to troubleshooting faults using advanced techniques

Course Outcomes

After completion of the course, the students are able to

CO1 - Infer the fundamental of standard mobile components. (K2)
CO2 –Examine and troubleshoot mobile hardware and software related problems. (K4)
CO3 - Inspect about various faults arising due to corrupt software (K4)
CO4 - Identify different flasher boxes and Flashing software for various brands (K4)
CO5 –Identify and troubleshooting faults using advanced techniques (K4)

MODULE I: HARDWARE BASED EXPERIMENTS

1. Study of various tools and equipment used for mobile phone repairs.
2. Introduction of various Circuit of the Motherboard and Various Components used in mobile phone
3. Assembling and disassembling of various models of mobile phones.
4. Identifying the fault and troubleshooting for repairing of various fault
5. Common repair procedure for hardware and software related faults.

MODULE II: SOFTWARE BASED EXPERIMENTS

6. Detailed study of various faults arising due to corrupt software
7. Introduction of various flasher boxes and Flashing software of various brands of hands.
8. Removing virus from infected phones and Unlocking of handsets through codes and/or software.
9. Common repair procedure for Water damaged repair techniques.
10. Use of internet for troubleshooting faults using advanced troubleshooting techniques.

Reference Books

1. ChukkyOparandu , “Mobile Phones and Tablets Repairs: A Complete Guide for Beginners and Professionals”, Mondraim Nig. Ltd, May 2016..
2. SanjibPandit , “Advance Mobile Repairing: Multicolour Circuits, Service Diagrams & Repairing”, Mondraim Nig. Ltd, December 2010.

Web References

1. https://www.youtube.com/watch?v=OjxCelVySi8
2. https://www.youtube.com/watch?v=jd8zBgwMfU0
3. https://in.pinterest.com/pin/862017184895958528/
4. https://fliphtml5.com/fgms/skao/basic
5. https://www.pinterest.com/smartphonesrepair/phone-repairing-manual-pdf-free-download/

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

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

U20CCS403	3. PCB AND CIRCUIT DESIGN	L	T	P	C	Hrs
		0	0	2	-	30

Course Objectives

6. To understand the fundamental concepts in circuit design
7. To know about the PCB design and construction along with its types
8. To get a basic idea about Proteus software.
9. To perform design synchronization with schematic tool
10. To study about routing guidelines

Course Outcomes

After completion of the course, the students are able to

CO1 - Infer the fundamental of circuit design (**K2**)
CO2–Describes PCB design and its types (**K2**)
CO3 –Demonstrate the Proteus PCB schematic (**K3**)
CO4–Examines the design synchronization (**K4**)
CO5–Tests the various routing guidelines (**K4**)

1. **Introduction to Circuit Designing:** Fundamental of circuit design - Creating New Components - Introduction to Analog Circuit Design - Introduction to Digital Circuit Design - Placing Symbols and Ports - Labeling components - Circuit optimization

2. **Introduction to PCB Design** - Definition and Evolution of PCB - Purposes of a PCB - Types of PCBs -Creating the Blank PCB - Defining a sheet template - Printed Circuit Technology - PCB Construction (Power and Ground Plane) - PCB Printing & Etching process

3. **Proteus PCB Schematic** - Defining the Board Shape & Placement Boundary - Creating a board outline & placement / routing boundary - Basic concepts of PCB Designing - Schematic capture - From schematic to PCB - Placing, editing, and connecting parts and electrical symbols - Adding and editing graphics and text

4. **Proteus PCB Editor** - Creating and editing parts - Preparing to create a net list - Creating a net list - Exporting and importing schematic data - PCB Material. - Board Layers, Colors and Grids. - Defining the Electrical/Mechanical Layer - Defining PWR/GND layers.

5. **Design Transfer to the PCB and Design Rule Check** - Design synchronization with schematic tool. - Design transfer using a Net list. - Design rules concepts. - Design Rule Checking

6. **Component Placement & Shielding** - Placing components. - Finding components for placement. - Moving components. - Shielding Practices. - Copper Pour

7. **Routing PCB Layout Routing and Grounding** - Routing guidelines

Reference Books

1. Bruce R. Archambeault , James Drewniak “PCB Design for Real-World EMI Control”, Springer-Verlag New York Inc., United States, 2002.
2. Kraig Mitzner, “Complete PCB Design Using OrCAD Capture and PCB Editor”, ElsevierScience & Technology, Oxford, United Kingdom, 2009.
3. Keng Tiong Ng , “PCB-RE: Real-World Examples”, Independently Published, 2019.
4. Roger Hu, “PCB Design and Layout Fundamentals for EMC”, Independently Published, 2019.
5. Matthew Scarpino, “Designing Circuit Boards with EAGLE: Make High-Quality PCBs at Low cost Pearson Education, United States, 2014

Web References

1. https://engineering.eckovation.com/learn-design-pcb/
2. https://www.tronicszone.com/blog/steps-pcb-design-manufacturing/
3. https://www.elprocus.com/what-is-printed-circuit-board-and-designing-process-of-pcb/
4. https://www.electronics-notes.com/articles/analogue_circuits/pcb-design/how-to-design-pcb- board-basics.php
5. https://resources.pcb.cadence.com/blog/2019-what-is-the-pcb-fabrication-process-an-introduction

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

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

		L	T	P	C	Hrs
U20CCM404	NSS	0	0	2	-	15

Course Objectives

- Understand the role of National Service Scheme in community
- Identify the needs and problems of the community and involve in problem solving
- Develop competence required for group living and acquire leadership qualities

Course Outcomes (COs)

CO1 - understand the community in which they work and render their service
CO2 - develop among themselves a sense of social and civic responsibility

Introduction and Basic Concepts of NSS: History-philosophy-aims & objectives of NSS- Emblem, flag, motto, song, badge- Organizational structure - roles and responsibilities functionaries.

NSS Programmes and Activities: Concept of regular activities, special camping, Day Camps-Basis of adoption of village/slums-Methodology of conducting Survey -Financial pattern of the scheme – Coordination with different agencies-Maintenance of the Diary.

Community Mobilization: Mapping of community stakeholders-Designing the message in the context of the problem and the culture of the community- Identifying methods of mobilization-Youth-adult partnership.

Health, Hygiene & Sanitation: Definition, needs and scope of health education- Food and Nutrition - Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan).

Entrepreneurship Development: Definition & Meaning – Qualities of good entrepreneur - Steps/ways in opening an enterprise -Role of financial and support service Institutions.

Reference Books

1. A Hand book on National Service Scheme, Anna University, Chennai, 2012
2. Delgado-Gaitn and Concha, The Power of Community: Mobilizing for Family and Schooling NewYork: Rowman& Littlefield Publishing, Inc. 2001
3. James Bailey,Guide to Hygiene and Sanitation in Aviation, World health organization, 2nd edition. 1980
4. AnuradhaBasu, Mark Casson, Nigel wadeson and Bernard Yeung, The oxford hand book of entrepreneurship, Oxford Press. 2009

Web References

1. http://nss.nic.in/intro.asp

Professional Elective-I

		L	T	P	C	Hrs
U20CCE401	SPREAD SPECTROM COMMUNICATION	3	0	0	3	45

Course Objectives

- To understand and gain complete knowledge about Direct Sequence Spread Spectrum
- To gain insight into Frequency hopped Spread Spectrum.
- To understand the Commercial applications of Spread Spectrum.
- To explain the cryptography concepts of Spread Spectrum.
- To expose the real time applications of spread spectrum.

Course Outcomes

After completion of the course, the students are able to

CO1–Describe basic Direct Sequence Spread Spectrum (**K2**)
CO2 - Explain the working principle of Frequency hopped Spread Spectrum (**K3)**
CO3 - Describe the acquisition and tracking of Spread Spectrum (**K2)**
CO4- Explain the characteristic of cryptography concepts (**K2)**
CO5 - Interpret the real time applications of spread spectrum (**K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction-Application and advantages of spread spectrum (SS)-Classification of SS- Pseudo noise sequences-Direct Sequence (DS) spread spectrum-Frequency hopping - Hybrid Spectrum methods.

UNIT II SPREAD SPECTRUM TECHNIQUES-TYPES (9 Hrs)

Frequency hopped (FH) spread spectrum signals. Performance of FH Spread spectrum-in AWGN channel and partial band interference, Fast hopping versus slow hopping- DS versus FH. CDMA system based on FH spread spectrum signals-Other types of spread spectrum signals.

UNIT III SPREAD SPECTRUM TECHNIQUES-ANALYSIS (9 Hrs)

Synchronization of SS systems - Acquisition. Tracking, Jamming consideration- Broad band –Partial-multiple tone pulse-repeat band jamming blades system

UNIT IV CRYPTOGRAPHY (9 Hrs)

Fundamental concepts of cryptosystems – authentication, digital signature. Key schedule – Encipherment, Decipherment , Stream cipher system. Public key –cryptosystem. Public key distribution system. RSA cryptosystem and authentication scheme. Protocols, Internetworking security mechanisms, Private and public key encryption.

UNIT V APPLICATIONS (9 Hrs)

Commercial application of SS – CDMA – Multi path channels – The FCC part 15 rules – Direct sequence CDMA – IS95 CDMA digital cellular systems

Text Books

1. Bernard Sklar , “Digital Communication – Fundamentals and Application”, Pearson Edition, 2001.
2. John G. Prokias, “Digital Communications”, McGraw Hill Inc,2001.
3. William Stallings, “Cryptography and network Security”, Pearson Education, 2017.

Reference Books

1. Don Torrieri ,”Principles of spread spectrum communication systems”, Springer Science & Business Media, 2006.

2. Andrew J. Viterbi ,"CDMA: Principles of Spread Spectrum Communication" ,Addison-Wesley Publishing Company, 1995.
3. Feher. K. "Wireless Digital Communications", Pearson education.
4. Behrouz A Forouzan, Debdeep Mukhopadhyay, " Cryptography and Network Security", McGraw Hill, 2007.
5. M.K.Simon, J.K Scholtz and B.K Levitt, "Spread Spectrum Communications", Computer Science press inc, 1985.

Web References

1. https://www.tutorialsweb.com/spread-spectrum/classification-of-ss-modulation-schemes.htm
2. http://www.myreadingroom.co.in/notes-and-studymaterial/68-dcn/778-spread-spectrum-techniques.html
3. https://www.tutorialspoint.com/digital_communication/digital_communication_spread_spectrum_modulation.htm
4. https://www.garykessler.net/library/crypto.html
5. https://www.geeksforgeeks.org/cryptography-and-its-types/

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

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

U20CCE402	NETWORK ANALYSIS AND MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn network devices functions and configurations hub, switch, tap and routers.
- To be familiar with network Security Devices and exposed to network services.
- To understand and analyze application performance
- To learn to analyze network traffic and protocols, network-troubleshooting concepts
- To understand network security concepts.

Course Outcomes

After completion of the course, the students are able to

CO1 - Explain the key concepts and algorithms in complex network analysis (**K2**)
CO2 - Apply a range of techniques for characterizing network structure (**K3**)
CO3 - Discuss methodologies for analysing networks of different fields (**K3**)
CO4 -Demonstrate knowledge of recent research in the area and exhibit technical writing and presentation skills. (**K3**)
CO5 - Explain the network management and SNMP protocol model (**K3**)

UNIT I A SYSTEM APPROACH TO NETWORK DESIGN AND REQUIREMENT ANALYSIS (9 Hrs)

Introduction-Network Service and Service based networks- Systems and services- characterizing the services. Requirement Analysis: Concepts – Background – User Requirements- Application Requirements- Host Requirements-Network Requirements – Requirement Analysis: Guidelines – Requirements gathering and listing- Developing service metrics to measure performance – Characterizing behavior- developing performance threshold

UNIT II FLOW ANALYSIS: CONCEPTS, GUIDELINES AND PRACTICE (9 Hrs)

Background- Flows- Data sources and sinks- Flow models- Flow boundaries- Flow distributions- Flow specifications- Applying the flow model-Establishing flow boundaries-Applying flow distributions Combining flow models, boundaries and distributions.

UNIT III LOGICAL DESIGN: CHOICES, INTERCONNECTION MECHANISMS, NETWORK MANAGEMENT AND SECURITY (9 Hrs)

Background- Establishing design goals- Developing criteria for technology evolution- Making technology choices for design-case study- Shared Medium- Switching and Routing: Comparison and contrast- Switching- Routing-Hybrid Routing/Switching Mechanisms – Applying Interconnection Mechanism to Design – Integrating Network management and security into the Design- Defining Network Management- Designing with manageable resources- Network Management Architecture Security- Security mechanism

UNIT IV NETWORK DESIGN: PHYSICAL, ADDRESSING AND ROUTING (9 Hrs)

Introduction- Evaluating cable plant design options – Network equipment placement- diagramming the physical design- diagramming the worksheet – case study. Introduction to Addressing and routing establishing routing flow in the design environments- manipulating routing flows- developing addressing strategies

UNIT V NETWORK MANAGEMENT AND SNMP PROTOCOL MODEL (9 Hrs)

Network and System management, Network management system platform; Current SNMP Broadband and TMN management, Network management standards.SNMPV1, SNMPV2 system architecture, SNMPV2, structure of management information. SNMPV2 – MIB – SNMPV2 protocol, , Application.

Text Books

1. James.D.McCabe, “Practical Computer Network Analysis and Design”, 1st Edition, MorgaKaufaman, 1997.
2. Mani Subramanian, “Network Management,” Principles & Practice” 2 nd Edition Prentice Hall, 2012.
3. J.Radz,”Fundamentals of Computer Network Analysis and Engineering: Basic Approaches for Solving Problems in the Networked Computing Environment”, Universe, 2005.

Reference Books

1. Mark Newman, “Networks: An Introduction”, Kindle Edition,2010.
2. Laura Chappel and Gerald Combs, “Wireshark 101: Essential Skills for Network Analysis”,Kindle Edition,2013.
3. William Stallings., “SNMP, SNMP2, SNMP3 and RMON1 and 2”, Pearson Education, 2004.
4. Daw Sudira, “Network Management”, Sonali Publications, 2004.
5. Rich Schiesser, “ IT Systems Management”, Always Learning, 2015.

Web References

1. https://www.tutorialspoint.com/data_communication_computer_network/network_addressing.htm
2. https://www.geeksforgeeks.org/simple-network-management-protocol-snmp/
3. https://www.researchgate.net/publication/338220481_Network_requirement_analysis
4. https://nptel.ac.in/courses/106/106/106106091/
5. https://www.skillshare.com/classes/Cisco-CCNA-200-301-CompleteGuide/7798886?via=browse-rating-network-administration-layout-grid

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

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

U20CCE403	INFORMATION CODING THEORY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce the basic notions of information and channel capacity.
- To acquire knowledge on Source coding of text, Audio and speech
- To understand source coding of image and video
- To formulate error control coding and decoding techniques applied in communication Systems
- To introduce convolution codes for performance analysis

Course Outcomes

After completion of the course, the students are able to

CO1 – Describe the channel performance using Information theory. (**K2)**
CO2 – Apply Source coding of text, Audio and speech coding algorithms (**K3**)
CO3 – Describe source coding techniques of image and video (**K2**)
CO4- Apply error control codes in Communication systems (**K3**)
CO5– Apply convolution codes for performance analysis (**K3**)

UNIT I INFORMATION THEORY (9 Hrs)

Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

UNIT II SOURCE CODING: TEXT, AUDIO AND SPEECH (9 Hrs)

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding

UNIT III SOURCE CODING: IMAGE AND VIDEO (9 Hrs)

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

UNIT IV ERROR CONTROL CODING: BLOCK CODES (9 Hrs)

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC

UNIT V ERROR CONTROL CODING: CONVOLUTIONAL CODES (9 Hrs)

Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding -LDPC

Text Books

1. Nilotpal Manna, Arijit Saha “Information Theory, Coding and Cryptography” Pearson Education, 1st Edition, 2013
2. Andre Neabauer, Jurgen Freudenberger, Volker Kuhn “Coding Theory: Algorithms, Architectures &Applications”, Wiley Publications, 2011.
3. R Bose, “Information Theory, Coding and Cryptography”, Tata McGraw-Hill, 3rd Edition, 2016

Reference Books

1. K Sayood, “Introduction to Data Compression” 3/e, Elsevier 2006
2. S Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007
3. Amitabha Bhattacharya “Digital Communication”, TMH 2006
4. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols And standards”, Pearson Education Asia, 2002
5. Simon Haykin, “Communication Systems”, fourth edition, John Wiley & Sons, 2008

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2. https://nptel.ac.in/courses/117/101/117101053/
3. https://en.wikipedia.org/wiki/Information_theory
4. https://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=18
5. https://www.codeandtheory.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	3	1	2	1	-	-	-	-	-	1	-	1	1	2	-
2	3	1	2	1	-	-	-	-	-	1	-	1	1	2	-
3	3	1	2	1	-	-	-	-	-	1	1	1	1	2	-
4	3	1	2	1	-	-	-	-	-	1	1	1	1	2	-
5	2	1	1	1	-	-	-	-	-	1	1	1	1	2	-

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

U20CCE404	COMPUTER GRAPHICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand graphics systems and its software
- To understand the two dimensional graphics and their transformations
- To understand the three dimensional graphics and their transformations
- To learn illumination and color models
- To be familiar with animation sequences

Course Outcomes

After completion of the course, the students are able to,

CO1- Explain graphics systems and its software (**K2**)
CO2- Design and apply two dimensional transformations(**K3**)
CO3-Design and apply three dimensional graphics (**K3**)
CO4- Apply Illumination and color models (**K3)**
CO5-Design animation sequences (**K3**)

UNIT-I INTRODUCTION (9Hrs)

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT-II TWO DIMENSIONAL GRAPHICS (9 Hrs)

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations–point, line, and polygon clipping algorithms.

UNIT-IIITHREE DIMENSIONAL GRAPHICS (9Hrs)

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces.

UNIT-IV ILLUMINATION AND COLOUR MODELS (9Hrs)

Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive color concepts – RGB color model – YIQ color model – CMY color model – HSV color model – HLS color model; Color selection.

UNIT-V ANIMATION AND REALISM (9 Hrs)

ANIMATION GRAPHICS :Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening.
COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing

Text Books

1. John F. Hughes, Andries Van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, Computer Graphics: Principles and Practice", Addison- Wesley Professional, 3rdEdition, 2013
2. Donald Hearn and M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", Pearson Education, 4thEdition 2010
3. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007

Reference Books

1. Massimiliano Corsini, Fabio Ganovelli, Sumanta Pattanaik, Marco Di Benedetto "Introduction to Computer Graphics: A Practical Learning Approach" CRC press Tylor& Francis Group 2012
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006
3. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010
4. Peter Shirley, Stephen R. Marschner, Michael Ashikhmin, "Fundamentals of Computer Graphics"CRC press Tylor& Francis Group 2002
5. Steven Harrington, "Computer graphics" The McGraw-Hill ,1987

Web References

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2. https://nptel.ac.in/courses/106/102/106102065/
3. https://nptel.ac.in/courses/106/102/106102063/
4. https://en.wikipedia.org/wiki/Hyperlink
5. http://www.weblinkcomputers.com/diploma-in-computer-application-graphics/

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

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

	L	T	P	C	Hrs
U20CCE405 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 process and memory management in OS
- To understand the concepts of file systems and its implementation.
- To learn the concept of Linux and Mobile operating systems.

Course Outcomes

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

CO1 - To understand the concepts of operating systems, processes and threads. **(K2)**
CO2 - To analyze CPU scheduling and deadlock techniques. **(K3)**
CO3 – To understand the principles of synchronization and memory management. **(K3)**
CO4 - Identify appropriate file system and directory implementation. **(K3)**
CO5 - To be familiar with the Linux system and Mobile OS like iOS and Android. **(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 -- Process scheduling – Operations on processes – Inter-process communication.

UNIT II 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.

UNIT III PROCESS AND MEMORY MANAGEMENT (9 Hrs)

Process, synchronization: The Critical Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors. Memory Management: Swapping – Contiguous memory allocation – Paging – Segmentation - Demand paging –Page replacement – Allocation of frames – Thrashing.

UNIT IV FILE SYSTEMS AND ITS IMPLEMENTATION (9 Hrs)

File System Interface: File concept – Access methods – Directory structure – File system mounting – Protection. File System Implementation: Directory implementation – Allocation methods – Free space management – efficiency and performance – recovery – log structured file systems.

UNIT V SECONDARY STORAGE AND CASE STUDY (9 Hrs)

Disk structure – Disk Scheduling – Disk Management – Swap-Space management. Case Study: Linux file system, Mobile OS — iOS and Android — Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System

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 References

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)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
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

Open Elective-I

		L	T	P	C	Hrs
U20EEO401	**SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS** (**Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE)**	3	0	0	3	45

Course Objectives

- To impart fundamental knowledge of solar cell formation and its properties.
- To understand the various technologies used to improve solar cells.
- To discuss the various components in On-grid connected systems.
- To gain knowledge on components in Off-grid connected systems using Solar PV.
- To design the PV systems for various real load applications with cost benefits.

Course Outcomes

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

CO1- Explain the fundamentals of solar cells. **(K2)**
CO2- Recognize the various solar PV technologies and their up gradations along with their benefits. **(K2)**
CO3- Design and analyze on–grid PV applications. **(K4)**
CO4- Design and analyze off–grid PV applications. **(K4)**
CO5- Realize cost benefit analysis of PV installations. **(K4)**

UNIT I ESSENTIAL BASICS OF SOLAR CELL (9 Hrs)

Solar cell – physics – Photovoltaics in Global Energy Scenario – Fundamentals of Semiconductors, Energy band, Charge carriers – Motion, PN Junction diode, Solar cells – Design characteristics, Solar radiation.

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES (9 Hrs)

Commercial technologies – Mono crystalline and Multi crystalline, Silicon – Wafer based Solar cell, Thin film solar cells – A–Si, Cd–Te and CIGS, Concentrated PV cells, Developing technologies – Organic cells, Dye sensitized cells.

UNIT III SOLAR PV FOR ON-GRID APPLICATIONS (9 Hrs)

Solar cells to solar array – On–Grid PV system – With and Without storage – Balance of system – DC–DC converters – Inverters – Net Metering – Design and analysis – Performance evaluation and monitoring – Field visit – Grid tied PV power plant.

UNIT IV SOLAR PV FOR OFF–GRID APPLICATIONS (9 Hrs)

Off–Grid stand alone PV system – System sizing – Module and Battery – Storage – Batteries for PV systems – Sun Tracking mechanism – Types of tracking – One–axis, Two–axis – Maximum power point tracking – Design and analysis – Performance evaluation and monitoring – Field visit – Off–grid PV system

UNIT V COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS (9 Hrs)

Cost and manufacturability – Manufacturing economics – Scaling – Pricing – Trends in retail pricing – Energy economics – Grid tied power plant – Solar street lighting system

Text Books

1. C.S. Solanki, “Solar Photovoltaics – Fundamentals, Technologies and Applications”, PHI Learning Pvt. Ltd., 2nd Edition, 2011.
2. Martin A. Green, “Solar Cells Operating Principles, Technology, and System Applications”, Prentice - Hall, 1st Edition, 2008.

Reference Books

1. J. Nelson, “The Physics of Solar Cells”, Imperial College Press, 1st Edition, 2003.
2. Thomas Markvart, “Solar Electricity”, John Wiley and Sons, 2nd Edition, 2000.
3. Stuart R. Wenham, Martin A. Green, Muriel E. Watt, Richard Corkish , “Applied Photovoltaics”, Earthscan, 3rd Edition, 2011.
4. Michael Boxwell, “The Solar Electricity Handbook”, Green stream Publishing, 10th Edition, 2016.
5. RikDe Gunther, “Solar Power-Your Home for Dummies”, Wiley Publishing Inc, 2nd Edition, 2010.

Web References

1. https://swayam.gov.in/nd1_noc20_ph21/preview
2. https://swayam.gov.in/nd2_nou20_ag13/preview
3. https://www.studentenergy.org/topics/solar-pv
4. https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php
5. https://www.energysage.com/solar/
6. https://www.bca.gov.sg/publications/others/handbook_for_solar_pv_systems.pdf
7. http://www.oas.org/dsd/publications/unit/oea79e/ch05.htm

COs/POs/PSOs Mapping

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

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

		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 Capelli Schellpfeffer, 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 References

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

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

		L	T	P	C	Hours
U20ECO41	**ENGINEERING COMPUTATION WITH MATLAB (Common to EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics)**	3	0	0	3	45

Course Objectives

- To understand basic representation of Matrices and vectors in MATLAB
- To learn various programming structures in MATLAB
- To study built in and user defined functions in MATLAB.
- To become conversant with 2D as well as 3D graphics in MATLAB
- To make a Graphical User Interface (GUI) in MATLAB in order to achieve interactivity

Course Outcomes

After completion of the course, students will be able to

CO1- State the basics of MATLAB **(K1)**
CO2- Explain how to work with matrices, and their operations **(K2)**
CO3- Use the MATLAB functions relevant to communication engineering, **(K3)**
CO4- Demonstrates various file operations in MATLAB **(K3)**
CO5- Applying the plotting capabilities of MATLAB effectively to various systems. **(K3)**

UNIT 1 INTRODUCTION TO MATLAB (9Hrs)

Menus & Tool bars, Variables - Matrices and Vectors - initializing vectors - Data types- Functions – User defined functions - passing arguments - writing data to a file-reading data from a file - using functions with vectors and matrices- cell arrays & structures - Strings - 2D strings-String comparing - Concatenation - Input and Output statements - Script files .

UNIT 2 LOOPS& CONTROL STATEMENTS (9Hrs)

Introduction; Relational & Logical operations - Example programs - Operator precedence - Control & Decision statements- IF - IF ELSE - NESTED IF ELSE - SWITCH - TRY & CATCH - FOR -WHILE - NESTED FOR - FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping using eval&lastern commands.

UNIT 3 PLOTS IN MATLAB & GUI (9Hrs)

Basic 2D plots, Labels, Line style, Markers, plot, subplot, LOG, LOG-LOG, SEMILOG-POLARCOMET, Grid axis, labeling, fplot, ezplot, ezpolar, polyval, exporting figures, HOLD, STEM, BAR, HIST, Interactive plotting, Basic Fitting Interface – Polyfit - 3D plots – Mesh - Contour - Example programs. GUI - Creation Fundamentals – Capturing mouse actions

UNIT 4 MISCELLANEOUS TOPICS (9 Hrs)

File & Directory management - Native Data Files - Data import & Export - Low Level File I/O – Directory management - FTP File Operations - Time Computations -Date & Time – Format Conversions - Date & Time, Functions - Plot labels - Optimization - zero Finding - Minimization in one Dimension - Minimization in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation

UNIT 5 SIMULINK & APPLICATIONS (9Hrs)

How to create & run Simulink, Simulink Designing - Using SIMULINK Generating an AM signal & 2nd order systems - Designing of FWR & HWR using Simulink - Creating a subsystem in Simulink. Applications Programs -Frequency response of filters. Open Loop gain of OPAMP, I/P characteristics of BJT, Plotting the graph between Breakdown voltage & Doping Concentration.

Text Books

1. RudraPratap, Getting Started with MATLAB 6.0 ,1st Edition, Oxford University Press-2004.
2. Duane Hanselman ,Bruce LittleField, “Mastering MATLAB 7”, Pearson Education Inc, 2005
3. William J.Palm, “Introduction to MATLAB 6.0 for Engineers”, McGraw Hill & Co, 2001.

Reference Books

1. M.Herniter, “Programming in MATLAB”, Thomson Learning, 2001
2. John OkyereAltla, “Electronics and circuit analysis using MATLAB”, CRC press, 1999
3. K.K.Sharma, “MATLAB Demustifyied”, Vikas Publishing House Pvt Ltd. 2004

Web References

1. https://www.mathworks.com/products/matlab.html
2. https://www.tutorialspoint.com/matlab/index.htm
3. https://www.cmu.edu/computing/software/all/matlab/
4. https://ctms.engin.umich.edu/CTMS/index.php?aux=Home

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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2	2	2	-	2	3	-	-	-	-	-	-	-	2	2	2
3	2	2	-	2	3	-	-	-	-	-	-	-	2	2	2
4	2	2	-	2	3	-	-	-	-	-	-	-	2	2	2
5	2	2	-	2	3	-	-	-	-	-	-	-	2	2	2

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

		L	T	P	C	Hours
U20ECO42	**CONSUMER ELECTRONICS** **(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)**	3	0	0	3	45

Course Objectives

- To enable the trouble shoot of different types of microphones and loudspeakers
- To make the students to analyze the working of digital console, digital FM tuner and troubleshoot audio systems
- To train and 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, camera **(K2)**

UNIT -1 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

UNIT-II 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 References

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

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

		L	T	P	C	Hrs
U20ITO401	**DATABASE SYSTEM: DESIGN & DEVELOPMENT** (Common to EEE, ECE, ICE, CCE, BME)	3	0	0	3	45

Course Objectives

- Understand the various data models, conceptualize E-R diagram and depict using relational model
- Gain knowledge about database languages and frame query using Relational Algebra and SQL
- Understand and design an efficient database schema using the various normal forms
- Impart knowledge on data storage and transaction processing, concurrency control techniques and recovery procedures
- Explore knowledge on tools and practice case studies

Course Outcomes

After completion of the course the students will be able to

CO1- Explain the concepts of Database Management System and develop Entity Relationship model and Relational Models for a given application**(K2)**

CO2- Manipulate and build database queries using Structured Query Language and relational algebra**(K2)**

CO3- Apply data normalization principles to develop a normalized database or a given application.**(K3)**

CO4- Explain various storage & indexing techniques, transactions and recovery techniques**(K2)**

CO5- Apply tools like NoSQL, MongoDB, Cassandra on real time applications**(K3)**

UNIT I INTRODUCTION (9 Hrs)

Database Systems– Data Models – Database System Architecture - Entity-Relationship Model - ER Diagram-Extended ER Model –ER into Relational Model - **Relational Model**: Structure of Relational Databases, Database Schema, Keys, Tables

UNIT II DATABASE LANGUAGES (9 Hrs)

Relational Algebra – Extended-Relational Algebra Operations –**SQL**: Introduction – DDL – DML – Integrity Constraints-Set Operations-Joins – Nested Queries -View- Trigger - Stored Procedures

UNIT III RELATIONAL-DATABASE DESIGN (9 Hrs)

Introduction to Schema Refinement – Decomposition – Lossless Decomposition – Functional Dependencies – Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form.

UNIT IV DATA STORAGE (9 Hrs)

RAID - File Organization - Indexing, Ordered Index, Index files, Hashing - Static and dynamic hashing.

Transactions: Transaction concepts and states– Concurrent Execution-Serializability-Concurrency Control: Lock based Protocol - Timestamp based Protocol - **Recovery System**: – Log-Based Recovery – Shadow Paging

UNIT V CASE STUDY (9 Hrs)

NoSQL – Document Database : MongoDB - Multi-dimensional: Cassandra

Text Books

1. Silberschatz, Korth, Sudarshan, *Database System Concepts*, 7thEdition – McGraw-Hill Higher Education, International Edition, 2019.
2. RamezElmasri, and Shamkant B. Navathe, Fundamentals of Database Systems (7th edition), Publisher: Pearson,2016

V. Bhaumik

Reference Books

1. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.
2. Date C J, Kannan A and Swamynathan S, “An Introduction to Database System”, 8th Edition, Pearson Education, New Delhi, 2006.
3. Alan Beaulieu, “Mastering SQL Fundamentals”, Second Edition, O’Reilly,2009
4. Kristina Chodorow; Shannon Bradshaw, “ MongoDB: The Definitive Guide”, 3rd Edition, O'Reilly Media, Inc., 2018.
5. Pramod J. Sadalage , Martin Fowler,” NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence” 1stEdition, Kindle Edition, 2012

Web References

1. http://www.database.com/
2. 2http://cassandra.apache.org/
3. .https://www.mongodb.com/

CO-POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U20ITO402	**R PROGRAMMING** **(Common to EEE, ECE, ICE, CCE, BME, MECH, Mechatronics)**	3	0	0	3	45

Course Objectives

- To understand the basics in R programming in terms of constructs, control statements, string functions
- To learn to apply R programming for Text processing
- To understand the use of data frames and tables
- To able to appreciate and apply the R programming from a statistical perspective
- To understand the interface model

Course Outcomes

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

CO1 - Create artful graphs to visualize complex data sets and functions.**(K3)**
CO2 - Write more efficient code using parallel R and vectorization.**(K3)**
CO3 - Create data frames and working with tables.**(K3)**
CO4- Interface R with C/C++ and Python for increased speed or functionality.**(K2)**
CO5 - Find new packages for text analysis, image manipulation &perform statistical analysis.**(K4)**

UNIT I INTRODUCTION (9 Hrs)

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

UNIT II MATRICES AND ARRAYS (9 Hrs)

Matrices, Arrays And Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.

UNIT III DATA FRAMES (9 Hrs)

Data Frames Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions

UNIT IV FUNCTIONS AND ARGUMENTS (9 Hrs)

Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots

UNIT V INTERFACING (9 Hrs)

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering.

Text Books

1. Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
2. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data &Analytics Series, 2013.

Reference Books

1. Mark Gardener, “ Beginning R – The Statistical Programming Language”, Wiley, 2013
2. Robert Knell, “Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.

Web References

1. https://www.coursera.org/learn/r-programming
2. https://www.r-project.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	1	-	-	-	-	-	-	-	-	-	-	-	2	-	2
2	3	2	1	1	-	-	-	-	-	-	-	-	2	-	2
3	3	2	1	1	-	-	-	-	-	-	-	-	2	-	2
4	3	2	1	1	-	-	-	-	-	-	-	-	2	-	2
5	2	1	-	-	-	-	-	-	-	-	-	-	2	-	2

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, 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, Oxford2nd edition Jacob Fraden - 2010
4. DoeblinE..O. “Measurement System Applications and Design”, TMH, 5th Edition, 2004

Reference Books

1. BelaG. 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, III Edition, Pearson Education,2000.

Web References

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

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

U20ICO402	INDUSTRIAL SAFETY AND MANAGEMENT (Common to CSE, IT, MECH, CCE, AI&DS)	L	T	P	C	Hrs
		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	-	-	-	-	-	-	-	-
2	3	-	1	-	-	1	1	-	-	-	-	-	-	-	-
3	3	-	1	-	-	1	1	-	-	-	-	-	-	-	-
4	2	-	1	-	-	1	1	-	-	-	-	-	-	-	-
5	3	-	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 References

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

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

		L	T	P	C	Hrs
U20BMO402	**TELEMEDICINE** (Common to EEE, ECE, CSE, IT, ICE, CCE, AI&DS)	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 References

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

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

		L	T	P	C	Hrs
U20ADO401	KNOWLEDGE REPRESENTATION AND REASONING (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	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 processes based on its context techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

CO1- Analyze 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 the process according to the context. **(K3)**

CO5- Learn the process, knowledge acquisition and sharing of ontology. **(K2)**

UNIT I EVOLUTION OF KNOWLEDGE REPRESENTATION (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 ONTOLOGY AND ITS CLASSIFICATION (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 KNOWLEDGE REPRESENTATION (9 Hrs)

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT IV PROCESSES, CONTEXTS AND AGENTS (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 KNOWLEDGE SOUP, ACQUISITION AND SHARING (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; 1st 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 References

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

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

		L	T	P	C	Hrs
U20ADO402	**INTRODUCTION TO DATA SCIENCE** (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	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.

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, OPPORTUNITIES 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 References

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

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

		L	T	P	C	Hrs
U20BST548	NUMERICAL METHODS AND STATISTICS	2	2	0	3	60

Course Objectives

- To learn the techniques of solving algebraic and transcendental equations.
- To introduce the numerical techniques of differentiation and integration.
- To know the basic concepts of statistical parameters like mean, median, mode etc.
- To understand the concept of testing of hypothesis using statistical analysis.
- To Identify the direction and strength of a linear correlation between two factors.

Course Outcomes

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

CO 1 - Solve algebraic and transcendental equations.**(K3 & K4)**
CO 2 - Analyze and apply the knowledge of interpolation by using the numerical methods.**(K3 & K4)**
CO 3 - Understand the basic concepts of Statistics.**(K2)**
CO 4 - Apply the concept of testing of hypothesis for small and large samples.**(K3)**
CO 5 - Know the applications of linear regression and correlation.**(K1 & K2)**

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

Solution of algebraic and transcendental equations – Newton Raphson method – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

.

UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION (12Hrs)

Interpolation: Interpolation by Newton's forward and backward difference formulae for equal intervals – Solution of ordinary differential equations – Single step methods – Taylor series method – Euler methods – Integration by Trapezoidal and Simpson's rules – Lagrange's method for unequal intervals.

UNIT III MEASURES OF DISPERSION (12Hrs)

Standard deviation – Mean deviation – Quartile deviation – Range – Measures of Skewness and Pearson's coefficient of skewness – Moments about the arbitrary origin and moments based on measures of skewness and kurtosis.

UNIT IV TESTING OF HYPOTHESIS (12 Hrs)

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations Small samples: Test for single mean, difference of means and correlation coefficients – test for ratio of variances – Chi–Square test for goodness of fit and independence of attributes.

UNIT V CORRELATION AND REGRESSION (12 Hrs)

Curve fitting – Method of least squares – Correlation – Rank correlation – Regression – Multiple and partial correlation – Plane of regression – Coefficient of multiple correlation – Coefficient of partial correlation.

Text Books

1. Grewal. B.S., "Numerical Methods in Engineering and Science ", Mercury learning & Information, Kindle Edition, 2018.
2. T. Veerarajan and T. Ramachandran, "Statistics and Numerical methods", Mc Graw Hill, 1st Edition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.

Reference Books

1. Rajesh Kumar Guptat, “Numerical Methods, Fundamental and its Applications”, Cambridge University, 2019.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, New Delhi, 10th Edition, 2019
3. Timothy Sauer, “Numerical Analysis”, 3rdEdition, Pearson Education, 2017.
4. Arvind Pragati Gautam, “Numerical Methods”, Alpha Science International Limited 2019.
5. Bali.N.P and Dr. Manish Goyal, “Engineering Mathematics”, Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015.

Web References

1. http://nptel.ac.in/courses/111107063/
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3. https://easyengineering.net/ma6452-statistics-and-numerical-methods/
4. https://nptel.ac.in/courses/110/105/110105087/
5. https://nptel.ac.in/courses/111/105/111105077/

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

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

U20CCT510	DATABASE 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 Schema Refinement and Normal Forms.
- 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. **(K3)**
CO2 - Design conceptual and logical database models for an application. **(K3)**
CO3 - Apply relational database design in to real time problems. **(K3)**
CO4 - Explain the need for Indexing, Hashing and Transactions in database**. (K2)**
CO5 - Describe 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.

UNIT II RELATIONAL MODEL AND BASIC OPERATION (9Hrs)

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 SCHEMA REFINEMENT AND NORMAL FORMS (9Hrs)

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.

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 CONCURRENCY CONTROL AND RECOVERY SYSTEM (9 Hrs)

Concurrency control, lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity. Recovery system - failure classification, storage structure, recovery and atomicity, log- based recovery, shadow paging, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems.

Text Books

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

Reference Books

1. Date CJ, Kannan A, Swamynathan S, “An Introduction to Database System”, 8th Edition, Pearson Education-2006.
2. Raghu Ramakrishna, Johannes Gehrke, “Database Management Systems”, 3rd Edition, McGraw Hill, 2014.
3. G.K.Gupta, "Database Management Systems”, Tata McGraw Hill, 2011.
4. Jeffrey D. Ullman, “Principles of database systems”, Computer Science Press, 1982.
5. Paul Beynon-Davies, “Database Systems”, Palgrave Macmillan, 3rd Edition, 2003.

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

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

U20CCT511	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn basic concepts of information security and various cryptographic algorithms.
- To understand the symmetric and public-key cryptosystem.
- To understand the concepts of message authentication and integrity
- To learn about system security
- To understand the concept of Web security and Firewalls

Course Outcomes

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

CO1- Explain the basic concepts of cryptographic algorithms and its techniques **(K2)**
CO2- Describe the concepts of symmetric and public-key cryptography. (**K3**)
CO3- Evaluate the message authentication and integrity (**K3**)
CO4 - Identify information system requirements for both of them such as client and server. (**K2**)
CO5 - Explain the current legal issues towards information security (**K2**)

UNIT I INTRODCTION (9 Hrs)

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II SYMMETRIC AND PUBLIC KEY CRYPTOGRAPHY (9 Hrs)

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III AUTHENTICATION AND INTEGRITY (9 Hrs)

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT – IV SYSTEM SECURITY (9 Hrs)

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)
Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT V SECURITY PRACTICE (9 Hrs)

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security**: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Text Books

1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition, 2014.
2. Atul Kahate, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2003.
3. Forouzan Mukhopadhyay, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2011.

Reference Books

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security, Wiley India, 1st Edition, 2011.
2. Mark Stamp, Information Security Principles, and Practice, Wiley India, 2rd edition 2011.
3. WM. Arthur Conklin, Greg White, Principles of Computer Security, McGraw-Hill, 4th edition, 2015.
4. Neal Krawetz, Introduction to Network Security, CENGAGE Learning, 1st edition, 2007.
5. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning, 1st edition, 2010.

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1. https://nptel.ac.in/courses/106/105/106105031/
2. http://www.cryptography.com/
3. https://www.schneier.com/cryptography.html
4. williamstallings.com/Extras/Security-Notes/
5. www.cs.bilkent.edu.tr/~selcuk/teaching/cs519/

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

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

U20CCT512	MICROCONTROLLER AND INTERFACING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about 8051 controller with its architecture programming model, instructions sets and addressing modes.
- To understand the internal peripherals, UART and their modes of operation.
- To introduce the concepts of interfacing microcontrollers with external devices.
- To learn Assembly language programming skills.
- To introduce various advanced processor architectures such Intel Galileo – Arduino.

Course Outcomes

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

CO1 -Describe 8051 controller with its architecture programming model, instructions sets and addressing modes**.(K2)**

CO2 - List and describe the peripherals, UART and their modes of operation**.(K2& K3)**

CO3 - Illustrate the concepts of interfacing microcontrollers with external devices**.(K3)**

CO4 - Illustrate the interrupts handling and demonstrate peripherals applications in C for the target 8051 board**.(K3)**

CO5 -Demonstrate an application by accessing the peripherals in C programming to the target Galileo board**(K3)**

UNIT I MICROCONTROLLERS (9 Hrs)

8051 Microcontroller architecture, programming model, instructions sets and addressing modes. Memory organization, stack structure and Interrupts. Assembly level programming for arithmetic operations, Timer operation.

UNIT II INTERNAL PERIPHERALS (9 Hrs)

GPIO architecture, Timer architecture and modes of operation, Timer peripheral programming, UART and modes of operation-UART programming by polling and interrupt driven-Serial data transfer using 8051-Interrupts in 8051-I/o ports and port expansion.

UNIT III EXTERNAL PERIPHERAL INTERFACING (9 Hrs)

Port expansion with 8255-ADC, DAC, Keyboard interfacing-Display interfacing LED 7 segment and LCD module. SPI and I2C architecture. Minimum vs Maximum mode of operation.8259 Interrupt controller.8237 DMA controller.

UNIT IV 8051 PROGRAMMING IN C (9 Hrs)

Cross compiler C -programming structure, Data types, memory models, infinite loops and handling interrupts in C. Intel Hex file format. C-Programming for LED, LCD display, temperature sensor with ADC, Measuring pulse width and frequency.

UNIT V INTEL GALILEO - ARDUINO PROGRAMMING (9 Hrs)

Galileo Board overview - Arduino IDE, Sketch programming and In-built libraries. Controlling DC motor, stepper motor and servo motor Acquisition of temperature data and send it to serial port. WIFI and Blue tooth shield .Application in Internet of Things (IoT).

Text Books

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlay Rolin D, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson Publication, 2rd edition, 2007
2. Kenneth J Ayala, “The 8051 Microcontroller – Architecture, Programming and Applications”, Penram International Publications, India, 2016
3. M. Saravanan N. Senthil Kumar, S. Jeevananthan, S.K.Shah “Microprocessors and Interfacing 8086, 8051, 8096, and Advanced Processors” oxford press, 2012

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1. Rajkamal, “Embedded Systems Architecture, Programming and Design”, TATA McGraw-Hill, 2nd edition 2015.
2. David E.Simon, “An Embedded Software Primer”, Pearson Education Asia, First Indian Reprint, 2012.
3. T Bezboruah, Embedded System Design Based on 8051 and PIC Family Microcontroller, LAP Lambert Academic Publishing, 2011
4. Dogan Ibrahim, “Microcontroller Projects In C for the 8051”, Elsevier Science, 2000
5. Uma Rathore Bhatt, “Assembly Language Programming with 8051 Microcontroller”, LAP Lambert Academic Publishing, 2016

Web References

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2. https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/
3. http://www.ti.com/microcontrollers/msp430-ultra-low-power-mcus/overview.html
4. https://developer.arm.com/products/architecture/cpu-architecture
5. https://www.udemy.com/course/8051-microcontroller-embedded-c-and-assembly-language/

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

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

		L	T	P	C	Hrs
U20BST550	NUMERICAL METHODS AND STATISTICAL LABORATORY	0	0	2	1	30

Course Objectives

•To learn the solutions of Algebraic and Transcendental equations.
•To know the techniques of solving simultaneous equations.
• To learn applications of integration.
• To familiarize the concept of Mean, Median, Mode and Standard deviation.
•To understand the measures of Skewness.

Course Outcomes

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

CO1- Find out the root of the Algebraic and Transcendental equations using Bisection method. **(K5)**
CO2 - Solve Linear equation.**(K3 & K4)**
CO3 - Apply the Trapezoidal and Simpsons rule.**(K3)**
CO4 - Find the Mean, Median and Mode.**(K5)**
CO5 - Find Pearson's coefficient of skewness.**(K3)**

List of experiments:

1. Roots of non-linear equation using bisection method.
2. Roots of non-linear equation using Newton's method.
3. Solve the system of linear equations using Gauss - Elimination method.
4. Solve the system of linear equations using Gauss - Seidal iteration method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Find the area by using trapezoidal rule.
7. Find the area by using Simpsons rule.
8. Find Mean, Median and Mode.
9. Find Quartile deviation.
10. Find Pearson's coefficient of skewness

Reference Books

1. Grewal. B.S., "Numerical Methods in Engineering and Science ", Mercury learning & Information, Kindle Edition, 2018.
2. T. Veerarajan and T. Ramachandran, "Statistics and Numerical methods", Mc Graw Hill, 1st Edition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
4. Rajesh Kumar Guptat, "Numerical Methods, Fundamental and its Applications", Cambridge University, 2019.
5. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019

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2. http://nptel.ac.in/courses/111107063
3. http://nptel.ac.in/courses/122102009

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

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

U20CCP506	CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basic fundamentals of cryptography.
- To learn different cryptographic operations of symmetric key cryptography.
- To learn different cryptographic operations of asymmetric key cryptography.
- To learn about message authentication and integrity techniques.
- To understand Intrusion Detection System

Course Outcomes

After completion of the course, the students are able to

CO1- Use basic mathematical functions in Cryptography. (**K3**)
CO2- Apply the various symmetric key cryptography techniques. (**K3**)
CO3- Apply the various public key cryptography techniques. (**K3**)
CO4- Implement Hashing techniques. (**K3**)
CO5- Implement the Digital Signature techniques. (**K3**)

LIST OF EXPERIMENTS

1. Generate a new string (cipher text) from the given string (plain text) by performing AND, OR, XOR given value with each character of the given string .
2. Perform encryption and decryption using the following algorithms
   a. Ceaser cipher
   b. Substitution cipher
   c. Hill Cipher
3. Implement DES algorithm in real time application
4. Implement the Blowfish algorithm logic.
5. Implement the Rijndael algorithm logic.
6. Write the RC4 logic in Java Using Java cryptography; encrypt the given text using Blowfish. Create your own key using Java key tool.
7. Implement RSA algorithm.
8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
9. Calculate the message digest of a text using the SHA-1 algorithm
10. Calculate the message digest of a text using the MD5 algorithm
11. Perform an wireless audit of an access point / router and decrypt WEP and WPA (netsim)
12. Demonstrate Intrusion Detection System (IDS) using any tool

Reference Books

1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition, 2014.
2. Atul Kahate, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2003.
3. Forouzan Mukhopadhyay, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2011.
4. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security, Wiley India, 1st Edition, 2011.
5. Mark Stamp, Information Security Principles, and Practice, Wiley India, 2rd edition 2011. WM. Arthur Conklin, Greg White, Principles of Computer Security, McGraw-Hill, 4th edition, 2015.

Web References

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3. https://www.schneier.com/cryptography.html
4. williamstallings.com/Extras/Security-Notes/
5. www.cs.bilkent.edu.tr/~selcuk/teaching/cs519/

COs/POs/PSOs Mapping

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

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

U20CCP507	MICROCONTROLLER AND INTERFACING LABORATORY	L	T	P	C	Hours
		0	0	2	1	30

Course Objectives

- To develop the code for basic concepts to understand Keil IDE for 8051.
- To experiment C code for accessing GPIO for interfacing switched and LEDs.
- To develop C code for accessing ADC through GPIO, timer peripherals and interrupts in 8051.
- To design analog sensors such as LDR, thermistor and temperature monitoring application in Intel Galileo.
- To acquire the ability to design, implement servo motor and stepper motor application in Intel Galileo.

Course Outcomes

After completion of the course, the students are able to

CO1- Describe and Implement 8051 instructions for solving mathematical problems **(K3)**
CO2- Use GPIO for interfacing switches and LEDs. **(K3)**
CO3- Use different methods for accessing timers peripheral and serial peripherals in 8051. **(K3)**
CO4- Design a system for temperature acquisition system in an intel Galileo board. **(K3)**
CO5- Analyze the memory requirements and delay for the system by implementing the application in 8051 target board. **(K3)**

LIST OF EXPERIMENTS

1. Basic programs to understand the Keil IDE for 8051
    a. Assembling, compiling and simulating the code
    b. Break points and step by step execution of the code
    c. Calculating the delay for the given clock frequency
2. Developing an assembly program for accessing GPIO and Timer peripherals in 8051 boards
    a. Blinking the LED by the defined rate in delay using timer
    b. Using polling method read the status of switches
3. Developing an assembly program for invoking interrupt in 8051 target board
    a. Control the LEDs by the external interrupts
    b. handling multiple interrupts
    c. handling timer interrupt
4. Developing C programs for accessing ADC through GPIO ,timer peripherals and interrupts in 8051
5. Design a setup for a display system to display the data in 7 segment LED and LCD module
    a. A number is incremented for the period of time and it should be shown in display
    b. The stored alpha numeric string is displayed in LCD module
6. Design a setup for UART communication between 8051 target board and PC
    a. The text stored in the 8051 program is send to PC
    b. The text sent by PC is displayed in LCD module in 8051 target board
7. Basic sketch programs to understand the ardiuno Galileo IDE
    a. Developing the sketch program for blinking the LEDs
    b. Using built in functions for accessing switch and LEDS
8. Design a system for an temperature monitoring application in Intel Galileo
9. Design a system for servo motor control application in Intel Galileo
10. Design a system for stepper motor control application along with ultra sonic sensor in Intel Galileo
11. Design a mini project either in 8051 target board or intel Galileo

Reference Books

1. Kenneth J. Ayala, “The 8051 Microcontroller. Architecture, Programming and Applications”, West publishing company 2014.
2. Muhammad Ali Mazidi, Janice Gillespie Mazidi, RolinD.Mckinlay , “The 805 Microcontroller and Embedded systems Using Assembly and C”, Second Edition, Pearson Education,2013.
3. Matt Richardson, “Getting started with Intel Galileo”, 2014.
4. Myke Predko, “Programming and Customizing the 8051 Microcontroller”, 1st Edition,2012.
5. Chris Braith, “8051 Microcontroller Application based Introduction”, Elsevier 2008.

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

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

U20CCP508	DATABASE SYSTEMS LABORATORY	L	T	P	C	Hours
		0	0	2	1	30

Course Objectives

- To learn and understand DDL & DML statements.
- To learn and understand DCL statements.
- To implement Basic SQL commands.
- To learn and execute the 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.
    a. Student Information System.
    b. Inventory Management.
    c. Payroll Processing.

Reference Books

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

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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/

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

U20CCC5XX	CERTIFICATION COURSE - V	L	T	P	C	Hours
		0	0	4	-	45

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.

U20CCS504	SKILL DEVELOPMENT COURSE 4 (Foreign Language / IELTS – I)	L	T	P	C	Hours
		0	0	2	-	30

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are 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. Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation

		L	T	P	C	Hrs
U20CCS505	SKILL DEVELOPMENT COURSE 5 (Presentation Skill 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 ontheir learning experience.

CT 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.

U20CCM505	INDIAN CONSTITUTION	L	T	P	C	Hrs
		0	0	2	-	30

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

PROFESSIONAL ELECTIVE-II

		L	T	P	C	Hrs
U20ECCM01	`VEHICULAR COMMUNICATION (Common to ECE and CCE)	3	0	0	3	45

Course Objectives

- To introduce the emerging technologies in vehicular communication systems
- To study the design considerations and challenges of vehicular communication
- To analyze the vehicular mobility modeling, and vehicular technologies
- To introduce the standards from the physical to network layers
- To study about various emerging applications of vehicular communications

Course Outcomes

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

CO1 - Describe the emerging technologies in vehicular communication systems. **(K2)**

CO2 -Infer technologies and system architecture of vehicular ad-hoc networks (VANET) or inter-vehiclecommunication networks. **(K2)**

CO3 - Examine the vehicular mobility modelling, and vehicular technologies **(K4)**

CO4 – Infer standards from the physical layers to network layers **(K2)**

CO5 - Illustrate vehicular communication platforms for various safety and infotainment applications **(K3)**

UNIT- I BASICS OF VEHICULAR COMMUNICATION (9 Hrs)

Introduction to Vehicular Communication- Basic principles and challenges, Inter and intra vehicular sensor communications for various functions such as collision control and vehicle localization. Sensors deployed for inter and intra vehicular communications- Ultra Wide Band sensors, GPS sensors. Various algorithms developed for collisions.

UNIT- II SYSTEM ARCHITECTURE OF VANET (9 Hrs)

Cooperative Vehicular Safety Applications Enabling technologies, cooperative system architecture, safety applications. Infrastructure-based vs. infrastructure-less technologies

UNIT - III VEHICULAR MOBILITY MODELS (9 Hrs)

Vehicular Mobility Modelling Random models, flow and traffic models, behavioral models, trace and survey- based models, joint transport and communication simulations

UNIT - IV STANDARDS IN VARIOUS LAYERS (9 Hrs)

Physical Layer Considerations for Vehicular Communications Signal propagation, Doppler spread and its impact on OFDM systems. MAC Layer of Vehicular Communication Networks Proposed MAC approachesand standards, IEEE 802.11p VANET Routing protocols Opportunistic packet forwarding, topology-based routing, geographic routing

UNIT - V EMERGING APPLICATIONS (9 Hrs)

Bus Systems–Classification, Applications in the vehicle- Coupling of networks- Networked vehicles - Buses - CAN Bus- LIN Bus- MOST Bus- Bluetooth- FlexRay- Diagnostic Interfaces. DSRC Protocol Stack, Cellular V2X

Text Books

1. H. Hartenstein and K. P. Laberteaux, “VANET: Vehicular Applications and Inter Networking Technologies”,Wiley, 2010.
2. H. Moustafa, Y. Zhang, “Vehicular Networks: Techniques, Standards, and Applications”, CRC Press, 2009.
3. Anand Paul, Naveen Chilamkurti, Seungmin Rho, Alfred Daniel, “Intelligent Vehicular Networks andCommunications: Fundamentals, Architectures and Solutions”, Elsevier, 2016.

Reference Books

1. P. H.-J. Chong, I. W.-H. Ho, Vehicular Networks: Applications, Performance Analysis and Challenges,Nova Science Publishers, 2019.
2. C. Sommer, F. Dressler, “Vehicular Networking”, Cambridge University Press, 2015.
3. M. Emmelmann, B. Bochow and C. C. Kellum, “Vehicular Networking: Automotive Applications andBeyond”, Wiley, 2010.
4. M. Watfa, “Advances in Vehicular Ad-Hoc Networks: Development and Challenges”, Information Science Reference, 2010.
5. Wai Chen, “Vehicular Communications and Networks: Architectures, Protocols, Operation and Deployment”, Elsevier, - Technology & Engineering, 2015

Web References

1. https://arxiv.org/pdf/1704.05746
2. https://www.springerprofessional.de/en/5g-enabled-vehicular-communications-and-networking/16262476
3. http://publications.lib.chalmers.se/records/fulltext/174782/174782.pdf
4. https://www.sciencedirect.com/science/article/pii/S221420961930261X

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

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

U20CCE507	`WIRELESS ADHOC AND SENSOR NETWORK	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the principles of sensor networks and mobile ad hoc networks
- To understand the networks impact on protocol design
- To develop MAC and routing protocols for sensor and mobile networks
- To develop efficient protocols for sensor and mobile networks
- To understand and develop information dissemination protocols for sensor and mobile networks

Course Outcomes

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

CO1-Demonstrate the Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid **(K2)**
CO2–State and Classify the issues and challenges in providing QoS **(K2)**
CO3–Explain and analyse about the energy management in adhoc networks**(K2)**
CO4–Demonstrate and apply various types of mesh networks. **(K2)**
CO5–Illustrate about sensor network protocols and relate it with recent trends in infrastructure**(K2)**

UNIT I ROUTING (9Hrs)

Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive, Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Mesh based protocols – Multicast with Quality of Service Provision.

UNIT II QUALITY OF SERVICE (9Hrs)

Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket basedand Predictive location based QoS Routing Protocols.

UNIT III ENERGY MANAGEMENT IN AD HOC NETWORKS (9Hrs)

Need for Energy Management – Classification of Energy Management Schemes –Battery Management and Transmission Power Management Schemes – Network Layerand DataLink Layer Solutions – System power Management schemes.

UNIT IV MESH NETWORKS (9Hrs)

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture –Opportunistic Routing – Self Configuration and Auto Configuration - Capacity Models –Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks

UNIT V SENSOR NETWORKS (9Hrs)

Introduction – Sensor Network architecture – Data Dissemination – Data Gathering –MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks –Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks

Text Books

1. HolgerKarl , Andreas Willig, “Protocol and Architecture for Wireless Sensor Networks”, John wiley publication, Jan 2006.

2. C. Siva Ram Murthy and B. S.Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.
3. Xiang-Yang Li , “Wireless Ad Hoc and Sensor Networks: Theory and Applications, 1227 th edition, Cambridge university Press,2008.

Reference Books

1. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”,MorganKaufmanPublishers, 2004
2. C.K. Toh, “Adhoc Mobile Wireless Networks”, Pearson Education, 2002.
3. Thomas Krag and Sebastin Buettrich, “Wireless Mesh Networking”, O’Reilly Publishers.2013
4. Waltenegus Dargie, Christian Poellabauer, —Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons, 2010
5. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, —Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.

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1. http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w03.pdf
2. https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks/
3. https://www.cse.wustl.edu/~jain/cse567-11/ftp/sensor/

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

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

U20CCE508	DATA MINING AND WAREHOUSE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1- Design a Data warehouse system and perform business analysis with OLAP tools. (**K2**)
CO2- Apply suitable pre-processing and visualization techniques for data analysis. (**K3**)
CO3- Apply frequent pattern and association rule mining techniques for data analysis. (**K3**)
CO4- Apply appropriate classification and clustering techniques for data analysis. (**K3**)
CO5- Preprocessing the datasets using WEKA tool. (**K3**)

UNIT I DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING (9 Hrs)

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

UNIT II DATA MINING – INTRODUCTION (9 Hrs)

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

UNIT III DATA MINING – FREQUENT PATTERN ANALYSIS (9 Hrs)

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

UNIT IV CLASSIFICATION AND CLUSTERING (9 Hrs)

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection- Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL (9 Hrs)

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

Text Books

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2. M. Sudeep Elayidom, “Data Mining and Warehousing”, 1st Edition, 2015 Cengage Learning India Pvt. Ltd.
3. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, 35th Reprint 2016.

Reference Books

1. Ian H.Witten and Eibe Frank, “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier, Second Edition.
2. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Pang-Ning Tan, Michael Steinbach, “Introduction to Data Mining”, Addison Wesley, 2006.
4. Dunham M H, “Data Mining: Introductory and Advanced Topics”, Pearson Education, New Delhi, 2003
5. Mehmed Kantardzic, “Data Mining Concepts, Methods and Algorithms”, John Wiley and Sons, USA, 2003.

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1. www.slideshare.net/.../data-warehousing-and-data-mining-presentation
2. www.wright.edu/~arijit.sengupta/mis710/notes/lect6a-datamining.ppt
3. https://www.cse.iitb.ac.in/infolab/Data/Talks/krithi-talk-impact.ppt

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

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

U20CCE509	COMPUTER VISION TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional vision and motion analysis techniques.
- To study some applications of computer vision algorithms.

Course outcomes

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

CO1 – Explain basic concepts of image processing techniques required for computer vision. **(K2)**
CO2 - Perform shape analysis, boundary tracking techniques, chain codes. **(K3)**
CO3 - Apply Hough Transform for line, circle, and ellipse detections. **(K3)**
CO4 - Apply 3D vision techniques & motion related techniques. **(K3)**
CO5 - Develop applications using computer vision techniques. **(K3)**

UNIT I IMAGE PROCESSING FOUNDATIONS (9 Hrs)

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT II FEATURE DESCRIPTORS (9 Hrs)

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors moments

UNIT III HOUGH TRANSFORM (9 Hrs)

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT IV 3D VISION AND MOTION (9 Hrs)

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT V APPLICATIONS (9 Hrs)

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, ”Digital Image Processing and Computer Vision” Cengage Learning, 1st Edition, 2008.

Reference Books

1. E. R. Davies, ”Computer & Machine Vision‖, Fourth Edition”, Academic Press, 2012.
2. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
4. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.
5. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.

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2. https://onlinecourses.nptel.ac.in/noc21_ee23/preview
3. https://nptel.ac.in/courses/106/105/106105216/
4. https://www.slideshare.net/Qentinel/what-is-computer-vision

COs/POs/PSOs Mapping

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

Correlation Level: 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

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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.
5. S. N. Sivanandam, S. Sumathi, S. N. Deepa, “Introduction to Neural Networks using MATLAB 6.0”, Tata McGraw Hill Education, 1st Edition, 2017.

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2. https://www.ifi.uzh.ch/dam/jcr:00000000-2826-155d-0000-00005e4763e3/fuzzylogicscript.pdf.
3. https://nptel.ac.in/courses/106/105/106105173/.

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

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

OPEN ELECTIVE-II

		L	T	P	C	Hrs
U20HSO501	PRODUCT DEVELOPMENT AND DESIGN	3	0	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,

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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

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	-	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

		L	T	P	C	Hrs
U20HSO502	INTELLECTUAL PROPERTY RIGHTS	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, Cop
yright, 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.

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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

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	-	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

U20HSO503	MARKETING MANAGEMENT AND RESEARCH	L	T	P	C	Hrs
		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

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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

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	-	-	1	-	1	-	-	-
2	-	1	2	-	1	-	3	-	-	2	-	1	-	-	-
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

U20HSO504	PROJECT MANAGEMENT FOR ENGINEERS	L	T	P	C	Hrs
		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 References

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

U20HSO505	FINANCE FOR ENGINEERS	L	T	P	C
		3	0	0	3

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)

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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/

COs/POs/PSOs Mapping

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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

U20ECCM04	INTERNET OF THINGS (Common to ECE, CCE and ICE)	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 Reference modules and architecture of IoT.
- To understand the concepts of Hardware and Software Elements.
- To acquire the knowledge about various Functions with IoT elements.
- To develop skills required to build real-time IoT based Applications.

Course Outcomes

After completion of the course, students will be able to

CO1- Infer internet of Things and its components**.(K2)**

CO2- Describe about Reference modules and Architecture**.(K2)**

CO3- Explain the concepts of Hardware and Software Elements **.(K2)**

CO4- Build and deploy various Functions with IoT elements**.(K3)**

CO5- Develop real-time IoT based Applications**.(K3)**

UNIT – I INTRODUCTION TO INTERNET OF THINGS (9 Hrs)

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust.

UNIT - II ARCHITECTURE OF IoT (9 Hrs)

State of the Art – Introduction, Architecture Reference Model- IoT reference Model, IoT Reference Architecture, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT - III ELEMENTS OF IoT (9 Hrs)

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.

Software Components- Programming APIs (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT - IV IoT 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.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, Internet 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, Rachit Thukral 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. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2002
4. Cuno Pfister, “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

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

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

U20CCT614	INTERNET PROGRAMMING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand different Internet Technologies.
- To learn java-specific client side programming.
- To learn java servlet programming and database connectivity.
- To learn PHP and XML document.
- Understand AJAX and services provided by web.

Course Outcomes

CO1- Construct a basic website using HTML and Cascading Style Sheets. (**K2**)
CO2- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms. (**K3**)
CO3- Develop server side programs using Servlets and JSP. (**K3**)
CO4- Construct simple web pages in PHP and to represent data in XML format. (**K3**)
CO5- Use AJAX and web services to develop interactive web applications**. (K3)**

UNIT I INTRODUCTION (9 Hrs)

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request and Response – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements –Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENT SIDE PROGRAMMING (9 Hrs)

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects, Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling DHTML with JavaScript-JSON introduction – Syntax – Function Files – Http Request – SQL.

UNIT III SERVER SIDE PROGRAMMING (9 Hrs)

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions, Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server

Database Connectivity: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV PHP and XML (9 Hrs)

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions, Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database.

XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEB SERVICES (9 Hrs)

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods.

Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Text Books

1. Deitel and Deitel and Nieto, “Internet and World Wide Web How to Program”, Pearson Education, 5th Edition, 2011.
2. Robert W.Sebesta, "Programming with World Wide Web", Pearson Education, Eighth Edition,2015.
3. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

Reference Books

1. Stephen Wynkoop and John Burke, “Running a Perfect Website”, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming, “Building Intranet Applications”, Wiley Publications, 3rd Edition, 2009.
3. Gopalan N.P. and Akilandeswari J.,”Web Technology”, Prentice Hall of India, 2011.
4. UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.
5. Kogent Learning Solutions Inc., Web Technologies: Black Book, Dreamtech publication, 2009.

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1. www. w3schools.com
2. https://www.javatpoint.com
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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	3	2	1	1	1	-	-	-	-	-	1	1	2	3	-
3	3	2	1	1	1	-	-	-	-	-	1	1	2	3	-
4	3	2	1	1	-	-	-	-	-	-	1	1	2	3	-
5	3	2	1	1	-	-	-	-	-	-	1	1	2	3	-

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

U20CCT615	WIRELESS COMMUNICATION SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about evolution of mobile communication technology.
- To understand the basic concepts and terms of cellular system.
- To describe the various medium access control used in wireless communication.
- To learn CDMA based communication systems
- To understand recent wireless technologies.

Course Outcomes

After completion of the course, the students are able to

CO1- Explain development in mobile communication. **(K2)**
CO2- Demonstrate the concepts of cellular system , resource availability and traffic demands**.(K2)**
CO3 -Illustrate the various medium access alternatives for wireless communication**.(K2)**
CO4- Analyze performance of CDMA based system**.(K3)**
CO5 -Explain the principles of recent wireless communication**.(K2)**

UNIT I INTRODUCTION (9 Hrs)

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks , Wireless Local Loop(WLL), Wireless Local Area network(WLAN), Bluetooth and Personal Area Networks

UNIT II CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS (9 Hrs)

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference, Handoff Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization , Repeaters, Micro cell zone concept

UNIT –II MEDIUM ACCESS ALTERNATIVES FOR WIRELESS COMMUNICATION (9 Hrs)

Spread Spectrum Modulation - Pseudo-Noise Codes with Properties and Code Generation Mechanisms -DSSS and FHSS Systems - Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques -Zero Inter Symbol Interference Communication Techniques - Detection Strategies - Diversity Combining Techniques: Selection Combining - Threshold Combining - Equal Gain Combining - Maximum Ratio Combining.

UNIT IV WIRELESS SYSTEMS (9 Hrs)

GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture.

UNIT V RECENT WIRELESS TECHNOLOGIES (9 Hrs)

Introduction to Wi-Fi, WiMAX, ZigBee Networks, Software Defined Radio, UWB Radio, Cognitive radio, Ad-hoc and sensor network, evolution of wireless network, MIMO systems, Security issues and challenges in a Wireless network.

Text Books

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Publications,2nd Edition, 2010.
2. Steve Rackley, Wireless Networking Technology, From Principles to Successful Implementation, Newnes; 1st edition,2011
3. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education, 2012

Reference Books

1. Upena Dalal and Manoj K. Shukla, "Wireless and Mobile Communication", Oxford Press Publications,2016.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2012.
3. Ezio Biglieri and Robert Calderbank, "MIMO Wireless Communications", Cambridge University Press,2015.
4. Kaveh Pah Laven and P. Krishna Murthy, "Principles of Wireless Networks", Pearson Education, 2012
5. William Stallings, "Wireless Communication and Networking", PHI, 2003.

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1. http://nptel.ac.in/courses/117102062/
2. https://onlinecourses.nptel.ac.in/noc17_cs37/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-452-principles-of-wireless-communications-spring-2006/
4. https://jiscollege.ac.in/ece/Syllabus_MCNT_2018.pdf
5. https://learnengineering.in/ec8652-wireless-communication/

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

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

U20CCT616	DATA SCIENCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concepts of Real world data representations.
- To learn the Data collection and its strategies in Data Science.
- To understand the Data analytics for Data Science.
- To gain knowledge in Data Science Tools.
- To expose the different opportunities in Industries.

Course outcomes

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

CO1 – Infer the Real world data and information. **(K2)**
CO2 – Explain basic concepts of Data collection and Data Preprocessing **(K2)**
CO3 – Make use of descriptive statistics to organize and summarize the data. **(K2)**
CO4 – Interpret the various Tools and its advantage. **(K3)**
CO5 – Illustrate the different opportunities in Industries. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Scope of Data Science - Stages in a Data Science Project – Data science process- Retrieving data – Cleansing, integrating and transforming data – Data analysis – Build the models – Presenting findings and building applications.– Data Security Issues.

UNIT II DATA COLLECTION AND DATA PRE-PROCESSING (9 Hrs)

Data manipulation: Reading and selection – Filtering missing data – Sorting – Grouping – Ranking and plotting; Introduction to Python; Fundamental Python Libraries for Data Scientists : Numpy – Scipy – ScikitLearn – Pandas – Matplotlib; IDE; Data Manipulation with Pandas; Sample programs to pre-process and visulaize data

UNIT II EXPLORATORY DATA ANALYTICS (9 Hrs)

Introduction – Data Preparation – Exploratory Data Analysis: Data summarization – Data distribution – Outlier Treatment – Measuring asymmetry – Continuous distribution; Estimation: Mean – Variance – Skewness and Kurtosis - Box Plots - Pivot Table - Heat Map - Correlation Statistics - ANOVA. Sampling – Covariance – Correlation.

UNIT IV DATA SCIENCE TOOLS (9 Hrs)

Introduction – Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing: Using confidence intervals – Using p-values. Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools -Visualization Tools

UNIT V APPLICATION (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.

Text Books

1. Chirag Shah, “A Hands on Introduction to Data Science”, Cambridge University Press, 2020.
2. SinanOzdemir, “Principles of Data Science”, Packt Publication, 2016.
3. Jiawei Han, Micheline Kamber and Jian Pei, “ Data Mining: Concepts and Techniques”, Third Edition. ISBN 0123814790, 2011.

Reference Books

1. Steven S. Skiena, “Data Science Design Manual”, Spring International Publication, 2017.
2. Davy Cielen, Arno D B Meysman, Mohamed Ali, “Introducing Data Science – Big data, Machine Learning, and more using Python tools”, Manning Publications Co, 2016.
3. Laura Igual, Santi Segua, “Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications”, Springer Nature, 2017
4. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
5. Mohammed J. Zaki and Wagner Miera Jr, “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge University Press, 2014.

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1. https://www.coursera.org/learn/excel-data-analysis
2. https://www.tutorialspoint.com/excel_data_analysis/index.htm
3. https://www.coursera.org/learn/open-source-tools-for-data-science
4. https://www.jeremyjordan.me/data-science
5. https://www.ngdata.com/top-data-science-resourrces

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

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

U20CCP609	INTERNET OF THINGS APPLICATION LABORATORY	L	T	P	C	Hours
		0	0	2	1	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-Demonstrate internet of Things and its hardware and software components.

CO2- Interface I/O devices, sensors & communication modules.

CO3-Explain the concepts of remotely monitor data and control devices.

CO4-Build and deploy an various architecture with their elements.

CO5-Develop real life IoT based projects.

LIST OF EXPERIMENTS

1. Study Raspberry Pi and perform necessary software installation.
2. Introduction to Raspberry PI platform and python programming
3. Interface LED/Buzzer with Raspberry Pi
4. To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi
5. Interface temperature and humidity sensor with Raspberry Pi
6. Interface DC motor using motor driver circuit with Raspberry Pi and control its rotation
7. Interface Bluetooth with Raspberry Pi and perform real time application
8. Write a program on Raspberry Pi to upload temperature and humidity data to thingspeak cloud and retrieve data from thingspeak cloud.
9. Communicate between Arduino and Raspberry PI using any wireless medium
10. To install MySQL database on Raspberry Pi and perform basic SQL queries.
11. Write a program on Raspberry Pi to publish and subscribe log data to MQTT broker.
12. To create TCP server on Raspberry Pi and respond with data to TCP client when requested.
13. To create UDP server on Raspberry Pi and respond with humidity data to UDP client when requested.
14. LoRaWAN Configuration to share the data in cloud.

Reference Books

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2012
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2007
3. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2002
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, 2017

Web References

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
2	2	1	-	-	3	-	-	-	-	-	-	-	3	3	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	3	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	3	3

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

U20CCP610	INTERNET PROGRAMMING LABORATORY	L	T	P	C	Hrs
		0	0	3	1	45

Course Objectives

- To be familiar with Web page design using HTML/XML and style sheets
- To be exposed to creation of user interfaces using Java frames and applets.
- To learn to create dynamic web pages using server side scripting.
- To be familiar with the PHP programming.
- To be exposed to creating applications with AJAX.

Course Outcomes

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

CO1- Construct Web pages using HTML/XML and style sheets. (**K3**)
CO2- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms. (**K3**)
CO3- Develop dynamic web pages using server side scripting. (**K3**)
CO4- Use PHP programming to develop web applications. (K3)
CO5- Construct web applications using AJAX and web services. (**K3**)

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML
   a. To embed a map in a web page
   b. To fix the hot spots in that map
   c. Show all the related information when the hot spots are clicked.
2. Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Write programs in Java using Servlets:
   i. To invoke servlets from HTML forms
   ii. Session tracking using hidden form fields and Session tracking for a hit count
5. Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
8. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
9. Write programs in PHP
   i. Validate the form using PHP regular expression.
   ii. PHP stores a form data into database.
10. Write a web service for finding what people think by asking 500 people‘s opinion for any consumer product.
11. Create an element that you can’t change its children or attributes. An element is like a single frame in a movie: it represents the UI at a certain point in time using React elements.
12. Create a components in React Js that renders Welcome many times.

Reference Books

1. Deitel and Deitel and Nieto, “Internet and World Wide Web How to Program”, Pearson Education, 5th Edition, 2011.
2. Robert W.Sebesta, "Programming with World Wide Web", Pearson Education, Eighth Edition,2015.
3. Stephen Wynkoop and John Burke, “Running a Perfect Website”, QUE, 2nd Edition,1999.
4. Chris Bates, Web Programming, “Building Intranet Applications”, Wiley Publications, 3rd Edition, 2009.
5. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

Web Reference

1. www. w3schools.com
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3. https://www.tutorialspoint.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	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
2	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
3	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
4	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
5	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2

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

		L	T	P	C	Hours
U20CCP611	WIRELESS COMMUNICATION SYSTEMS LABORATORY	0	0	3	1	45

Course Objectives

- To perform the various multiple access technique using trainer kit.
- To Learn the GPS receiver and demonstrate how to measure latitude & longitude.
- To understand and apply various Error correction codes.
- To understand about multipath receiver.
- To know the concept of various generation in wireless communication.

Course Outcomes

After completion of the course, the students are able to

CO1 - Analyze the various multiple access technique using trainer kit.

CO2- Demonstrate the transmission and reception of audio, video and tone using satellite communication trainer.

CO3 - Distinguish between different codes.

CO4 - Implement multipath receiver.

CO5 - Familiarize different generation in wireless communication.

LIST OF EXPERIMENTS

1. To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer.
2. To establish analog/digital communication link and transmit & receive three signals (audio, video, tone) simultaneously using Satellite Communication Trainer.
3. To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude
4. Simulation of error correction code (like CRC).
5. To study FHSS Transceiver
6. To study RAKE Receiver.
7. To study GSM Transceiver system.
8. To Study Bluetooth system kit.
9. To design and implement m-sequence generator
10. Simulation of Channel model for Free space propagation loss and log normal shadowing models
11. Simulation of Frequency Division Multiple access transmitter and receiver systems
12. BER simulation of OFDM system over multipath fading channel
13. Simulation of Frequency Division Multiple access techniques for communication systems
14. Simulation of CDMA transmitter and receiver
15. Simulation of Direct sequence spread spectrum modulation and demodulation
16. Generation of OFDM Transmitter and receiver systems using SDR kit
17. Design and Lead Software Defined Network experiments based both on Virtual Machines
18. Program Python scripts for SDN

Reference Books

1. Upena Dalal and Manoj K. Shukla, “Wireless and Mobile Communication”, Oxford Press Publications,2016.
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2012.
3. Ezio Biglieri and Robert Calderbank, “MIMO Wireless Communications”, Cambridge University Press,2015.

4. Vijay K. Garg, “Wireless Communications and Networks”, Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian reprint).
5. J. Schiller, “Mobile Communication” 2/e, Pearson Education, 2012.

Web References

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2. https://onlinecourses.nptel.ac.in/noc17_cs37/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-452-principles-of-wireless-communications-spring-2006
4. http://www.mnit.ac.in/dept_ece/download/Syllabus_Wireless_Optical.pdf
5. https://www.abebooks.com/book-search/title/wireless-communication-technology/author/blake/

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

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

U20CCC6XX	CERTIFICATION COURSE - VI	L	T	P	C	Hours
		0	0	4	-	45

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.

U20CCS606	SKILL DEVELOPMENT COURSE 6 (Foreign Language / IELTS – II)	L	T	P	C	Hours
		0	0	2	-	30

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are 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. Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation

U20CCS607	SKILL DEVELOPMENT COURSE 7 (Technical Seminar)	L	T	P	C	Hours
		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 evaluatedbased on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks aregiven based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student andmaintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.

		L	T	P	C	Hrs
U20CCS608	SKILL DEVELOPMENT COURSE 8 (NPTEL / MOOC - I)	0	0	0	-	50

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Departmentcommittee 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.

U20CCM606	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C	Hours
		0	0	2	-	30

Course Objectives

- 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.
CO2 -Distinguish the Indian languages and literature.
CO3 -Learn the philosophy of ancient, medieval and modern India.
CO4 - Acquire the information about the fine arts in India.
CO5 - Know the contribution of scientists of different eras.

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. Kapil Kapoor, “Text and Interpretation: The India Tradition”,ISBN: 81246033375, 2005
2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, “Position paper on Arts, Music, Dance and Theatre”, ISBN 81-7450 494-X, 200
4. S. Narain, “Examinations in ancient India”, Arya Book Depot, 1993
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
6. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal BanarsidassPublishers, ISBN 13: 978-8120810990,2014

PROFESSIONAL ELECTIVE-III

	DIGITAL IMAGE PROCESSING	L	T	P	C	Hrs
U20ECCM03	(Common to ECE and CCE)	3	0	0	3	45

Course Objectives

- To become familiar with digital image fundamentals
- To get exposed to mathematical preliminaries and Image Transform used in Image Processing
- To learn concepts of Image Enhancement and restoration techniques.
- To study the image segmentation and colour Image processing techniques.
- To become familiar with image compression and recognition methods

Course Outcomes

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

CO1-Summarize the digital image fundamentals.**(K2)**

CO2- Correlate the various image processing technique with the help of mathematical preliminaries. **(K4)**

CO3- Apply different types of image enhancement and restoration techniques in various applications **(K3)**

CO4- Illustrate the significance of Colour Image Processing and Image Segmentation techniques**(K4)**

CO5- Connect Image compression and Recognition techniques in Image processing. **(K4)**

UNIT I DIGITAL IMAGE FUNDAMENTALS (9 Hrs)

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels., simple image formation model, Brightness, contrast, hue, saturation, Mach band effect

UNIT II IMAGE TRANSFORM: (9 Hrs)

Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT- Image transforms – 1D DFT, 2D DFT, Discrete Cosine transform, Discrete Sine transform, Hadamard transform, Haar transform, Slant transform, KL transform, SVD transform, Wavelet transform.

UNIT III IMAGE ENHANCEMENTAND IMAGE RESTORATION (9 Hrs)

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV COLOUR IMAGE PROCESSING AND IMAGE SEGMENTATION (9 Hrs)

Colour fundamentals – Colour models – HIS to RGB and RGB to HIS. Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation- Morphological processing-erosion and dilation. Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm

UNIT V MAGE COMPRESSION AND RECOGNITION (9 Hrs)

Need for compression – Coding Redundancy - Interpixel Redundancy - Psycho visual Redundancy - Bit plane coding - Variable length coding – Adaptive coding – Arithmetic coding – LZW coding – Hybrid coding – Wavelet – JPEG – MPEG.. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

Text Books

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, 2017, 4th edition, Pearson Education, USA
2. Anil K. Jain, Fundamentals of Digital Image Processing, 2015, 1st edition, Pearson India, India
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.

Reference Books

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
4. John C. Russ, F. Brent Neal-The Image Processing Handbook, Seventh Edition, The Kindle edition (2016), CRC Press,Taylor & Francis Group.
5. P.Ramesh Babu, Digital Image Processing, Scitech Publications., 2003

Web References

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html
3. https://nptel.ac.in/courses/117/105/117105079/
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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	3
2	3	2	2	2	-	-	-	-	-	-	-	-	2	1	3
3	3	2	2	2	-	-	-	-	-	-	-	-	2	1	3
4	3	2	2	2	-	-	-	-	-	-	-	-	2	1	3
5	3	2	2	2	-	-	-	-	-	-	-	-	2	1	3

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

WIRELESS MOBILE NETWORKING 3 0 0 3 45

Course Objectives

- To understand the functioning of wireless communication system and evolution of different wireless communication systems and standards.
- To explain GPRS and multiple access techniques for Wireless Communication
- To explain wireless application on protocol and features of mobile services
- To understand the key modules of digital communication systems and encoding techniques
- To evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks

Course Outcomes

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

CO1- Describe the function of PCS and call processing in GSM
CO2- Demonstrate an ability explain GPRS and multiple access techniques for Wireless Communication
CO3- Compare the features of next generation mobile communication networks.
CO4- Describe and analyze the digital communication system with spread spectrum modulation.
CO5- Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT I BASICS OF PCS AND GSM (9 Hrs)

Personal Communication Services (PCS) architecture- Global system for Mobile Communication (GSM) Architecture, GSM frequency spectrum, GSM radio aspects, GSM services, Supplementary services, GSM channel types, call processing in GSM- Mobility Management: Location updates procedure, Temporary Mobile Subscriber Identity, concept of roaming, Location area, routing area, tracking area

UNIT II GPRS AND MOBILE DATA COMMUNICATION (9 Hrs)

General Packet Radio Services (GPRS) architecture, GPRS Services, Quality of service – GPRS Network nodes, Mobility management and routing in GPRS- WLANs (wireless LANs) IEEE 802.11 standard, RFID- Bluetooth technology, Wi-Max, Wi-Fi- Mobile IP.

UNIT III WIRELESS APPLICATION ON PROTOCOL AND 3G MOBILE SERVICE (9 Hrs)

Mobile Internet standard, WAP Gateway and Protocols- WML- IMT 2000 specification- W-CDMA, CDMA 2000, Quality of services in 3G Network- UMTS Technology- Features of 4G, 4G LTE, VoLTE, 4.5G,5G.

UNIT IV WLL, SIGNAL ENCODING TECHNIQUES AND SS MODULATION (9 Hrs)

WLL architecture and technologies- WLL types and application- Concept of LEC networks- Line coding techniques- ASK,BPSK, PCM,DPCM and DM- Types of spread spectrum: DSSS, FHSS

UNIT V APPMOBILE AD-HOC NETWORK AND WSN (9Hrs)

MANET, MANET topologies, Features of MANET, Applications, types of MANET Architecture, Design challenges in MANET- Mesh Networking- Wireless sensor network, Applications, Clustering of WSN, Characteristics of WSN- Sensor node: Block diagram, different types of WSN Architecture, Energy efficiency in WSN.

Text Books

1. Theodore S. Rappaport, "Wireless communication- Principles and practice", Pearson publication New Delhi, 2005
2. Lin Yi-Bang, Clamtac Imrich, "Wireless and mobile network Architectures", John Wiley & sons, New Delhi, 2001
3. T.G.Palanivelu, "Wireless and Mobile Communication", PHI learning pvt ltd, 2008

Reference Books

1. Singal T.L., "Wireless Communication", McGraw Hill Education Private Limited, New Delhi, 2010,
2. Talukdar Asoke K, Javagal Roopa R, "Mobile Computing Technology", Hill Education Private Limited, New Delhi, 2010,
3. Willam Stallings, "Wireless Communications and Networks", 2nd edition, Pearson Publisher, 2004
4. Simon Haykin · Michael Moher, "Modern Wireless Communications, Pearson Prentice Hall, 2005
5. Iti Saha Misra, "Wireless Communications and Networks: 3G and Beyond", McGraw Hill Education (India) Pvt Ltd, 2013

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1. https://www.octoscope.com/English/Collaterals/Presentations/octoScope_WirelessTutorial_20090209.pdf
2. www.radio-Electronics.com/info/wireless/Bluetooth/Bluetooth_overview.php
3. https://www.data-alliance.net/blog/5g-4g-3g-standards-lte-gsm-cdma-ism-wcdma-hspa

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

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

U20CCE613	INFORMATION RETRIEVAL	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

CO1- Basics of information retrieval models. **(K2)**
CO2- Use an open source search engine framework and explore its capabilities. (**K3**)
CO3- Apply appropriate method of classification or clustering. (**K3**)
CO4- Design and implement innovative features in a search engine. (**K3**)
CO5- Design and implement a recommender system. (**K3**)

UNIT I INTRODUCTION (9 Hrs)

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

UNIT II MODELING AND RETRIEVAL EVALUATION (9 Hrs)

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

UNIT III TEXT CLASSIFICATION AND CLUSTERING (9 Hrs)

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

UNIT IV WEB RETRIEVAL AND WEB CRAWLING (9 Hrs)

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

UNIT V RECOMMENDER SYSTEM (9 Hrs)

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

Text Books

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, ACM Press Books, Second Edition, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, “Recommender Systems Handbook”, First Edition, 2011.
3. W.Bruce Croft, Donald Metzler and Trevor Strohman, “Search Engines: Information Retrieval in Practice”, Pearson, 1 st Edition, 2009.

Reference Books

1. C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010.
3. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems: Theory and Implementation”, Kluwer Academic Publishers, second edition, 2000.
4. Ricardo Baeza-Yates, “Modern Information Retrieval”, Pearson Education, 2007.
5. Ophir Frieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series “,Springer, 2 nd Edition, 2004.

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2. https://nptel.ac.in/courses/106/105/106105081/
3. https://nptel.ac.in/courses/106/105/106105183/

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

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
- To demonstrate 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 (**K2**)
CO2 - Design effective HCI for individuals..(**K3**)
CO3 - Enumerate the cognitive computerized models for HCI(**K2**)
CO4 - Design mobile application framework using HCI tools.(**K3**)
CO5 - Develop web interface using various tools(**K4**)

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 (9 Hrs)

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 (9 Hrs)

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV APPLICATION FRAMEWORK (9 Hrs)

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 (9 Hrs)

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. Cabrera & James, “ Modular Design Frameworks: A Projects-based Guide for UI/UX Designers”, 2017.
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edit ion, O’Reilly 2009.
4. Jonathan Lazar , “Research Methods in Human-Computer Interaction”, 2009.
5. Yvonne Rogers, “Interaction Design: Beyond Human-Computer Interaction”, 2001.

Web References

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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/

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
2	3	3	3	3	-	3	-	3	-	2	-	2	2	-	-
3	2	2	2	2	2	2	3	3	-	3	3	-	2	-	2
4	2	2	2	2	2	2	-	3	-	3	-	3	3	-	-
5	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
U20BMCM01	**SOFT COMPUTING** (Common to ECE, ICE, BME, CCE)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To gain knowledge in the basics of fuzzy set.
- To learn the concepts of Optimization algorithms.
- To get familiarized with the learning schemes of neural networks.
- To understand with the design of fuzzy interface systems.
- To get exposed to neuro-fuzzy hybrid systems and its applications

Course Outcomes

After completion of the course the students will be able to

CO1 - Gain knowledge in the basics of fuzzy set. **(K2)**
CO2 - Understand the concepts of optimization algorithms. **(K2)**
CO3 - Explain the terminologies and various learning schemes of Neural Networks. **(K3)**
CO4 - Gain knowledge in fuzzy interface systems. **(K3)**
CO5 - Familiarize with the neuro-fuzzy hybrid systems and its applications. **(K3)**

UNIT- I Introduction to Fuzzy Set (9 Hrs)

Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT- II Optimization (9 Hrs)

Optimization - Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT- III Neural Networks (9 Hrs)

Introduction to Neural Networks - Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT- IV Fuzzy Interface Systems (9 Hrs)

Type of fuzzy interface-Adaptive networks based Fuzzy interface systems – structure and parameters of a fuzzy system-Classification and Regression Trees - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

UNIT- V Applications of Hybrid Systems (9 Hrs)

Hybrid Systems -Neural Networks, Fuzzy Logic - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy Art Map: A Brief Introduction - Soft Computing Tools - Fuzzy Logic Controller.

Text Books

1. Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd. 2017.
2. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 2nd Edition, 2011
3. Ross T. J., "Fuzzy Logic with Engineering Applications", McGraw Hill, 2016.

Reference Books

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education 2004
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill, 2011.

3. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2002.
4. Martin T. Hagam Howard B. Deruth and Mark Beale, “Neural Network Design”, Thompson Learning, 2002.
5. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

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2. https://www.elprocus.com/soft-computing/
3. https://nptel.ac.in/courses/108/104/108104049/
4. http://www.myreaders.info/html/soft_computing.html
5. 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	1	1	1	1	1	-	-	-	-	-	1	3	2	-
2	3	1	1	1	1	1	-	-	-	-	-	1	3	2	-
3	3	1	1	1	1	1	-	-	-	-	-	1	3	2	-
4	3	2	1	2	2	1	-	-	-	-	-	1	3	2	-
5	3	2	1	2	2	1	-	-	-	-	-	2	3	2	-

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

OPEN ELECTIVE-III

		L	T	P	C	Hrs
U20EEO603	**CONVENTIONAL AND NON-CONVENTIONAL ENERGY SOURCES** (Common to ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS, FT)	3	0	0	3	45

Course Objectives

- To get knowledge on the status of conventional and non-conventional energy resources in world.
- To have a clear idea about the operation of conventional power plant and its associated equipment's.
- To learn about the concept of energy harvesting of solar through thermal and PV module
- To understand the technological basis for harnessing wind energy.
- To get a clear knowledge on power generation using Ocean, Tidal Energy and Bio-Energy

Course Outcomes

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

CO1 – Identify the world and Indian energy scenario and the necessity of renewable energy sources **(K1)**

CO2 – Gain knowledge for the generation of electrical power from various power plants **(K1)**

CO3 – Analyze and compare the various solar harvesting techniques **(K3)**

CO4 – Describe the aerodynamics of wind turbines and calculate their power, energy production**(K1)**

CO5 – Describe the construction and working principle of various equipment's used in Ocean, Tidal Energy and Bio-Energy power plants**(K2)**

UNIT I ENERGY RESOURCES (9 Hrs)

Perspective of energy resources – Forms of Energy – Conventional and non-conventional sources of energy– World's energy status - Energy reserves in India. Limitations of Conventional sources of energy efficiency – Renewable Energy Sources – Energy parameters – Energy Intensity - Gross Domestic product.

UNIT II POWER PLANTS (9 Hrs)

Thermal power plant – layout, working principle. Gas turbine power plant – layout, working principle. Nuclear power plants: fuels, nuclear fuel cycle, reactors and nuclear waste management. Hydro Electric plants – Types, energy conversion schemes, environmental aspects.

UNIT III SOLAR ENERGY SYSTEMS (9 Hrs)

Solar radiation - Principles of solar energy collection –Types of collector – working principles - Characteristics - efficiency - Solar Energy applications – water heaters, air heaters, solar cooling; solar drying and power generation – solar tower concept – solar pump. Photovoltaic (PV) technology – photovoltaic effect – modelling -Characteristics – efficiency of solar cells.

UNIT IV WIND ENERGY SYSTEMS (9 Hrs)

General theory of wind mills – Types of wind mills – performance of wind machines–wind power – efficiency. Merits and Limitations of Wind energy system – Modes of wind power generation.

UNIT V ALTERNATE ENERGY SYSTEMS (9 Hrs)

Ocean and Tidal energy conversion - working principle of OTEC – Anderson closed cycle OTEC System. Tidal power – tides - tidal range - types of tidal power plants, single basin and double basins schemes. Bio-mass Energy – Biogas plants.

Text Books

1. S. Rao and Dr. B. B. Parulekar, “Energy Technology”, Khanna Publication, 3rd Edition, 1999.
2. B. H. Khan, “Non-Conventional Energy Resources”, Tata McGraw Hill Education, 2nd Edition, 2009.
3. D. P. Kothari, K. C. Singal, Rakesh Ranjan, “Renewable Energy Sources and Emerging Technologies”, PHI, 2011

Reference Books

1. G. D. Rai, “Non-conventional energy sources”, Khanna Publication. 4th Edition, 2002.
2. Pulfrey, David. L, “Photo voltaic Power Generation”, Van Nostrand reinhold Company, 1983.
3. Abbasik, “Renewable Energy Sources and their Environment”, PHI, 2008.
4. Steve Doty, Wayne C. Turner, “Energy Management Handbook”, Fairmont Press, 8th Edition, 2012.
5. S.A.Abbasi and N. Abbasi, “Renewable Energy Sources and Their Environmental Impact”, PHI, 2001.

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2. https://nptel.ac.in/courses/112/107/112107291/
3. https://byjus.com/physics/conventional-and-nonconventional-sources-of-energy/
4. https://www.jagranjosh.com/general-knowledge/nonconventional-sources-of-energy-1448698715-1
5. https://wb.gov.in/departments-power-and-non-conventional-energy-sources.aspx

COs / POs and 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	2	-	1	2	-	-	-	-	1	-	1	1
2	3	1	1	2	-	1	2	-	-	-	-	1	-	1	1
3	3	1	1	2	-	1	2	-	-	-	-	1	-	1	1
4	3	1	1	2	-	1	2	-	-	-	-	1	-	1	1
5	3	1	1	2	-	1	2	-	-	-	-	1	-	1	1

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

		L	T	P	C	Hrs
U20EEO603	**ELECTRONIC PRODUCT DESIGN AND PACKAGING** (Common to EEE, CSE, IT, ICE, MECH, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To provide basic knowledge about Electronic Product and 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 withstand 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 ELECT RONIC SYSTEMS PACKAGING (9 Hrs)

Definition of a system and history of semiconductors, Products and levels of packaging, Packaging aspects of handheld products, Definition of PWB, Basics of Semiconductor and Process flowchart, Wafer fabrication, inspection and testing, Wafer packaging; Packaging evolution; Chip connection choices, Wire bonding, TAB and flip chip.

UNIT II : SEMICONDUCTOR PACKAGES (9 Hrs)

Single chip packages or modules (SCM), Commonly used packages and advanced packages; Materials in packages; Thermal mismatch in packages; Multichip modules (MCM)-types; System-in-package (SIP); Packaging roadmaps; Hybrid circuits;

UNIT III ELECTRICAL ISSUES IN PACKAGING (9 Hrs)

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 parasitic

UNIT IV CHIP PACKAGES (9 Hrs)

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 electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability

Text Books

1. Tummala, Rao R., Fundamentals of Microsystems Packaging, McGraw Hill, 2001
2. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011
3. Tummala, Rao R, Microelectronics packaging handbook, McGraw Hill, 2008.

Reference Books

1. Blackwell (Ed), “The electronic packaging handbook”, CRC Press, 2000.
2. R.S.Khandpur, “Printed Circuit Board”, Tata McGraw Hill, 2005
3. R. K. Ulrich, “Recent literature in Electronic Packaging”, 2005
4. Michael L. Bushnell and Vishwani D. Agrawal, “Essentials of Electronic Testing for Digital, Memory and Mixed signal VLSI Circuits”, Kluwer Academic Publishers.2000.
5. M. Abramovici, M. A. Breuer, and A.D. Friedman, “Digital System Testing and Testable Design”, Computer Science Press,

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

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

	PLATFORM TECHNOLOGY	L	T	P	C	Hrs
U20CSO603	(Common to EEE, ECE, ICE, MECH, CIVIL, CCE, BME, AI&DS)	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# FUNDAMENTAL (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. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley, 2002.
2. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition, 2008.
3. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill, 2008.

Reference Books

1. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Sixth edition, A Press, 2012.
2. Joh Skeet, “C# in depth, Manning publications”, Third Edition, 2014.

3. AdrewStellman and Jennifer Greene, “Head First C#”, Third Edition, O’Reilly, 2013.
4. Rod Johnson, “J2EE Design and Development”, Wrox, 2002
5. Michael Schmalz, “C# Database Basics”, O'Reilly Media, January 2012.

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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

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	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

U20CEO603	DISASTER MANAGEMENT	L	T	P	C	Hours
	(Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT)	3	0	0	3	45

Course Objectives

- 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)

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 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. Mrinalini Pandey, 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.

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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

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	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	Hours
U20CEO604	**AIR POLLUTION AND SOLID WASTE MANAGEMENT** (common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT)	3	0	0	3	45

Course Objectives

- 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)**

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 (8 Hrs)

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 VEQUIPMENT (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, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd. 1993,

Reference books

1. P. AarneVesilind, 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.

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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

		L	T	P	C	Hrs
U20BMO603	**BIOMETRIC SYSTEMS** (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics)	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

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

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

		L	T	P	C	Hrs
U20BMO604	**MEDICAL ROBOTICS** (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL , Mechatronics)	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

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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. Gonzalez and C. S. G. Lee, “Robotics”, McGraw Hill, 2008.

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

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

		L	T	P	C	Hrs
U20ADO603	**PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE)	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 References

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

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	–	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
U20ADO604	(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 makedecisions
- 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 References

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

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	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

U20CCT717	MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Understand the basics of data science, AI and Machine learning
- To learn the essential concepts of R programming
- To know the concepts of data acquisition and processing
- To Understand the various techniques of Machine learning
- To Study the clustering concepts to apply in various application

Course Outcomes

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

CO1 – Define the basics of AI and Machine learning**.(K2)**
CO2 – Describe the essential concepts of Knowledge Inference**.(K2)**
CO3 – Infer the techniques of machine learning. **.(K2)**
CO4 – Illustrate the clustering concepts to apply in various application **.(K2)**
CO5 - Apply concepts of AI and ML in real time**.(K3)**

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 INFERENCE (9 Hrs)

Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network- Dempster - Shafer theory.

UNIT III TECHNIQUES OF ML (9 Hrs)

ML Techniques overview, Validation Techniques (Cross-Validations), Feature Reduction/Dimensionality reduction, Principal components analysis (Eigen values, Eigen vectors, Orthogonality)

UNIT IV CLUSTERING (9 Hrs)

Distance measures, Different clustering methods (Distance, Density, Hierarchical), Iterative distance-based clustering; Dealing with continuous, categorical values in K-Means, Constructing a hierarchical cluster , K-Medoids, k-Mode and density-based clustering ,Measures of quality of clustering

UNIT V APPLICATIONS (9 Hrs)

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

Text Books

1. Elaine Rich and Kelvin Knight, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition, 2017.
2. DAN.W. Patterson, “Introduction to A.I. and Expert Systems”, PHI, 2007.
3. Ameet V Joshi, “Machine Learning and Artificial Intelligence“, Springer, 2020

4. Tom M Mitchell, Machine Learningǁ, First Edition, McGraw Hill Education, 2013.
5. PeterHarrington,“MachineLearninginaction”,ManningPublication,2012.

Reference Books

1. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
2. Ivan Bratko, “Prolog Programming for Artificial Intelligence”, Addison-Wesley, Pearson Education, 4th Edition, 2011.
3. Andreas C.Mueller and Sarah Guido, “Introduction to Machine Learning with Python”, O’ReillyMedia, Inc.First Edition, 2016.
4. Eremy Watt, RezaBorhani, and AggelosK. Katsaggelos, “Machine Learning Refined Foundations, Algorithms, and Applications”, Cambridge University Press, 2016.
5. Shai Shalev-Shwartzand Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”,CambridgeUniversity Press, 2014.
6. Mehryar Mohri, Afshin Rostamizadeh, AmeetTalwalkar, “Foundations of Machine Learning”, MIT Press, Second Edition,2012.

Web References

1. https://www.google.co.in/books/edition/The_R_Book/8D4HVx0apZQC?hl=en&gbpv=1&dq=ESSENTIALS+OF+R+PROGRAMMING&printsec=frontcover
2. https://www.tutorialspoint.com/r/index.htm
3. https://doi.org/10.1007/978-3-030-26622-6
4. https://www.coursera.org/learn/machine-learning
5. https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms/

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

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

U20CCT718	CLOUD COMPUTING AND DISTRIBUTED SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand how modern clouds operate and different role of services.
- To understand about cluster computing operation, different types and their performance.
- To know about architecture of parallel and grid computing with distributed technologies.
- To acquire the knowledge about various distributed systems and network virtualization.
- To get idea about distributed file accessing models and file system.

Course Outcomes

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

CO1 - Describe the basic introduction and various services under by cloud computing **(K2)**
CO2 – Analyze the performances of cluster computing on different models **(K3)**
CO3 – Describe about architecture on parallel and grid computing and their relation **(K2)**
CO4 - Explain the basic concepts of distributed systems and analysis on network virtualization **(K2)**
CO5 - Design and study the operations of file system analysis **(K3)**

UNIT I CLOUD COMPUTING (9 Hrs)

Evolution of cloud computing, Comparison with traditional computing architecture (client/server), Services provided at various levels, Role of Networks in Cloud computing, Role of Web services; Service Models (SaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS); Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud, Cloud Security.

UNIT II CLUSTER AND PARALLEL COMPUTING (9 Hrs)

Cluster setup and its Administration, Performance Models & Simulations; Networking, Distributed shared memory, parallel I/O Clusters, Scheduling parallel jobs on clusters, Load sharing and Fault tolerance manager, parallel programming scheduling techniques, Dynamic load balancing, Cluster System – Beowulf, COMPaS and NanOS.

Parallel Computing: Flynn's Classification of Computer Architecture, Types of Parallelism, Parallel programming models.

UNIT III CLOUD SOFTWARE AND COMPUTING PLATFORMS (9 Hrs)

HDFS – Map Reduce – Google App Engine (GAE) – Programming Environment for GAE – Architecture of GFS – Case Studies: Openstack, Heroku, and Docker Containers –Amazon EC2, AWS, Microsoft Azure, Google Compute Engine.

UNIT IV DISTRIBUTED SYSTEMS (9 Hrs)

Introduction, Characteristics, Issues, Goals, and Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept, Middleware: Models of Middleware, Services offered by middleware, Client Server model. Layered Protocols, Interprocess communication (IPC): MPI, Remote Procedure Call (RPC), Remote Object Invocation, Remote Method Invocation (RMI), Message Oriented Communication, Stream Oriented Communication, Group Communication.

UNIT V DISTRIBUTED FILE SYSTEMS AND NAME SERVICES (9 Hrs)

Introduction and features of DFS, File models, File Accessing models, File-Caching Schemes, File

Replication, Case Study: Distributed File Systems (DSF), Network File System (NFS), Andrew File System (AFS), Introduction to Name services and Domain Name System, Directory Services, Case Study: The Global Name Service, The X.500 Directory Service, Designing Distributed Systems: Google Case Study.

Text Books

1. Malhar Barai, Vincenzo Caselli, Binildas A. Christudas , “Service Oriented Architecture With Java”, Packt Publishing, 2008.
2. Qusay H. Mahmoud , “Distributed Programming with Java” , Manning Publisher 2000.
3. Barrie Sosinsky, “Cloud Computing Bible”, Wiley-India, 2010.

Reference Books

1. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed System: Principles & Paradigms, Prentice Hall, 2007
2. George Couluris, Jean Dollimore, “Distributed Systems Concepts & Design”, Pearson education, 3rd edition, 2006.
3. N.A. Lynch: Distributed Algorithms, Morgan Kayfmann Publishing Inc., CA, 1996.
4. Thomas Erl, Zaigham Mahood& Ricardo Puttini, “Cloud Computing, Concept, Technology & Architecture”, Prentice Hall, SecondEdition,2013.
5. Kai Hwang. Geoffrey C. Fox, Jack J. Dongarra, “Distributed and Cloud Computing from parallel processing to the internet of things”, Elsevier, 2012.

Web References

1. https://www.cl.cam.ac.uk/teaching/1819/CloudComp/materials.html
2. https://www.geektonight.com/cloud-computing-notes/
3. https://studentsfocus.com/cs8791-cc-notes-cloud-computing-notes-csc-7th-sem/
4. http://www.facweb.iitkgp.ac.in/~shamik/spring2013/cc/cc2013_dtls.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	2	1	2	-	2	1	1	-	2	3	2	2	3	2	1
2	3	2	2	2	3	1	1	-	2	3	2	2	3	2	1
3	3	2	2	2	3	1	1	-	2	3	2	2	3	2	1
4	3	2	2	2	3	1	1	-	2	3	2	2	3	2	1
5	3	2	2	2	3	1	1	-	2	3	2	2	3	2	1

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

U20HSP703	BUSINESS BASICS FOR ENTREPRENEURS	L	T	P	C
		0	0	2	1

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. "Guide to business planning", Profile Books Limited, 2004.
2. Lasher. W, "The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business" Broadway Books, 2010.
3. Arjun Kakkar, "Small Business Management: Concepts and Techniques for improving Decisions", Global India Publications, 2009.

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

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	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

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

U20CCP712	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C	Hrs
		0	0	3	3	45

Course Objectives

- To Illustrate a problem and build intelligent agents
- To learn appropriate searching techniques to solve a real world problem
- To analyze the problem and infer new knowledge using suitable knowledge representation schemes
- To Develop planning and apply learning algorithms on real world problems
- To Design an expert system and implement natural language processing techniques

Course Outcomes

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

CO1 – Formulate a problem and build intelligent agents**.(K3)**

CO2 – Apply appropriate searching techniques to solve a real world problem. **(K3)**

CO3 – Analyze the problem and infer new knowledge using suitable knowledge representation Schemes. **(K3)**

CO4 - Develop planning and apply learning algorithms on real world problems. **(K3)**

CO5- Design an expert system and implement natural language processing techniques. **(K3)**

LIST OF EXPERIMENTS

1. Implementation of toy problems
2. Developing agent programs for real world problems
3. Implementation of constraint satisfaction problems
4. Implementation and Analysis of DFS and BFS for an application
5. Developing Best first search and A* Algorithm for real world problems
6. Implementation of mini max algorithm for an application
7. Implementation of unification and resolution for real world problems.
8. Implementation of knowledge representation schemes - use cases
9. Implementation of block world problem
10. Implementation of learning algorithms for an application
11. Development of ensemble model for an application
12. Implementation of NLP programs

Reference Books

1. PrateekJoshi, “Artificial IntelligencewithPhython”,1sted.,PacktPublishing,2017
2. DenisRothman, “Artificial IntelligencebyExample”,Packt,2018
3. ParagKulkarni, Prachi Joshi, “Artificial Intelligence –Building Intelligent Systems,” 1st ed., PHI learning,2015
4. Deepak Kemhani,”FirstcourseinArtificial Intelligence”,McGrawHillPvtLtd,2013
5. Stuart J. Russell, Peter Norwig , Artificial Intelligence –A Modern approach, 3rd Pearson Education, 2016

Web References

1. https://www.AI&ML.com
2. https://onlinelibrary.wiley.com/doi/full/10.1002/inf2.12016
3. https://nptel.ac.in/courses/117/106/117106091/
4. https://www.tutorialspoint.com/artificial_intelligence/index.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	2	1	2	-	2	1	1	-	2	3	2	2	3	2	-
2	3	2	2	2	3	1	1	-	2	3	2	2	3	2	-
3	3	2	2	2	3	1	1	-	2	3	2	2	3	2	-
4	3	2	2	2	3	1	1	-	2	3	2	2	3	2	-
5	3	2	2	2	3	1	1	-	2	3	2	2	3	2	-

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

		L	T	P	C	Hrs
U20CCP713	CLOUD COMPUTING AND DISTRIBUTED SYSTEMS LABORATORY	3	0	0	3	45

Course Objectives

- To understand how modern clouds operate and different models of services.
- To learn to run virtual machines of different configuration.
- To acquire knowledge about usage of web server and data directory
- To provide students with contemporary knowledge in distributed systems
- To equip students with skills to analyse and design distributed applications.

Course Outcomes

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

CO1 - Adapt different types of virtualization and increase resource utilization.

CO2 – Build a private cloud using open source technologies.

CO3 – Analyse security issues on cloud and Develop real world web applications and deploy on commercial cloud.

CO4 - Demonstrate various service models and knowledge of the basic elements and concepts related to distributed system technologies.

CO5 - Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.

LIST OF EXPERIMENTS

Cloud Computing Experiments

1. Understand deployment models, service models, advantages of cloud computing.
2. Understand different types of virtualizations, Host and bare metal hypervisors and implement horizontal scalability.
3. Implement IaaS using your resources.
4. Simulate identity management in your private cloud.
5. Explore Storage as a Service for remote file access using web interface.
6. Understand security of web server and data directory.

Distributed System Experiments

7. Client/server using RPC/RMI.
8. Implementations of multi thread application.
9. Inter-process communication.
10. Distributed File System.
11. Deadlock management in Distributed systems.

Reference Books

1. MalharBarai, Vincenzo Caselli, Binildas A. Christudas , “Service Oriented Architecture With Java”, Packt Publishing, 2008.
2. Distributed Programming with Java, Qusay H. Mahmoud, Manning Publisher 2000.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

4. George Couluris, Jean Dollimore, “Distributed Systems Concepts & Design”, Pearson education, 3rd edition, 2006.
5. N.A. Lynch: Distributed Algorithms, Morgan Kayfmann Publishing Inc., CA, 1996.
6. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed System: Principles & Paradigms, Prentice Hall, 2007
7. Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Wile,* 2011

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

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

		L	T	P	C	Hrs
U20CCP714	COMPREHENSIVE VIVA VOCE	0	0	2	1	30

The student will be tested for his understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be made by a committee comprising of the faculty members of the department. The committee will conduct three written examinations of short questions type or multichoice questions type from the subjects. The end semester examination which carries a total of 50 marks, will have viva voce examination conducted by a committee of one external examiner and one internal examiner.

U20CCW701	PROJECT PHASE – I	L	T	P	C
		0	0	4	2

Each batch of 2 or 3 students will be assigned an experimental or a theoretical project to be carried out under the supervision of a guide. The project work has to be carried out in the 7th and 8th semesters and has to be completed by the end of the 8th semester.

In the phase I of the project work, the progress of the work carried out in the 7th semester will be monitored and assessed. A committee of departmental faculty members comprising the project guide, the Head of the Department and one more faculty member will conduct the internal assessment. The project work and the report will be evaluated by the internal assessment committee by conducting three reviews for a total of 50 marks. The end semester examination which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner.

U20CCW702	INTERNSHIP / INPLANT TRAINING	L	T	P	C
		0	0	0	2

Students may undergo Inplant training or internship during summer / winter vacation at Industry/ Research organization for a period of two weeks to four weeks. Students are also permitted to undergo internships during their seventh semester after the theory classes are over. Each student has to submit a detailed report on In-Plant Training which He/ She has undergone. The department committee will assess the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of Inplant training or internship.

U20CCM707	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		0	0	0	2	30

Course Objectives

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

Course Outcomes

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

- Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

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 (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

PROFESSIONAL ELECTIVE-IV

		L	T	P	C	Hrs
U20CCE716	OFDM SYSTEMS	3	0	0	3	45

Course Objective

- To develop mathematical theory of digital communications over fading channels
- To learn multicarrier techniques for fading wireless channels
- To analyze and design of multi-channel techniques for communication
- To understand the synchronization issues in multicarrier environment
- To understand multiplexed MIMO systems

Course Outcomes

After completion of the course, the students are able to

CO1 – Describe basic principles of OFDM. **(K2)**
CO2 - Explain the fundamental concepts of wireless channel modelling techniques.**(K2)**
CO3 – Illustrate the performance of multicarrier system in wireless cellular systems **(K2)**
CO4 - Demonstrate the concepts of channel estimation in fading channels **(K2)**
CO5 - Design spatially multiplexed MIMO systems **(K3)**

UNIT –I INTRODUCTION (9 Hrs)

Introduction-High Rate Wireless Applications -Single-Carrier vs. Multi-Carrier Transmission - Introduction to OFDM -Basic Principle of OFDM -Modelling of OFDM for Time-Varying Random Channel-Appropriate Channel Model for OFDM Systems -Impairments of Wireless Channels to OFDM Signals -Application to Millimeter-Wave Radio Channels.

UNIT –II PROPAGATION IN WIRELESS CHANNEL (9 Hrs)

Large-Scale Fading, Small-Scale Fading; SISO Channel Models - Indoor Channel Models and Outdoor Channel Models; MIMO Channel Models-Statistical MIMO Model, I-METRA MIMO Channel Model, SCM MIMO Channel Model.

UNIT –III OPTIMIZATION AND SYNCHRONIZATION (9 Hrs)

Coded OFDM-Multiple Access Extensions of OFDM–Multiband OFDM-MIMO OFDM - Performance Optimization -Channel Partitioning -Synchronization -Timing Offset Estimation - Frequency Offset Estimation -Synchronization in Cellular Systems

UNIT –IV CHANNEL ESTIMATION (9 Hrs)

Channel Estimation -Pilot Structure -Training Symbol-Based Channel Estimation -DFT-Based Channel Estimation – Decision-Directed Channel Estimation -PAPR Reduction-Inter-Cell Interference Mitigation Techniques.

UNIT –V SIGNAL DETECTION FOR MIMO SYSTEMS (9 Hrs)

Managing Trust in online social network Security and Privacy in online social network security Linear Signal Detection -ZF Signal Detection, MMSE Signal Detection, OSIC Signal Detection , ML Signal Detection, Sphere Decoding Method, QRM-MLD Method, Lattice Reduction-Aided Detection, Lenstra-Lenstra-Lovasz (LLL) Algorithm, Application of Lattice Reduction, Soft Decision for MIMO Systems, Log-Likelihood-Ratio (LLR) for SISO Systems, LLR for Linear Detector-Based MIMO System, LLR for MIMO System with a Candidate Vector Set, LLR for MIMO System Using a Limited.

Text Books

1. Ye (Geoffrey) Li and Gordon L. Stuber, “Orthogonal Frequency Division Multiplexing for Wireless Communications”, Springer, 2006.
2. Ramjee Prasad, “OFDM for Wireless Communications Systems”, Artech House, 2004.
3. Tao Jiang, Lingyang,Yan Zhang, “Orthogonal Frequency Division Multiple Access fundamentals and applications”, CRC Press, Taylor and Francis Group LLC,2010
4. Y.J.Liu, Introduction to OFDM Receiver Design and Simulation, Artech House,2019.

Reference Books

1. Yong Soo Cho, Jaekwon Kim, "MIMO-OFDM Wireless Communications with Matlab" John Wiley and Sons, 2010.
2. Claude Oestges ,“MIMO Wireless Communications”, 2e, Prentice Hall, 2010.
3. EzioBiglieri, RobertCalderbank, "MIMO Wireless Communications" Cambridge University Press 2007.
4. Bahai, Saltzberg and Ergen, Multi-Carrier,“Digital Communications, Theory and Applications of OFDM”, Second Edition, Springer, 2004.
5. Henrik Schulze and Christian Lueders, “Theory and Applications of OFDM and CDMA Wideband Wireless Communications”, John Wiley and Sons, 2005.

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1. https://nptel.ac.in/courses/117/104/117104115/
2. https://nptel.ac.in/courses/117/104/117104118/
3. https://tinyurl.com/ya39mdu9

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

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

U20ITCM07	SOCIAL NETWORK ANALYSIS (Common to IT, CCE and AI&DS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concept of social network analysis and related applications.
- To learn network models and link analysis.
- To analyze and evaluate communities.
- To understand human behaviour in social web and related communities.
- To learn application of social networks.

Course Outcomes

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

CO1 - Discuss the concepts of social network analysis and related applications **(K2)**
CO2 - Discuss the various Network Growth Models **(K2)**
CO3 - Explain the concept of communities in web social networks **(K2)**
CO4 - Explain human behaviour in social web and related communities **(K2)**
CO5 - Create Learning Methods and Applications **(K3)**

UNIT I INTRODUCTION TO NETWORKS AND SOCIETY (9 Hrs)

Social Network Analysis - Applications of Social Network Analysis - Preliminaries - Levels of Social Network Analysis - Historical Development - Graph Visualisation Tools - Network Measures - Network Basics - Node Centrality - Assortativity - Transitivity and Reciprocity - Similarity - Degeneracy.

UNIT II NETWORK GROWTH MODELS AND LINK ANALYSIS (9 Hrs)

Properties of Real - World Networks - Random Network Model - Ring Lattice Network Model Watts - Strogatz Model - Preferential Attachment Model - Price's Model - Local-world Network Growth Model - Network Model with Accelerating Growth - Aging in Preferential Attachment - Applications of Link Analysis - Signed Networks - Strong and Weak Ties - Link Analysis Algorithms

UNIT III EXTRACTION, MINING COMMUNITIES IN WEB SOCIAL NETWORKS (9Hrs)

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

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES (9 Hrs)

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

UNIT V LEARING METHODS AND APPLICATIONS OF SOCIAL NETWORKS (9 Hrs)

Machine Learning Pipelines - Intuition behind Representation Learning - Benefits of Representation Learning - Criterion for Graph Representation Learning - Graph Representation Learning Pipeline - Representation Learning Methods. Applications and Case Studies - Malicious Activities on OSNs - Sock puppets in OSNs

Text Books

1. Tanmoy Chakraborty "Social Network Analysis" Wiley Edition: 2021

2. S.Wasserman, K.Faust: Social Network Analysis: Methods and Applications, Cambridge Univ Press, 1994 3. Scott, J. (2007).
3. Social network analysis: A handbook (2nd Ed.). Newbury Park, CA: Sage. 4. Knoke (2008). Social Network Analysis, (2nd Ed). Sage.
4. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007.
5. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st Edition, 2010.

Reference Books

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

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1. https://nptel.ac.in/courses/106/106/106106169/
2. https://www.coursera.org/learn/social-media-data-analytics
3. https://www.tutorialspoint.com/social_media_marketing/social_media_analysis.htm
   https://blockgeeks.com/
4. https://www.talkwalker.com/blog/social-media-analytics-guide

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	1	-	-	2	-	-	-	-	-	-	-	-	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3
4	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3
5	3	2	1	1	2	-	-	-	-	-	-	-	-	2	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 will 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 Behaviour – 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. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
3. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, Second Edition, 2007.

Reference Books

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, O‘Reilly Media, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Bart Baesens“Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Apr 2014
5. Vignesh Prajapati , “Big Data Analytics with. R and Hadoop”,2013

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2. https://www.r-bloggers.com/
3. https://www.ntnu.no/iie/fag/big/lessons/lesson2.pdf
4. https://www.dbs.ifi.lmu.de/Lehre/BigData-Management&Analytics
5. https://www.geeksforgeeks.org/
6. https://hadoop.apache.org/
7. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

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

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

	SATELLITE COMMUNICATION	L	T	P	C	Hrs
U20ECCM05	(Common to ECE and CCE)	3	0	0	3	45

Course Objectives

- To give exposure on the basics of satellite orbits.
- To understand satellite segment and earth segment
- To learn about the various methods of satellite access
- To study the applications of satellites
- To recognize the concepts of the basics of satellite Networks

Course Outcomes

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

CO1- Explain the basics of satellite orbits. **(K2)**
CO2- Summarize the satellite segment and earth segment**. (K2)**
CO3- Analyze the satellite Link design**(K3)**
CO4- Interpret the working principle of various methods of satellite access**. (K2)**
CO5- Discuss the various satellite applications**. (K2)**

UNIT - I SATELLITE ORBITS (9 Hrs)

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geostationary and non-Geo-stationary orbits – Look Angle Determination- Limits of visibility –Eclipse -Sub satellite point –Sun transit Outage-Launching Procedures - launch vehicles and propulsion

UNIT - II SPACE SEGMENT AND EARTH SEGMENT (9 Hrs)

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and Command-Transponders-The Antenna Subsystem - earth segment- Transmit-Receive Earth Station.

UNIT - III SATELLITE LINK DESIGN (9 Hrs)

The space link, Equivalent Isotropic Radiated Power, transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, intermodulation noise, inter satellite links. interference between satellite

UNIT - IV SATELLITE ACCESS AND CODING METHODS (9 Hrs)

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes

UNIT - V SATELLITE APPLICATIONS (9 Hrs)

INTELSAT Series, INSAT, VSAT, Mobile satellite services : GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH). Recent trends - Macro and Nano Satellites.

Text Books

1 Dennis Roddy, Satellite Communication, 4th Edition, Mc Graw Hill International, 2006.
2 Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd, 2017, ISBN: 978-81-265-0833-4
3 M.Richharia, Satellite Communication Systems-Design Principles, Macmillan 2003

Reference Books

1. Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015, ISBN: 978-81-265-2071-8.
2. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall/Pearson, 2007.
3. Tri T. Ha, Digital Satellite Communication, second edition, 2017.
4. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall/Pearson, 2007.
5. Gerard Maral, Michel Bousquet, Zhili Sun, Satellite Communications Systems: Systems, Techniques and Technology, 5th Edition, Wiley India Pvt. Ltd., 2020

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2. https://www.managementstudyguide.com/satellite-communication-system.htm
3. https://www.tutorialspoint.com/satellite_communication/satellite_communication_introduction.htm
4. https://www.intelsat.com/resources/tools/satellite-101/
5. https://www.sciencedirect.com/topics/engineering/satellite-communication-system

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

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

U20ITCM06	GREEN COMPUTING (Common to IT and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To explore various Green Assets and Modelling.
- To understand the issues related with Green compliance.
- To study and develop various case studies

Course Outcomes

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

CO1 - Acquire knowledge to adopt green computing practices in the environment. **(K2)**
CO2 - Explore the skill in energy saving practices in their use of hardware. **(K2)**
CO3 - Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders. **(K2)**
CO4 - Understand the ways to minimize equipment disposal requirements. **(K2)**
CO5 - Illustrate the security issues possible in sensor networks and aware of different applications **(K2)**

UNIT I FUNDAMENTALS OF GREEN COMPUTING (9 Hrs)

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbonfoot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals –Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING (9 Hrs)

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green InformationSystems: Design and Development Models.

UNIT III GRID FRAMEWORK (9 Hrs)

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV GREEN COMPLIANCE (9 Hrs)

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V APPLICATIONS OF GREEN IT (9 Hrs)

The Environmentally Responsible Business Strategies (ERBS) – Case Study: Scenarios for Trial Runs- Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

Text Books

1. BhuvanUnhelkar, “Green IT Strategies and Applications- Using Environmental Intelligence”, CRC Press, June 2014.

2. WoodyLeonhard, Katherine Murray,"GreenHomecomputingfordummies",August2012

Reference Books

1. AlinGales,MichaelSchaefer,MikeEbbers,"GreenDataCenter:stepsforthe Journey", Shroff,IBM rebook,2011.
2. JohnLamb,"The Greening of IT", Pearson Education,2009.
3. Jason Harris, "Green Computing and Green IT- Best Practices on regulation & Industry", Lulu.com,2008.
4. Carlspeshocky,"Empowering Green Initiatives with IT",JohnWiley&Sons,2010.

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2. https://www.athabascau.ca/syllabi/comp/comp635.php

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

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

U20EEO706	ELECTRICAL ENERGY CONSERVATION AND AUDITING	L	T	P	C	Hrs
	(Common to ECE, ICE, MECH, CIVIL, BME, Mechatronics and CCE)	3	0	0	3	45

Course Objectives

- To know the necessity of conservation of energy.
- To understand the energy management schemes in motors.
- To understand the energy management methods in lighting schemes.
- To illustrate the metering schemes for energy management.
- To learn economic analysis and management techniques.

Course Outcomes

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

CO1 - Outline about the energy audit process and instruments. **(K2)**
CO2 - Apply the energy efficient methods for improving efficiency of electric motors. **(K2)**
CO3 - Develop good illumination systems and analyze the power factor. **(K3)**
CO4 - Acquire knowledge on various meters used for energy management. **(K2)**
CO5 - Analyze and evaluate cost effective model in electrical equipment. **(K5)**

UNIT I INTRODUCTION (9 Hrs)

Basics of energy – need for energy management – energy accounting – energy monitoring – targeting and reporting – energy audit – definitions – types of energy audit – audit instruments – audit of process industry – Case studies.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION (9 Hrs)

Energy management for electric motors: energy efficient controls and starting efficiency – motor efficiency and load analysis – selection of motors – energy efficient motors. Energy management by cogeneration: forms of cogeneration – electrical interconnection.

UNIT III LIGHTING SYSTEMS (9 Hrs)

Energy management in lighting systems: task and the working space – light sources – ballasts – lighting controls – optimizing lighting energy – reactive power management – capacitor sizing – degree of compensation – capacitor losses –effect of harmonics – lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT (9 Hrs)

Metering for energy management: units of measure – utility meters – demand meters – paralleling of current transformers – instrument transformer burdens – multi tasking solid state meters – metering location vs requirements – power analyzer – metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS (9 Hrs)

Power system tariffs – Economic analysis: cash flow model – Time value of money – pay-back method – utility rate structures – cost of electricity – loss evaluation – load management – demand control techniques – utility monitoring and control system – economic analysis of HVAC systems.

Text Books

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, “Guide to Energy Management”, The Fairmont Press, Inc., 5th Edition, 2006.

2. Frank Kreith, D. Yogi Goswami, “Energy Management and Conservation Handbook”, CRC Press, 2nd Edition, 2016.
3. Wayne C. Turner, “Energy Management Handbook”, The Fairmont Press, 4th Edition, 2001.

References Books

1. P. Venkataseshaiah K.V. Sharma, “Energy Management and Conservation”, Dreamtech Press, 1stEdition, 2020.
2. Amit K. Tyagi, “Handbook on Energy Audits and Management”, TERI, 1st Edition, 2003.
3. ICAI, “Electricity in buildings good practice guide”, McGraw-Hill Education, 1st Edition, 2017.

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1. https://nptel.ac.in/courses/108/106/108106022/
2. https://www.youtube.com/watch?v=onIhwmbL8CA
3. https://www.youtube.com/watch?v=CTt4y8bokWs
4. https://ieeexplore.ieee.org/document/7977655
5. https://ieeexplore.ieee.org/document/993185
6. https://ieeexplore.ieee.org/document/6450335

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

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

U20ECO705	IOT AND ITS APPLICATIONS	L	T	P	C	Hrs
	(Common to EEE, ICE, CSE MECH, IT, CIVIL)	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

4. Vijay Madisetti, ArshdeepBahga, "Ïnternet of Things, A Hands on Approach", University Press ,3rd/e ,Aug 2018.

5. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill ISBN: 9789352605224, 9789352605224,2nd edition, May 2017
6. Dr. SRN Reddy, RachitThukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs 2014.

Reference Books

6. Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi, 2012
7. Adrian McEwen, “Designing the Internet of Things”, Wiley, 2007
8. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications, 2013
9. CunoPfister, “Getting Started with the Internet of Things”, O Reilly Media, 2015
10. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press

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6. https://www.i-scoop.eu/internet-of-things-guide/
7. https://www.theinternetofthings.eu/
8. https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/
9. https://www.coursera.org/learn/iot
10. 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	2	3
2	3	-	3	2	-	-	-	-	-	-	-	-	2	2	3
3	2	3	2	-	-	-	-	-	-	-	-	-	2	2	3
4	2	2	2	-	-	-	-	-	-	-	3	-	2	2	3
5	2	3	2	-	3	-	-	-	-	-	3	-	2	2	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, CSE, IT, ICE, MECH, Mechatronics, CCE and Civil)

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–Tactilesensors,Temperature–IC,Thermistor,RTD,Thermocouple.AcousticSensors – 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, VI Edition, 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 Transducers I, 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.

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

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

U20CSO706	ARTIFICIAL INTELLIGENCE (Common to EEE, ICE, CIVIL, MECH,CCE, 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

After completion of the course, the 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. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill2008.
2. Stuart Russel, Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
3. Patrick Henry Winston,” Artificial Intelligence”, Addison Wesley, Books Third edition, 2000.

Reference Books

1. George F Luger, Artificial Intelligence, Pearson Education, 6th edition, 2009.
2. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
3. Engene Charniak and Drew Mc Dermott,” Introduction to Artificial intelligence, Addison Wesley 2000.
4. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley, Books Third edition, 2000.
5. Nils J. Nilsson, “Principles of Artificial Intelligence”, Narosa Publishing House, 2000.

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1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://www.w3schools.com/ai/
4. https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/
5. https://nptel.ac.in/courses/112/103/112103280/

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	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

		L	T	P	C	Hrs
U20CSO707	**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 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 data centres 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 editiouun,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

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	1	-	2	1	3	1	2	2	2
2	1	1	2	1	1	3	1	-	2	1	3	1	3	2	2
3	2	2	1	1	-	3	1	1	2	1	3	1	3	2	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	2	2

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

U20ITCM08	AUTOMATION TECHNIQUES & TOOLS - DEVOPS	L	T	P	C	Hrs
		3	0	0	3	45

(common to EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS)

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. **(K2)**

CO2 - Apply the Agile Methodology and comparing various other software development models with agile. **(K3)**

CO3 - Explain implementing Continuous Integration and Continuous Delivery. **(K2)**

CO4 - Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing). **(K2)**

CO5 - Create quick MVP prototypes for modules and functionalities. **(K3)**

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

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

U20ITO706	AUGMENTED AND VIRTUAL REALITY	L	T	P	C	Hrs
	(common to EEE, ICE, MECH, CICIL, BME)	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 **(K2)**
CO2 - Summarize different VR modelling Process **(K2)**
CO3 - Identify applications of virtual reality environment **(K2)**
CO4 - Explore and work on Augmented Reality environment **(K2)**
CO5 - Illustrate applications related to VR and AR **(K3)**

UNIT I VIRTUAL REALITY AND 3D COMPUTER GRAPHICS (9 Hrs)

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 (9 Hrs)

Geometric modeling – kinematics modeling- physical modeling – behaviour modeling – model Management.

UNIT III CONTENT CREATION CONSIDERATIONS FOR VR (9 Hrs)

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) (9 Hrs)

Introduction – Benefits of AR – Key players of AR technology - Understanding Augmented reality - Working with AR and System structure

UNIT -V APPLICATIONS ON VR (9 Hrs)

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.

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

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

		L	T	P	C	Hrs
U20ICO705	**INDUSTRIAL AUTOMATION** (Common to EEE, ECE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics)	**3**	**0**	**0**	**3**	**45**

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. **(K1)**

CO2- Know about the design of systems using PLC and PLC programming. **(K1,K2,K3)**

CO3- Acquire knowledge on application of PLC**. (K1,K3)**

CO4- Know about the SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software. **(K1, K2, K3)**

CO5- Know the fundamentals of DCS. **(K1)**

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.

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

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

		L	T	P	C	Hrs
U20CEO706	GLOBAL WARMING AND CLIMATE CHANGE (Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT)	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

CO 1 - Understand the concept and effects of global warming **(K2)**
CO 2 - Understand Climate system, earth's atmosphere and its components**.(K2)**
CO 3 - Analyze the Impacts of Climate Change on various sectors **(K4)**
CO 4 - Assess the concept about carbon credit and clean development mechanism.**(K3)**
CO 5 - Understand climate changes, its impact and mitigation activities.**(K2)**

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.

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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,.

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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	3	3	2	3	3	3	3	3	3	2	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	-	-	-
5	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

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

U20BMO705	INTERNET OF THINGS FOR HEALTH CARE (Common to EEE, ECE, ICE, CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the architecture of IoT and its associated protocols
- To gain knowledge on interfacing IoT and cloud
- To analyse the design and development of IoT.
- To get trained with m-IoT components and equipment
- To understand wearable technologies and applications of m-IoT

Course Outcomes

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

CO1 - Understand the architecture of IoT and its associated protocols **(K2)**
CO2 - Gain knowledge on interfacing IoT and cloud. **(K2)**
CO3 - Analyse the design and development of IoT. **(K3)**
CO4 - Understand m-IOT components and equipment **(K2)**
CO5 - Gain knowledge in wearable technologies and applications of m-IoT **(K2)**

UNIT I INTRODUCTION TO IoT **(9 Hrs)**

Brief History of IoT, Architectural Layers of IoT, Bluetooth, ZigBee, Wi-Fi, IP-Based Protocols, UPnP, CoAP, MQTT, XMPP. SCADA, Authentication protocols, IEEE 802.15.4.

UNIT II IOT IN THE CLOUD **(9 Hrs)**

Network layer, Cloud, Network Technologies, Types of Networks, BAN, Cloud and Virtualization, Cloud terminologies, Types of Cloud, Service Models, Fog and edge customization

UNIT III DESIGN & DEVELOPMENT **(9 Hrs)**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino board details – IDE programming – Raspberry Pi – Introduction and Interfacing

UNIT IV M-IoT **(9 Hrs)**

Perception Layer, RFIDs, cameras, Sensors, Introduction to ASICs, pulse oximeters, instrumentation amplifiers, surgical equipment and dependencies, Surgery and its types, role of IoT in surgery.

UNIT V APPLICATION OF IoT in HEALTH CARE **(9 Hrs)**

Ventilators, Wearable Technologies, smart watches, Computer Assisted Anthropology, Smart Health Organizations

Text Books

1. Aboul Ella Hassanien, Nilanjan, Dey, Surekha Borra, “Medical Big Data and Internet of Medical Things”, CRC Press, 1st edition, 2018.
2. Pankajavalli, P. B., Karthick, G. S. “Incorporating the Internet of Things in Healthcare Applications and Wearable Devices,”IGI Global, 1st edition, 2019.
3. Peter Waher, “Learning Internet of Things”, Packt Publishing, 2015

Reference Books

1. Valentia E.Balas, Le Hoang Son, Sudan Jha, Manju Khari, Raghvendra Kumar “Internet of Things in Biomedical Engineering”, , Academic Press, 2019

2. Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends, Yole Development Copyrights ,2014
3. Vijender Kumar Solanki, Raghvendra Kumar, Md. Atiqur Rahman Ahad “A Handbook of Internet of Things in Biomedical and Cyber Physical System” Springer International Publishing,2019
4. Amit Banerjee, Lalit Garg, Joel J. P. C. Rodrigues “Internet of Medical Things for Smart Healthcare” Springer Singapore,2019
5. Subhas Chandra Mukhopadhyay “Intelligent IoT Systems in Personalized Health Care” Elsevier SciencePublishing,2020

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1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/
2. https://www.digimat.in/nptel/courses/video/108105091/L01.html
3. https://youtu.be/ZIBBZnGjFCg
4. https://youtu.be/UrwbeOIIc68
5. https://youtu.be/gGNz-SduPnM

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

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

U20BMO706	TELEHEALTH TECHNOLOGY (common to EEE, ECE, ICE, CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Learn the key principles for telehealth technologies
- To understand communication networks and services.
- To know telemedicine system deployment
- To know the technology for alternative medicine
- To get an adequate knowledge of telemedicine applications.

Course Outcomes

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

CO1 - Understand fundamentals of telemedicine **(K2)**
CO2 - Gain knowledge in Communication networks and services (**K2)**
CO3 - Explain telemedicine system deployment and apply safeguard technologies in telemedicine **(K3)**
CO4 - Gain knowledge in technology for alternative medicine (**K2)**
CO5 - Explain telemedicine applications. **(K2)**

UNIT I FUNDAMENTALS OF TELEMEDICINE (9 Hrs)

Information Technology and Healthcare Professionals- Providing Healthcare to Patients- Technical Perspective - Healthcare Providers - Healthcare Informatics Developments - Different Definitions of Telemedicine - The Growth of the Internet: Information Flooding in E-Health.

UNIT II COMMUNICATION NETWORKSAND SERVICES (9 Hrs)

Wireless Communications Basics - Types of Wireless Networks - Wireless Technology in Patient Monitoring - Body Area Networks - Remote Recovery, General Health Assessments. Technologies in Medical Information Processing - Collecting Data from Patients - Bio-signal Transmission and Processing - Patient Records and Data Mining - Knowledge Management for Clinical Applications - Electronic Drug Store.

UNIT III TELEMEDICINE SYSTEM DEPLOYMENT AND SECURITY (9 Hrs)

Planning and Deployment Considerations - OSI Model - Scalability to Support Future Growth - Integration with Existing IT Infrastructure – Database - Evaluating IT Service and Solution Provider - Technologies for Safeguarding Medical Data and Privacy - Information Security Overview – Safeguarding Patient Medical History.

UNIT IV TECHNOLOGY FOR ALTERNATIVE MEDICINE (9 Hrs)

Technology for Natural Healing and Preventive Care - Consumer Electronics in Healthcare- Telehealth in General Healthcare and Fitness - Telemedicine in Physiotherapy -Healthcare Technology and the Environment.

UNIT V APPLICATIONS OF TELEMEDICINE (9 Hrs)

Teleradiology- Telepathology -Telecardiology- Tele oncology- Tele dermatology- Telesurgery-e-Health and Cyber Medicine - Future Trends in Healthcare Technology.

Text Books

1. Norris A C, Essentials of Telemedicine and Telecare, John Wiley, New York, 2002.
2. Bernard Fong, A. C. M. Fong, C. K. Li, "Telemedicine Technologies: Information Technologies in Medicine and Telehealth", John Wiley & Sons, Ltd, 2010.
3. Khandpur R S, "Telemedicine Technology and Applications", PHI Learning Pvt Ltd, 2017.

Reference Books

1. Olga Ferrer Roca, Marcelo Sosa Iudicissa, Handbook of Telemedicine, IOS Press, Netherland, 2002.
2. Wootton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine" Taylor & Francis 2017
3. Carroll, P.W. Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), "Public Health Informatics and Information Systems", Springer, 2003.
4. Ferrer-Roca, O., Sosa - Iudicissa, M. (Eds.), "Handbook of Telemedicine,Studies in Health Technology and Informatics", IOS Press, 2002
5. R. Latifi," Current Principles and Practices of Telemedicine and e-Health, IOS Press; 2008

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4. https://youtu.be/d87Iyj4rCNg
5. https://youtu.be/QfAoYUsTvtk

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

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, BME, 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 **(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.

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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/

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

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

		L	T	P	C	Hrs
U20ADO706	**ARTIFICIAL INTELLIGENCE APPLICATIONS** (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, CCE)	**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

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

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

U20CCT819	BLOCKCHAIN TECHNOLOGY AND APPLICATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand block chain technology and allows the students to explore the driving force behind the crypto currency.
- To know the various methods of Decentralization and Cryptographic primitives.
- To understand the bitcoin and alternative coins for payments methods.
- To introduce Smart contracts and Ricardian contracts for deploying smart contracts on a block chain.
- To know block chain technology for IoT - Government - Health - Finance etc.,

Course Outcomes

After completion of the course the students will be able to

CO1 - Apply the functional/operational aspects of crypto currency and ecosystem (K3)
CO2 - Analyse abstract models for Block chain Technology in decentralization and cryptography (K3)
CO3 - Identify the procedures in crypto currency domain for bit coin transactions and payments (K2)
CO4 - Apply the smart contracts on a block chain (K3)
CO5 - Apply block chain technology in various applications Health - Finance - Media (K3)

UNIT I INTRODUCTION (9 Hrs)

Introduction to block chain - History of block chain - Types of block chain - CAP theorem and blockchain - Benefits and limitations of blockchain. Planning the Block chain - Documenting Ownership

UNIT II DECENTRALIZATION AND CRYPTOGRAPHY (9 Hrs)

Decentralization using block chain - Methods of decentralization - Routes to decentralization - Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives - Asymmetric cryptography - Public and private keys

UNIT III BITCOIN AND ALTERNATIVE COINS (9 Hrs)

Integrity of the Transaction History - Hashing Data Identifying data from their digital finger print Bitcoin: Transactions - Blockchain - Bitcoin payments - Alternative Coins Theoretical foundations - Bitcoin limitations - Namecoin - Litecoin - Primecoin - Zcash

UNIT IV SMART CONTRACTS (9 Hrs)

Authorizing Transactions - Storing Transaction Data - Using the Data Store Definition - Ricardian contracts: Smart contract templates - Deploying smart contracts on a blockchain - Major Accomplishments of the smart contracts in Blockchain

UNIT V BLOCKCHAIN APPLICATIONS (9 Hrs)

Internet of Things - Medical Record Management System - Blockchain in Government and Blockchain Security - Blockchain Use Cases - Finance

Text Books

1. Daniel Drescher - “Blockchain Basics: A Non-Technical Introduction in 25 Steps” - Apress - First Edition - 2017.
2. Imran Bashir - “Mastering Blockchain - Distributed ledgers - decentralization and smart contracts explained” - Packt Publishing Ltd. - Second Edition - ISBN 978-1-78712-544-5 - 2017.

3. Arvind Narayanan - Joseph Bonneau - Edward Felten - Andrew Miller - and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press - 2016.

Reference Books

1. Andreas M. Antonopoulos - “Mastering Bitcoin: Unlocking Digital Cryptocurrencies” - O'Reilly Media - First Edition - 2014.
2. Michaud K. Why Blockchain: The Complete Guide to Understanding Bitcoin and Blockchain. Kyle Michaud; 2018 Mar 19..

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- https://www.edx.org/learn/blockchain-cryptography
- https://www.class-central.com/tag/blockchain
- https://cognitiveclass.ai/courses/blockchain-course/
- https://www.skillshare.com/browse/blockchain

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

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

U20HSP804	ENTREPRENEURSHIP MANAGEMENT	L	T	P	C
		0	0	2	1

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 for the benefit of entrepreneurs in general, and women entrepreneurs in particular. **(K2)**

UNIT I: ENTRPRENEURIAL SKILLS 1 (10 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 (10 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 (10 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*. publishing as Prentice Hall, One Lake Street, Upper Saddle River, New Jersey 07458..

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.

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2. https://bscdesigner.com/8-entrepreneurial-kpis.htm
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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	1	1	2	-	-	-
2	1	1	2	2	1	1	3	2	2	2	1	2	-	-	-
3	1	2	1	1	1	2	3	2	2	1	1	2	-	-	-

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

U20CCW803	PROJECT PHASE - II	L	T	P	C
		0	0	16	8

Extension and completion of project work started in the previous semester. On completion of the project work, each student has to prepare a project report and submit the same to the department.

In the Phase II, the project work and the report will be evaluated by the internal assessment committee by conducting two reviews and one demo for a total of 40 marks. The end semester examination which carries a total of 60 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner.

		L	T	P	C	Hrs
U20CCS809	SKILL DEVELOPMENT COURSE 9 (NPTEL / MOOC - II)	0	0	0	-	50

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Departmentcommittee 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.

U20CCE821	MULTIPLE INPUT MULTIPLE OUTPUT COMMUNICATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about concept of fading and diversity techniques.
- To understand about capacity of MIMO Channels.
- To learn space time blocks.
- To acquaint SU-MIMO with linear receivers.
- To study about Iterative decoding techniques.

Course Outcomes

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

CO1 – Describe concept of diversity and need of multiple antennas **(K2)**
CO2 – Estimate capacity and Information rates of MIMO channels (**K3)**
CO3 – Analyze the performance of space time block codes **(K3)**
CO4 – Apply Space-time codes for frequency selective channels **(K3)**
CO5 – Apply Concatenated codes for MIMO channels **(K3)**

UNIT I FADING CHANNELS AND DIVERSITY TECHNIQUES (9 Hrs)

Wireless channels – Error/Outage probability over fading channels – Diversity techniques – Channel coding as a means of time diversity – Multiple antennas in wireless communications.

UNIT 2 CAPACITY ANALYSIS OF MIMO CHANNELS (9 Hrs)

Capacity and Information rates of noisy, AWGN and fading channels – Capacity of MIMO channels – Capacity of non-coherent MIMO channels – Constrained signalling for MIMO communications.

UNIT 3 SPACE-TIME BLOCK AND TRELLIS CODES (9 Hrs)

Transmit diversity with two antennas: The Alamouti scheme – Orthogonal. and Quasi-orthogonal space-time block codes – Linear dispersion codes – Generic space-time trellis codes – Basic space-time code design principles – Representation of space-time trellis codes for PSK constellation – Performance analysis for space-time trellis codes – Comparison of space-time block and trellis codes.

UNIT 4 SPACE-TIME CODING FOR FREQUENCY SELECTIVE CHANNELS (9 Hrs)

MIMO frequency-selective channels – Capacity and Information rates of MIMO FS fading channels.– Space-time coding and Channel detection for MIMO FS channels – MIMO OFDM systems.

UNIT 5 CONCATENATED CODES AND ITERATIVE DECODING (9 Hrs)

Development of concatenated codes – Concatenated codes for AWGN and MIMO channels – Turbo coded modulation for MIMO channels – Concatenated space-time block coding.

Text Books

1. Tolga M. Duman and Ali Ghrayeb, “Coding for MIMO Communication systems”, John Wiley & Sons, West Sussex, England, 2007.
2. B. Gershman and N.D. Sidiropoulus, “Space-time processing for MIMO Communications”, Wiley, Hoboken, NJ, USA, 2005.
3. Robert W. Heath Jr. Angel Lozano “Foundations of MIMO Communication”, Cambridge University Press, 2019.

Reference Books

1. Jerry R. Hampton “Introduction To MIMO Communications”, Cambridge University Press, 2014.
2. Ezio Biglieri, Robert Calderbank “MIMO Wireless Communications”, Cambridge University Press, 2007.
3. E.G. Larsson and P. Stoica, “Space-time block coding for Wireless communications”, Cambridge University Press, 2003.
4. M. Janakiraman, “Space-time codes and MIMO systems”, Artech House, 2004.
5. H. Jafarkhani, “Space-time coding: Theory & Practice”, Cambridge University Press, 2005

Web References

1. https://www.electronics-notes.com/articles/antennas-propagation/mimo/what-is-mimo-multiple-input-multiple-output-wireless-technology.php
2. https://nptel.ac.in/content/syllabus_pdf/117105132.php

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

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

U20CCE822	SOFTWARE DEFINED NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To grasp the fundamentals of software defined networks.
- To learn about open flow specification
- To understand the separation of the data centre
- To study about the SDN Programming.
- To study about the various applications of SDN

Course Outcomes

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

CO1 - Describe the evolution of software defined networks **(K2)**

CO2 - Express the various components of SDN and their uses **(K2)**

CO3 - Design of Data Centre using SDN **(K3)**

CO4 - Design of SDN in various environments **(K3)**

CO5 - Application of SDN in current scenario **(K3)**

UNIT 1 INTRODUCTION (9 Hrs)

Basic Packet-Switching Terminology– Modern Data Center – Traditional Switch Architecture – Autonomous and Dynamic Forwarding Tables– Need of SDN-Evolution of SDN – SDN Working principle – Centralized and Distributed Control and Data Planes

UNIT 2 OPENFLOW AND SDN CONTROLLERS (9 Hrs)

Open Flow Specification – Drawbacks of Open SDN – SDN via APIs – SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – Alternatives Overlap and Ranking

UNIT 3 DATA CENTRES (9 Hrs)

Data Center demands – Tunneling Technologies for the Data Center – Path Technologies in the Data Center – Data Center Concepts and Constructs- Multitenant Data Center, Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT 4 SDN IN OTER ENVIORNMENTS (9 Hrs)

Wide area – Service provider and carrier networks – Campus networks – Hospitality networks – Mobile networks – In-line network functions – Optical networks – Use Cases for Input Traffic Monitoring, Classification, and Triggered Actions.

UNIT 5 EMERGING PROTOCOL, CONTROLLER, AND APPLICATION MODELS (9 Hrs)

Reactive versus Proactive Applications – Open Daylight Controller –Traffic Engineering for Service Providers – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

Text Books

1. Paul Göransson, Chuck Black, Timothy Culver “Software Defined Networks - A Comprehensive Approach”, Morgan Kaufmann publications, 2017.
2. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks, O'Reilly Media, 2013.

Reference Books

1. Siamak Azodolmolky “Software Defined Networking with OpenFlow”,packt publishing, 2013
2. Vivek Tiwari, “SDN and Open Flow for Beginners”, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, “Network Innovation through Open Flow and SDN: Principles and Design”, CRC Press, 2014.

Web References

1. https://www.cisco.com/c/en/us/solutions/software-defined-networking/overview.html
2. https://www.zdnet.com/article/software-defined-networking.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	1	-	3	-	-	-	-	-	-	-	3	2	3
2	3	3	1	-	3	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	3
4	3	2	1	2	3	-	-	-	-	-	-	-	3	2	3
5	3	2	2	2	3	-	-	-	-	-	-	-	3	2	3

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

U20CCE823	INFORMATION SECURITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basics of Information Security
- To select appropriate techniques to tackle and solve problems in the discipline of information security management
- To learn authentication and digital signature concepts
- To become aware of program security
- To know the technological aspects of Network Security

Course Outcomes

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

CO1 - Discuss the basics of information security **(K2)**
CO2 – Illustrate Symmetric Encryption Principles and algorithms **(K3)**
CO3 – Explore authentication and digital signature in information security **(K3)**
CO4 - Describe concepts of program security **(K3)**
CO5 - Design and implementation of Security Techniques in networks **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction - Attacks, Vulnerability, Security Goals, Security Services and mechanisms- Components of an Information System, Securing the Components, Balancing Security and Access

UNIT II CRYPTOGRAPHIC TECHNIQUES (9 Hrs)

Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography- DES, AES, RSA algorithms

UNIT III AUTHENTICATION AND DIGITAL SIGNATURES (9 Hrs)

Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos

UNIT IV PROGRAM SECURITY (9 Hrs)

Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-themiddle attacks, Covert channels

UNIT V SECURITY IN NETWORKS (9 Hrs)

Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME

Text Books

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003.
2. Mark Stamp, Information Security Principles & Practice, WILEY INDIA 2006.
3. Charles P. Pfleeger, “Security in Computing”, Pearson Education.

Reference Books

1. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
2. Information Security Based on ISO27001/ISO 17799: A Management Guide by A Calder, Van Haren Publishing (19 July 2006).
3. Behrouz A. Forouzan, Cryptography & Network Security, TMH 2007.

Web References

1. https://www.csoonline.com/article/3513899/what-is-information-security-definition-principles-and-jobs.html
2. https://www.iso.org/isoiec-27001-information-security.html
3. https://www.bmc.com/blogs/introduction-to-information-security-management-systems-isms/

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

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

U20CCE824	BIGDATA ANALYTICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the competitive advantages of big data analytics.
- To understand the big data frameworks.
- To learn data analysis methods.
- To learn stream computing.
- To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

Course Outcomes

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

CO 1-Understand how to leverage the insights from big data analytics. **(K2)**

CO 2-Understand concepts of Hadoop framework **(K2)**

CO 3-Analyze data by utilizing various statistical approaches. **(K3)**

CO 4-Perform analytics on real-time streaming data and data mining. **(K3)**

CO 5-Understand the various NoSql alternative database models. **(K2)**

UNIT I INTRODUCTION TO BIGDATA (9 Hrs)

Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.

UNIT II HADOOP FRAMEWORK (9 Hrs)

Distributed File Systems - Large-Scale File System Organization – HDFS concepts - Map Reduce Execution, Algorithms using Map Reduce, Matrix-Vector Multiplication – Hadoop YARN.

UNIT III DATA ANALYSIS (9 Hrs)

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

UNIT IV MINING DATA STREAMS (9 Hrs)

Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT V BIG DATA FRAMEWORKS (9 Hrs)

Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts.Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries.

Text Books

4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley and SAS Business Series, 2012.
5. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
6. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, Second Edition, 2007.

Reference Books

6. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
7. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, O‘Reilly Media, 2013.
8. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
9. Bart Baesens“Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Apr 2014
10. Vignesh Prajapati , “Big Data Analytics with. R and Hadoop”,2013

Web References

8. https://www.analyticsvidhya.com/
9. https://www.r-bloggers.com/
10. https://www.ntnu.no/iie/fag/big/lessons/lesson2.pdf
11. https://www.dbs.ifi.lmu.de/Lehre/BigData-Management&Analytics
12. https://www.geeksforgeeks.org/
13. https://hadoop.apache.org/
14. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.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	2	1	2	1	2	1	1	-	1	1	1	1	3	-	3
2	3	2	2	1	3	1	1	-	1	1	1	1	3	-	3
3	3	2	2	1	3	1	1	-	1	1	1	1	3	-	3
4	3	2	2	1	3	1	1	-	1	1	1	1	3	-	3
5	3	2	2	1	3	1	1	-	1	1	1	1	3	-	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	3	3	3	2	2	1	-	-	-	-	-	-	1	3	-
2	3	3	3	2	1	-	-	-	-	-	-	-	1	3	-
3	3	3	3	2	1	-	-	-	-	-	-	-	1	3	-
4	3	3	2	2	1	1	-	-	-	-	-	-	2	1	-
5	3	3	3	2	2	2	2	-	-	-	-	-	3	3	3

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

U20CCE826	MILLIMETER WAVE PERSONAL COMMUNICATION SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand about millimetre wave characteristics
- To learn about of different modulation of mmWave
- To learn about MIMO in mmWave
- To understand about diversity in MIMO
- To learn about Beam steering and Beamforming in Mmwave

Course Outcomes

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

CO1 – Describe about millimetre wave characteristics (K2)
CO2 – Illustrate different modulation of MmWave (K3)
CO3 – Describe MIMO techniques for MmWave (K2)
CO4- Discuss about diversity in MIMO (K2)
CO5 – Demonstrate Beam steering and Beamforming in Mmwave (K2)

UNIT I MILLIMETER WAVE CHARACTERISTICS (9 Hrs)

Introduction – interference - indoor propagation effects - ITU indoor path loss model - link budget. Millimetre wave characteristics, channel performance at 60 GHz, gigabit wireless communications, development of millimetre wave standards, Coexistence with wireless backhaul.

UNIT II MODULATIONS FOR MMW COMMUNICATIONS (9 Hrs)

OOK - PSK - QAM - OFDM, MMW transceivers: Transceiver architecture .MMW antennas: Path loss and antenna directivity - Antenna beam width – Beam steering antenna.

UNIT III MMW MIMO (9 Hrs)

Spatial diversity of antenna arrays - Multiple antennas - Multiple transceivers - Noise coupling in a MIMO system.

UNIT IV DIVERSITY OVER MMW MIMO CHANNELS (9 Hrs)

Potential benefits of advanced diversity for MMW: Spatial and temporal diversity - Spatial and frequency diversity - Dynamic spatial, Frequency and modulation allocation.

UNIT V ADVANCED BEAMSTEERING AND BEAMFORMING (9 Hrs)

The need for beam steering / beamforming. Adaptive Frame Structure, Advanced Beam Steering Technology, Advanced Antenna ID Technology, Advanced Beam Forming Technology.

Text Books

1. Kao-Cheng Huang, Zhoacheng Wang, “Millimeter Wave Communication Systems”, Wiley IEEE press, 2011.
2. K.C. Huang, Z. Wang, "Millimeter Wave Communication Systems", Wiley-IEEE Press, March 2011.
3. Robert W. Heath, Robert C. Daniel, James N. Theodore S. Rappaport, Murdock, "Millimeter Wave Wireless Communication", Prentice Hall, 2014.

Reference Books

1. John S. Seybold “Introduction to RF propagation,” John Wiley and Sons, 2005.
2. Chia-Chin Chong, Kiyoshi Hamaguchi, Peter F. M. Smulders and Su-Khiong, “Millimeter - Wave Wireless Communication Systems: Theory and Applications,” Hindawi Publishing Corporation, 2007.
3. Xiang, W; Zheng, K; Shen, X.S; "5G Mobile Communications: Springer, 2016.

Web References

1. https://www.pearson.com/us/higher-education/program/Rappaport-Millimeter-Wave-Wireless-Communications/PGM19461.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
CO1	3	3	2	1	1	-	-	-	-	-	1	1	1	2	2
CO2	3	3	2	1	1	-	-	-	-	-	1	1	1	2	2
CO3	3	3	2	1	1	-	-	-	-	-	1	1	1	2	2
CO4	3	3	2	1	1	-	-	-	-	-	1	1	1	2	2
CO5	3	3	2	1	1	-	-	-	-	-	1	1	1	2	2

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

U20CCE827	ADVANCED TELECOMMUNICATION NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about next generation opportunities and challenges
- To learn about the services in telecom & cable
- To learn about NG networks and services
- To understand about IMS and convergence
- To learn about ad-hoc and sensor network

Course Outcomes

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

CO1 – Comprehend the concepts of challenges and opportunities in future Telecomm. (K2)
CO2 – Demonstrate about services in telecom & cable. (K2)
CO3 – Summarize about NG Networks and services. (K2)
CO4 – Analyse IMS and convergence management. (K3)
CO5 – Outline management of AD-HOC and Sensor network. (K2)

UNIT I CHANGES, OPPORTUNITIES, AND CHALLENGES (9 Hrs)

Introduction, Changes, Opportunities, and Challenges, Major Management Challenges for a Value-Added Service: Triple Shift Service, The Grand Challenge: System Integration and Interoperability of Disjoined Islands, Examples of Management System Applications

UNIT II MANAGEMENT OF TRIPLE/QUADRUPLE –SERVICES- TELECOM & CABLE (9 Hrs)

Context of Triple/Quadruple Play for Telecom Operators, Economic, Service, and Commercial Challenges, Technical Challenge, Technical Tool Box, Key Issues-Network and IS, CPE and Home N/w, Backbone. HFC Network, Digital TV, Data over Cable Service Interface Specification.

UNIT III ADVANCED TECHNOLOGIES, NETWORKS, AND SERVICES (9 Hrs)

5G Technologies, 5G Networks, 5G Services, Management of 5G Services, 5G Technologies in Society.

UNIT IV IMS AND CONVERGENCE MANAGEMENT (9 Hrs)

IMS Architecture, IMS Services, QoS Control and Authentication, Network and Service Management for NGN, IMS Advantages

UNIT V MANAGEMENT OF WIRELESS AD HOC AND SENSOR NETWORKS (9 Hrs)

Overview, Logical Architectures, Functional and Physical Architectures, Information Architectures – Manager-Agent Communication Models, Management Interfaces and Protocols, Structure of Management Information and Models.

Text Books

1. Thomas Plevyak, Veli Sahin “Next Generation Telecommunications Networks, Services, and Management”, Wiley IEEE Press, 2011.
2. Saadawi Tarek N, “Fundamentals of Telecommunication networks”, John Wiley and Sons Inc, 2015.
3. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, Wiley, 2015.
4. Thiagarajan Viswanathan, “Telecommunication Switching Systems and Networks”, 2015.
5. Lillian Goleniewski, “Telecommunications Essentials”, Second edition, 2006.

Reference Books

1. Hsiao-Hwa Chen, Mohsen Guizani “Next Generation Wireless Systems and Networks”, John Wiley

and Sons, 2006
2. Manohar Naidu Ellanti, Steven Scott Gorshe “Next Generation Transport Networks Data, Management, and Control Planes “,Springer, 2005.
3. Salah Aiidarons, Thomas Plevayk, "Telecommunications Network Technologies and Implementations", Eastern Economy Edition IEEE press, New Delhi, 1998.
4. Lakshmi. G, Raman, "Fundamentals of Telecommunication Network Management", Eastern Economy Edition IEEE Press, New Delhi.
5. Wireless Communications and Networks, 3G and beyond, ITI Saha Misra, TMH.

Web References

1. https://www.digitalmarketplace.service.gov.uk/digital-outcomes-and-specialists/opportunities/10136.

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	-	1	2	1	-	-	3	1	1	1	3	2
CO2	3	3	2	-	1	2	1	-	-	3	1	1	1	3	2
CO3	3	3	2	-	1	2	1	-	-	3	1	1	1	3	2
CO4	3	3	2	-	1	2	1	-	-	3	1	1	1	3	2
CO5	3	3	2	-	1	2	1	-	-	3	1	1	1	3	2

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

U20ADCM01	MOBILE APPLICATION DEVELOPMENT (Common to AIDS and CCE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the system requirements for mobile applications.
- To learn the intricacies of UI required by mobile applications.
- To understand the patterns, libraries and constraints for designing the mobile applications.
- 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 **(K2)**
CO3: Develop design for mobile applications for specific requirements **(K3)**
CO4: Implement the design using Android SDK **(K3)**
CO5: Implement the design using Objective C and IoS **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II BASIC DESIGN (9 Hrs)

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III ADVANCED DESIGN (9 Hrs)

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV ANDROID UI DESIGN (9 Hrs)

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V IOS (9 Hrs)

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

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Text Books

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, Dream Tech, 2012.
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK” Apress, 2013.
3. Greg Milette,Adam Stroud, “Professional Android™ Sensor Programming”, John Wiley and Sons, Inc2012,ISBN/978111265055,9781280678943,978111227459.

Reference Books

1. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012.
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox,2012.
3. Reto Meier, P, “Professional android Development”, Wiley-India Edition, 2012.

Web References

1. https://www.tutorialspoint.com/mobile_development_tutorials.htm
2. https://www.udemy.com/course/learn-android-application-development-y/

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

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

U20CCE829	PATTERN RECOGNITION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To acquire basic knowledge about the pattern recognition and its applications.
- To understand about unsupervised algorithms suitable for pattern classification.
- To familiarize with the feature selection algorithms and methods of implementing them in applications.
- To learn basic fuzzy system and neural network architectures, for applications in pattern recognition, image processing and computer vision.
- To learn about the basis of algorithms used for training and testing the dataset.

Course Outcomes

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

CO1 -Implement basic pattern classifier algorithms. **(K2)**
CO2 -Knowledge about the working principle of unsupervised algorithms. **(K2)**
CO3- Demonstrate about extraction and selection of classifiers. (**K3)**
CO4- Explore advanced methodologies of Fuzzy and Neural networks-based Pattern recognition.(**K3)**
CO5- Apply SVM and HMM algorithms for real time applications. **(K3)**

UNIT I PATTERN CLASSIFIER **(9 Hrs)**

Overview of Pattern Recognition – Discriminant Functions – Supervised Learning – Parametric Estimation – Maximum Likelihood Estimation – Bayes Theorem – Bayesian Belief Network, Naive Bayesian Classifier.

UNIT II CLUSTERING **(9 Hrs)**

Clustering Concept – Hierarchical Clustering Procedures – Partitional Clustering – Clustering of Large Data Sets – EM Algorithm – Grid Based Clustering – Density Based Clustering.

UNIT III FEATURE EXTRACTION AND SELECTION **(9 Hrs)**

Entropy Minimization – Karhunen Loeve Transformation – Feature Selection through Functions Approximation – Binary Feature Selection – K-NN.

UNIT IV FUZZY AND NEURAL NETWORKS **(9 Hrs)**

Fuzzy Classification: Fuzzy Set Theory, Fuzzy and Crisp Classification, Fuzzy Clustering, Fuzzy Pattern Recognition – Introduction to Neural Networks: Elementary Neural Network for Pattern Recognition, Hebbnet, Perceptron, ADALINE, Back Propagation, Convolutional Neural Networks.

UNIT V HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINES **(9 Hrs)**

State Machines – Hidden Markov Models: Maximum Likelihood for the HMM, The Forward and Backward Algorithm, Sum-Product Algorithm for the HMM, Scaling Factors, The Viterbi Algorithm, Extensions of The Hidden Markov Model – Support Vector Machines: Maximum Margin Classifiers, Relevance Vector Machines.

Text Books

1. Christopher M. Bishop, "Pattern recognition and machine learning", Springer, 2nd edition, 2011.
2. R. O. Duda, P. E. Hart, D. G. Stork, “Pattern Classification”, John Wiley, 2001.
3. Robert Schalkoff, “Pattern Recognition: Statistical Structural and Neural Approaches”, John wiley & sons, Inc,1992.
4. Andrew Webb, “Statistical Pattern Recognition”, Arnold publishers, London, 1999.
5. Duda R.O, Hart P.G, “Pattern Classification and scene analysis””, Wiley Edition, 2000.

6. Earl Gose, Richard Johnsonbaugh Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India Pvt Ltd., New Delhi,1999.
7. Freeman J. A., and Skapura B.M, “Neural networks, algorithms, applications and programming techniques”, Addison- Wesley,2003

Reference Books

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
2. M. Narasimha Murthy, V. Susheela Devi, “Pattern Recognition”, Springer 2011.
3. Menahem Friedman, Abraham Kandel, “Introduction to Pattern Recognition Statistical, Structural, Neural and Fuzzy Logic Approaches”, World Scientific publishing Co. Ltd, 2000.
4. Robert J. Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., 1992.
5. S. Theodoridis, K. Koutroumbas, “Pattern Recognition”, Fourth Edition, Academic Press, 2009.

Web References

1. https://nptel.ac.in/courses/117/105/117105101/
2. https://www.ias.ac.in/article/fulltext/sadh/019/02/0189-0238
3. https://www.geeksforgeeks.org/pattern-recognition-introduction/
4. https://www.geeksforgeeks.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
1	3	2	1	-	-	-	-	-	2	2	-	-	2	3	2
2	3	2	1	-	-	-	2	2	-	-	-	1	2	3	2
3	3	2	1	-	-	-	2	2	-	-	-	1	2	3	2
4	3	2	1	-	-	-	2	2	-	-	-	1	2	3	2
5	3	2	1	2	3	-	2	-	-	-	-	1	2	3	2

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

U20ITCM10	BUSINESS INTELLIGENCE (Common to IT and CCE)	L	T	P	C	Hrs
		3	0	0	3	4

Course Objectives

- To learn the fundamentals of business intelligence
- To acquire knowledge in data integration
- To perform multi-dimensional data modelling
- To explore enterprise reporting

Course Outcomes

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

CO1 - Explain the need for Business Intelligence **(K2)**

CO2 - Understand the technology and processes associated with Business Intelligence framework **(K2)**

CO3 - Demonstrate the Data Warehouse implementation methodology and project life cycle **(K3)**

CO4 - Analyze and develop the metrics, indicators and achieve the business goal **(K3)**

CO5 - Design an enterprise dashboard that depicts the key performance indicators which helps in decision making **(K2)**

UNIT I INTRODUCTION TO BUSINESS INTELLIGENCE (9 Hrs)

Why and What is Business Intelligence? -The Information Asset-Exploiting Information-Actionable Knowledge-The Information Asset and Data Valuation-Return on Investment-Applications-OLTP and OLAP-Data warehousing in BI-BI Roles and Responsibilities-The Intelligence Dashboard

UNIT II BUSINESS INTELLIGENCE FRAMEWORK (9 Hrs)

The Business Intelligence Process-System Infrastructure-Information Access, Delivery and Analysis Services-Information Processing and Information Flow-The Information Flow Model-Modelling Frameworks

UNIT III BASICS OF DATA INTEGRATION (9 Hrs)

Data warehouses, OLAP and Metadata-Business Rules-Data Profiling-Data Quality and Information Compliance-Information Integration

UNIT IV MULTI-DIMENSIONAL DATA MODELING (9 Hrs)

Introduction to data and dimension modelling-multidimensional data model-ER Modeling vs. multi-dimensional modelling-concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema- Introduction to business metrics and KPI's- Creating cubes using SSAS.

UNIT V ENTERPRISE REPORTING (9 Hrs)

Introduction to enterprise reporting - Concepts of dashboards, balanced scorecards - Introduction to SSRS Architecture - Enterprise reporting using SSRS.

Text Books

1. David Loshin, Business Intelligence, Morgan Kaufmann, 2nd Edition, 2012.
2. Mike Biere, Business intelligence for the enterprise, Prentice Hall Professional, 2003.

Reference Books

1. Larissa Terpeluk Moss, Shaku Atre, Business intelligence roadmap, Addison-Wesley Professional, 2003.
2. Brain Larson, Delivering business intelligence with Microsoft SQL server 2008, McGraw Hill Professional,2009
3. Cindi Howson, Successful Business Intelligence: Secrets to making Killer BI Applications, McGraw Hill Professional,2007

4. Stephen Few, Information dashboard design, O'Reilly, 2006
5. Lynn Langit, Foundations of SQL Server 2005 Business Intelligence, Apress, 2007

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1. www.wipro.com/documents/resource-center/library/bidw_bilogistics.pdf
2. https://www.coursera.org/courses?query=business%20intelligence
3. https://www.coursera.org/learn/business-intelligence-tools

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

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