SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH. INFORMATION TECHNOLOGY

ACADEMIC REGULATION 2019
(R-2019)

CURRICULUM

COLLEGE VISION AND MISSION

Vision

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

Mission

M1 :	**Quality Education**	:	To provide comprehensive academic system that amalgamates the cutting-edge technologies with best practices
M2 :	**Research and Innovation**	:	To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues
M3:	**Employability and Entrepreneurship**	:	To inculcate the employability and entrepreneurial skills through value and skill-based training
M4 :	**Ethical Values**	:	To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society

DEPARTMENT VISION AND MISSION

Vision

To be a pioneer in the field of Information Technology by achieving academic excellence, involving in research & development and promoting technical & professional expertise

Mission

M1: Expertise: To impart quality education and create excellent engineers with strong analytical, Programming and Problem solving Skills to meet the ever changing demands of IT industry

M2: Eminence: To kindle creative thinking, innovation and foster value-based research in the field of information technology

M3: Complaisant: To enrich the employability skills, inculcate entrepreneurial ideology and promote professional expertise

M4: Exemplar: To instil human values, ethical responsibilities and empowering graduates to be socially responsible and technically competent

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: Fortify

To prepare the students with fundamental knowledge in programming languages and in developing applications.

PEO2: Equip

To develop skill in understanding the complexity in networking, security, data mining, web technology and mobile communication so as to develop innovative applications and projects in these areas for the betterment of society, as well as to enable them to pursue higher education

PEO3: Endow

To enable the students as full-fledged professionals by providing opportunities to enhance their analytical, communication skills and problem solving skills along with organizing abilities

PEO4: Conventional

To familiarize the students with the ethical issues in engineering profession, issues related to the World-wide economy, nurturing of current job related skills and emerging technologies

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO1: Establishment of Mathematical and computer systems concepts

To use mathematical and system concepts to solve multidisciplinary problems using appropriate mathematical analysis, system and programming concepts on various computing environments.

PSO2: Establishment of applications and information concepts

To inculcate good breadth of knowledge to create applications and enhance informatics with cutting edge technologies

PSO3: Establishment of Business, Technological concepts

The ability to interpret and respond to business agility with relevant software tools and skills and provide newer ideas and innovations in information technology research

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

Sl.No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	9
2	Basic Sciences(BS)	38
3	Engineering Sciences (ES)	40
4	Professional Core (PC)	57
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Internship / Project Work	12
8	Employability Enhancement Courses (EEC) **	-
9	Mandatory courses (MC) **	-
Total		**183**

SCHEME OF CREDIT DISTRIBUTION-SUMMARY

Sl.No	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	-	4	-	-	-	3	1	1	9
2	Basic Sciences(BS)	12	16	4	3	3	-	-	-	38
3	Engineering Sciences (ES)	18	10	8	4	-	-	-	-	40
4	Professional Core (PC)	-	-	10	8	12	15	9	3	57
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		**30**	**30**	**22**	**21**	**21**	**21**	**20**	**18**	**183**

***** EEC and MC course Credits 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	T101	Mathematics – I	BS	3	1	0	4	25	75	100
2	T102	Physics	BS	4	0	0	4	25	75	100
3	T103	Chemistry	BS	4	0	0	4	25	75	100
4	T104	Basic Electrical and Electronics Engineering	ES	3	1	0	4	25	75	100
5	T105	Engineering Thermodynamics	ES	3	1	0	4	25	75	100
6	T106	Computer Programming	ES	3	1	0	4	25	75	100
Practical										
7	P101	Computer Programming Laboratory	ES	0	0	3	2	50	50	100
8	P102	Engineering Graphics	ES	2	0	3	2	50	50	100
9	P103	Basic Electrical and Electronics Laboratory	ES	0	0	3	2	50	50	100
							30	**300**	**600**	**900**

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	T107	Mathematics – II	BS	3	1	0	4	25	75	100
2	T108	Material Science	BS	4	0	0	4	25	75	100
3	T109	Environmental Science	BS	4	0	0	4	25	75	100
4	T110	Basic Civil And Mechanical Engineering	ES	4	0	0	4	25	75	100
5	T111	Engineering Mechanics	ES	3	1	0	4	25	75	100
6	T112	Communicative English	HS	4	0	0	4	25	75	100
Practical										
7	P104	Physics Laboratory	BS	0	0	3	2	50	50	100
8	P105	Chemistry Laboratory	BS	0	0	3	2	50	50	100
9	P106	Workshop Practice	ES	0	0	3	2	50	50	100
Mandatory Course										
10	P107	NSS/NCC*	MC	0	0	0	-	-	-	-
							30	**300**	**600**	**900**

To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19ITT31	Numerical Methods	BS	2	2	0	3	25	75	100
2	U19ITT32	Data Structures	ES	3	0	0	3	25	75	100
3	U19ITT33	Digital Design and Microprocessors	ES	3	0	0	3	25	75	100
4	U19ITT34	Database Management Systems	PC	3	0	0	3	25	75	100
5	U19ITT35	Computer Networks	PC	3	0	0	3	25	75	100
6	U19ITT36	Software Engineering and Project Management	PC	3	0	0	3	25	75	100
Practical										
7	U19ITP31	Numerical Methods Using C Laboratory	BS	0	0	2	1	50	50	100
8	U19ITP32	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U19ITP33	Digital Design and Microprocessors Laboratory	ES	0	0	2	1	50	50	100
10	U19ITP34	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U19ITC3X	Certification Course-I **	EEC	0	0	4	-	100	-	100
12	U19ITS31	Skill Development Course1: General Proficiency – I	EEC	0	0	2	-	100	-	100
13	U19ITS32	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U19ITM31	Physical Education	MC	0	0	2	-	100	-	100
							22	800	600	1400

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19ITT41	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U19ITT42	Programming in Java	ES	3	0	0	3	25	75	100
3	U19ITT43	Operating Systems	PC	3	0	0	3	25	75	100
4	U19ITT44	Internet and Web Technology	PC	3	0	0	3	25	75	100
5	U19ITE4X	Professional Elective – I#	PE	3	0	0	3	25	75	100
6	U19XXO4X	Open Elective – I $	OE	3	0	0	3	25	75	100
Practical										
7	U19ITP41	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U19ITP42	Operating Systems Laboratory	PC	0	0	2	1	50	50	100
9	U19ITP43	Web Technology Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19ITC4X	Certification Course-II**	EEC	0	0	4	-	100	-	100
11	U19ITS41	Skill Development Course 3: General Proficiency - II	EEC	0	0	2	-	100	-	100
12	U19ITS42	Skill Development Course 4*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19ITM41	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	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 4) 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	U19ITT51	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U19ITT52	Mobile Computing	PC	3	0	0	3	25	75	100
3	U19ITT53	Data Warehousing and Data Mining	PC	3	0	0	3	25	75	100
4	U19ITT54	Network Security	PC	3	0	0	3	25	75	100
5	U19ITE5X	Professional Elective - II[#]	PE	3	0	0	3	25	75	100
6	U19XXO5X	Open Elective-II[$]	OE	3	0	0	3	25	75	100
Practical										
7	U19ITP51	Mobile Computing Laboratory	PC	0	0	2	1	50	50	100
8	U19ITP52	Data Warehousing and Data Mining Laboratory	PC	0	0	2	1	50	50	100
9	U19ITP53	Network Security Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19ITC5X	Certification Course-III**	EEC	0	0	4	-	100	-	100
11	U19ITS51	Skill Development Course 5: Foreign Language/ IELTS-I	EEC	0	0	2	-	100	-	100
12	U19ITS52	Skill Development Course 6 : Presentation Skills Using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19ITM51	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	700	600	1300

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19ITT61	Artificial Intelligence	PC	3	0	0	3	25	75	100
2	U19ITT62	IoT and Edge Computing	PC	3	0	0	3	25	75	100
3	U19ITT63	Design Thinking	PC	3	0	0	3	25	75	100
4	U19ITT64	Block Chain Technology	PC	3	0	0	3	25	75	100
5	U19ITE6X	Professional Elective - III #	PE	3	0	0	3	25	75	100
6	U19XXO6X	Open Elective – III$	OE	3	0	0	3	25	75	100
Practical										
7	U19ITP61	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
8	U19ITP62	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
9	U19ITP63	Creative Innovative Project Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19ITC6X	Certification Course-IV**	EEC	0	0	4	-	100	-	100
11	U19ITS61	Skill Development Course 7: Foreign Language/ IELTS-II	EEC	0	0	2	-	100	-	100
12	U19ITS62	Skill Development Course 8: Technical Seminar	EEC	2	0	0	-	100	-	100
13	U19ITS63	Skill Development Course 9: NPTEL/MOOC-I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U19ITM61	Professional Ethics	MC	2	0	0	-	100	-	100
							21	800	600	1400

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19ITT71	Cloud Computing	PC	3	0	0	3	25	75	100
2	U19ITT72	Data Science and Analytics	PC	3	0	0	3	25	75	100
3	U19ITE7X	Professional Elective – IV[@]	PE	3	0	0	3	25	75	100
4	U19XXO7X	Open Elective – IV[$]	OE	3	0	0	3	25	75	100
Practical										
5	U19ITP71	Business Basics for Entrepreneurs	HS	0	0	2	1	100	-	100
6	U19ITP72	Cloud Computing Laboratory	PC	0	0	2	1	50	50	100
7	U19ITP73	Data Science Laboratory	PC	0	0	2	1	50	50	100
8	U19ITP74	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U19ITW71	Project Phase – I	PW	0	0	4	2	50	50	100
10	U19ITW72	Internship / Inplant Training	PW	0	0	0	2	100	-	100
							20	500	500	1000

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19ITT81	C # and .Net	PC	3	0	0	3	25	75	100
2	U19ITE8X	Professional Elective – V[@]	PE	3	0	0	3	25	75	100
3	U19ITE8X	Professional Elective – VI[#]	PE	3	0	0	3	25	75	100
Practical										
4	U19ITP81	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U19ITW81	Project Phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U19ITS81	Skill Development Course 10: NPTEL/MOOC-II	EEC	0	0	0	-	100	-	100
							18	315	285	600

ANNEXURE I

PROFESSIONAL ELECTIVE COURSES (18 CREDITS)

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE41	Storage Technologies
2	U19ITE42	Computer Vision
3	U19ITE43	Object Oriented Analysis and Design
4	U19ITE44	Agile Methodologies
5	U19ITE45	Information Coding Techniques
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE51	Software Testing
2	U19ITE52	Data Visualization
3	U19ITE53	Brain Computer Interface and Its Applications
4	U19ITE54	Linux Internals
5	U19ITE55	Automation Techniques and Tools-Dev Ops
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE61	Open Source Software
2	U19ITE62	E-Commerce
3	U19ITE63	Parallel and Distributed Systems
4	U19ITE64	Big Data
5	U19ITE65	Bio inspired Computing
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE71	Machine Learning
2	U19ITE72	Information Management
3	U19ITE73	Robotics Process automation
4	U19ITE74	Wireless sensor network
5	U19ITE75	Green Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE80	Assistive Technology
2	U19ITE81	Business Intelligence
3	U19ITE82	Social Network Analytics
4	U19ITE83	Mixed Reality
5	U19ITE84	Game Development
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U19ITE85	Cyber security
2	U19ITE86	Computer Animation: Algorithms and Techniques
3	U19ITE87	Deep Learning
4	U19ITE88	High Performance Computing
5	U19ITE89	Multimedia Streaming Analytics

ANNEXURE II

OPEN ELECTIVE COURSES (12 CREDITS)

Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U19EEO41	Solar Photovoltaic Fundamentals and Applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics
2	U19EEO42	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, BME, IT, CSE
3	U19ECO41	Engineering Computation with MATLAB	ECE	ICE, EEE, MECH, CIVIL, BME, Mechatronics
4	U19ECO42	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO41	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U19CSO42	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19CSO43	Programming in JAVA	CSE	ECE, MECH, Mechatronics
8	U19ITO41	Database System: Design & Development	IT	EEE, ECE, ICE, BME
9	U19ITO42	R programming	IT	EEE, ECE, ICE, BME, MECH, Mechatronics
10	U19ICO41	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL,CCE, AI&DS, FT
11	U19ICO42	Control System Engineering	ICE	CSE, IT, MECH, CCE, AI&DS
12	U19MEO41	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME
13	U19MEO42	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
14	U19MEO43	Power Plants for Electrical Engineering	MECH	EEE
15	U19CEO41	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, FT
16	U19CEO42	Building Science and Engineering	CIVIL	EEE, MECH, BME
17	U19BMO41	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
18	U19BMO42	Telemedicine	BME	EEE, ECE, CSE, IT, ICE
19	U19CCO41	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19CCO42	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
Open Elective – II / Open Elective – III				
1	U19HSO51 / U19HSO61	Product Development and Design	MBA	**Common to B. Tech**

2	U19HSO52 / U19HSO62	Intellectual Property Rights	MBA	(Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics**)
3	U19HSO53 / U19HSO63	Marketing Management and Research	MBA	
4	U19HSO54 / U19HSO64	Project Management for Engineers	MBA	
5	U19HSO55 / U19HSO65	Finance for Engineers	MBA	
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME**)				
1	U19EEO53 / U19EEO63	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
2	U19EEO54 / U19EEO64	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics
3	U19ECO53 / U19ECO63	Electronic Product Design and Packaging	ECE	CSE, IT, CIVIL,BME,AI&DS
4	U19ECO54 / U19ECO64	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U19CSO54 / U19CSO64	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
6	U19CSO55 / U19CSO65	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
7	U19ITO53 / U19ITO63	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U19ITO54 / U19ITO64	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
9	U19ITO55 / U19ITO65	Data Structures	IT	MECH
10	U19ICO53 / U19ICO63	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME,AI&DS
11	U19ICO54 / U19ICO64	Measurement and Instrumentation	ICE	ECE, Mechatronics
12	U19MEO54 / U19MEO64	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
13	U19MEO55 / U19MEO65	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
14	U19CEO53 / U19CEO63	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME,CCE,AI&DS,FT
15	U19CEO54 / U19CEO64	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
16	U19BMO53 / U19BMO63	Biometric Systems	BME	CSE, IT,MECH, Mechatronics
17	U19BMO54 / U19BMO64	Medical Robotics	BME	CSE, IT, MECH,Mechatronics
18	U19CCO53 / U19CCO63	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
19	U19CCO54 / U19CCO64	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19ADO51 / U19ADO61	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL
21	U19ADO52 / U19ADO62	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics

Open Elective – IV (Offered in Semester VII)				
1	U19EEO75	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U19EEO76	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
3	U19ECO75	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL
4	U19ECO76	Sensors for Industrial Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO76	Artificial Intelligence	CSE	EEE, ICE, CIVIL, MECH
6	U19CSO77	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19ITO76	Automation Techniques & Tools-DevOps	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, BME, Mechatronics
8	U19ITO77	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, BME
9	U19ICO75	Industrial Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, BME, Mechatronics.
10	U19ICO76	Ultrasonic Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U19MEO76	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL
12	U19MEO77	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U19CEO75	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U19CEO76	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
15	U19MCO71	Building Automation	Mechatronics	MECH, CIVIL
16	U19MCO72	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL
17	U19BMO75	Internet of Things for Healthcare	BME	EEE, ECE, ICE
18	U19BMO76	Telehealth Technology	BME	EEE, ECE, ICE
19	U19CCO75	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
20	U19CCO76	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
21	U19ADO73	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics
22	U19ADO74	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME

ANNEXURE III

EMPLOYABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

Sl.No.	Course Code	Course Title
1.	U19ITCX1	Advanced Python Programming
2.	U19ITCX2	Android Programming
3.	U19ITCX3	CCNA – I
4.	U19ITCX4	CCNA - II
5.	U19ITCX5	Edge Computing
6.	U19ITCX6	Hyper Automation
7.	U19ITCX7	Internet of Things
8.	U19ITCX8	Machine Learning
9.	U19ITCX9	Web Programming (HTML, CSS, Javascript)

ANNEXURE IV

EMPLOYABILITY ENHANCEMENT COURSES-(B) SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1.	U19ITS31	SDC 1:General Proficiency – I
2.	U19ITS32	SDC 2*
		1) Object Oriented Programming
		2) Hardware and Troubleshooting
		3) Electronic Devices and Circuits
3.	U19ITS41	SDC 3:General Proficiency - II
4.	U19ITS42	SDC 4:*
		1) Graphic Design
		2) Networking
		3) Communication Engineering
5.	U19ITS51	SDC 5:Foreign Language/ IELTS-I
6.	U19ITS52	SDC 6:Presentation Skills Using ICT
7.	U19ITS61	SDC 7:Foreign Language/ IELTS-II
8.	U19ITS62	SDC 8: Technical Seminar
9.	U19ITS63	SDC 9: NPTEL/MOOC-I
10.	U19ITS81	SDC 10: NPTEL/MOOC-II

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

T101	MATHEMATICS – I (Common to all branches)	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To introduce the idea of applying calculus concepts to problems in Engineering.
- To understand the concept of partial differentiation
- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To introduce mathematical tools to solve first order differential equations.
- To learn linear differential equations of higher order with constant coefficients.

Course Outcomes

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

CO1 – Understand the concept of curvature. **(K2)**
CO2 – Solve different types of partial differential equation. **(K3)**
CO3 – Understand the concept of double and triple integrals. **(K2)**
CO4 – Solve differential equations. **(K3)**
CO5 – Solve higher order differential equations. **(K3)**

UNIT I CALCULUS **(12 Hrs)**

Curvature, radius of curvature, evolutes and involutes.Beta and Gamma functions and their properties.

UNIT II FUNCTIONS OF SEVERAL VARIABLES **(12 Hrs)**

Partial derivatives, Total derivatives, Differentiation of implicit functions, Change of Variables, Jacobians and their properties, Taylor's series for functions of two variables, Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III MULTIPLE INTEGRALS AND APPLICATIONS **(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 IV DIFFERENTIAL EQUATIONS **(12 Hrs)**

Exact equations, First order linear equations, Bernoulli's equation, orthogonal Trajectories, growth, decay and geometrical applications. Equations not of first degree: Equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT V 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, simultaneous linear Differential equations, solution by Variation of parameters method simple application to Electric circuits.

Text Books

1. Venkataraman M.K, Engineering Mathematics-First year, National PublishingCompany, Chennai, 2010
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41stEdition, 2011.

Reference Books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Kandasamy P. et al, Engineering Mathematics, Vol.1 & 2, S. Chand & Co., New Delhi.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi, 8th Edition.
5. Bali N.P and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

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1. https://www.youtube.com/watch?v=rAof9Ld5sOg
2. https://nptel.ac.in/courses/111/104/111104092/
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://www.youtube.com/watch?v=BJ_0FURo9RE

5. https://www.youtube.com/watch?v=p_di4Zn4wz4

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

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

T102	PHYSICS	L	T	P	C	Hrs
		4	0	0	4	45

(Common to all branches)

Course Objectives

- To understand the concepts of physics and its significant contributions in the advancement of technology and invention of new products that dramatically transformed modern-day society.
- To expose the students to different areas of physics which have direct relevance and applications to different Engineering disciplines
- To understand the concepts and applications of Ultrasonics, optics and some optical devices, Lasers and Fiber optics, Nuclear energy sources and wave mechanics

Course Outcomes

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

CO1 - Understand the basic concepts of sound Engineering and ideas to get good audibility inside a hall. Also gain knowledge about the production, propagation, properties and application of ultrasonic waves. **(K2)**

CO2 - Interpret the different characteristic behavior of light waves with air, glass, lens, grating, prism etc., Gain adequate knowledge about the interference, diffraction and polarization phenomenon of light waves and their applications. **(K2)**

CO3 - Understand the principle mechanism of laser light; distinguish between ordinary light and laser light. Basic idea about the various laser sources. Also gain knowledge about the optical fibers and their importance in communication. **(K3)**

CO4 - Understand the basic concept of quantum mechanics, dual nature of matter, and importance of energy of electrons associated with the properties of the materials. Also able to calculate energy of electron in an energy level by solving Schrodinger's equation. **(K1)**

CO5- Gain knowledge about the structure of nucleus its constituents, nature. Understanding the nuclear energy fission and fusion concepts. Basic ideas of nuclear reactors to produce energy. **(K3)**

UNIT I ACOUSTICS & NDT **(9 Hrs)**

Ultrasonics - Ultrasonic Waves Productions (Piezoelectric & Magnetostriction method) – Detections (Acoustic Grating) NDT applications – Ultrasonic Pulse Echo Method - Liquid Penetrant Method

Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine's formula for Reverberation Time – Doppler effect and its application to Radarrs.(elementary ideas)

UNIT II OPTICS **(9 Hrs)**

Interference - Air Wedge – Michelson's Interferometer - Wavelength Determination – Interference Filter – Antireflection Coatings

Diffraction - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating & Prism

Polarisation Basic concepts of Double Refraction - Huygens Theory of Double Refraction- Quarter and Half Wave Plates – Specific Rotary Power – Laurent Half Shade Polarimeter

UNIT III LASERS & FIBER OPTICS **(9 Hrs)**

Lasers - Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – Population Inversion and Laser Action – types of Optical resonators (qualitative ideas) – Types of Lasers - NdYAG, CO_2 laser, GaAs Laser-applications of lasers

Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode)-applications to sensors and Fibre Optic Communication

UNIT IV WAVE MECHANICS **(9 Hrs)**

Matter Waves – de Broglie Wavelength – Uncertainty Principle – Schrödinger Wave Equation – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box – Quantum Mechanical Tunneling – Tunnel Diode.

UNIT V NUCLEAR ENERGY SOURCE **(9 Hrs)**

General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in

fission –Nuclear Reactor: Materials Used in Nuclear Reactors. – PWR – BWR – FBTR. Nuclear fusion reactions for fusion reactors-D-D and D-T reactions, Basic principles of Nuclear Fusion reactors.

Text Books

1. V Rajendran, Engineering Physics, *2nd Edition*, TMH, New Delhi *2011(For units I to IV only)*
2. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008.(For unit V only)

Reference Books

1. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012.
2. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.
3. R. Murugesan, Modern Physics, S. Chand & Co, New Delhi 2006.
4. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008.
5. Science of Engineering Materials, 2nd Edition, C.M. Srivastava and C. Srinivasan, New Age Int. (P) Ltd, New Delhi, 1997.
6. Avadhanulu M N, Engineering Physics, S. Chand & Co, 2009.

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1. https://swayam.gov.in/nd1_noc20_ph15/preview
2. https://swayam.gov.in/nd1_noc20_ph22/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	3	-	-	-	-	-	-	-	2	2	1
2	3	3	2	2	3	-	-	-	-	-	-	-	2	2	1
3	3	3	2	3	3	-	-	-	-	-	-	-	3	2	1
4	3	3	3	3	2	-	-	-	-	-	-	-	1	-	-
5	3	3	3	1	3	-	-	-	-	-	-	-	2	1	2

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

T103 **CHEMISTRY**

L	T	P	C	Hrs
4	0	0	4	45

(Common to all Branches)

Course Objectives

- Know the fundamental principles of Engineering Chemistry required solving engineering problems.
- Practical implementation of fundamental theory concepts.
- Introducing new techniques and latest information that motivates the students to bring out his or her views and work effectively.
- To enable the students understand the role of engineering materials such as polymers, energy production, electrical field basic concepts of material behaviour and study the environmental applications in the field of engineering and technology
- To acquire knowledge of engineering materials and about fuels and batteries

Course Outcomes

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

CO1 - Understand the basic concept of hardness of water, the chemicals responsible for it, measurement of hardness, its disadvantages and its removal. **(K2)**

CO2 - Understand the synthesis of various organic and inorganic polymer **(K3)**

CO3 - Understand the application of the concept of oxidation and reduction reaction to various cells **(K2)**

CO4 - Understand the application of electrochemistry in corrosion of metals and also about different types of corrosion control methods **(K3)**

CO5 - Understand the concept of phase equilibrium and its application to different types of heterogeneous equilibrium system like eutectic alloys. **(K3)**

UNIT I WATER **(9 Hrs)**

Hardness of water- units and calcium carbonate equivalent. Determination of hardness of water- EDTA method. Disadvantages of hard water –boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion. Water softening methods– internal & external conditioning–Lime-Soda process, Zeolite process and Ion-exchange process. Desalination–reverse osmosis & electro dialysis.

UNIT II POLYMER **(9 Hrs)**

Classification, types of polymerization reactions – mechanism of radical, ionic and Ziegler- Natta polymerizations. Polymer properties –chemical resistance, crystallinity and effect of temperature, Mn and Mw. Thermoplastics and thermosets. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, Polyurithane, Rubbers–vulcanization, synthetic rubber, BuNa-S, BuNa-N, silicone and butyl rubber. Conducting polymers–classification and applications. Polymer composites–FRP–laminar composites. Moulding constituents of plastic, moulding techniques–compression, injection, transfer and extrusion moulding.

UNIT III ELECTROCHEMICAL CELLS **(9 Hrs)**

Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes–hydrogen, calomel, Ag/AgCl & glass electrodes. Batteries– primary and secondary cells, Leclanche cell, Lead acid storage cell, Ni-Cd battery & alkaline battery. Fuel cells–H_2-O_2 fuel cell.

UNIT IV CORROSION AND ITS CONTROL **(9 Hrs)**

Chemical & electro chemical corrosion–Galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion – corrosion control methods – cathodic protection and corrosion inhibitors. Protective coating–types of protective coatings– metallic coating–tinning and galvanizing, cladding, electroplating and anodizing

UNIT V PHASE RULE **(9 Hrs)**

Definition and derivation of phase rule. Application to one component system– water and sulfur systems. Thermal analysis, condensed phase rule. Two component systems– Pb-Ag, Cu-Ni, and Mg-Zn systems.

Text Books

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai and Sons, New Delhi 15th Ed, 2010.
2. B.Sivasankar (2008) , "Engineering Chemistry ", Tata McGraw Hill , India
3. Shaley Oberoi & Monica Malik (2009), "Engineering Chemistry made easy", Cengage Learning, Delhi.
4. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. (2016)
5. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015

Reference Books

1. S. S. Dara, A Textbook of Engineering Chemistry, 11th Ed, S.Chand& Co., Ltd. New Delhi, 2008.
2. B. K. Sharma, Engineering Chemistry, 3rdedition Krishna Prakashan Media (P) Ltd., Meerut, 2001.
3. P. Kannan and A. Ravi Krishnan "Engineering Chemistry" Hi-Tech Sri Krishna Publications, Chennai, 9th Ed, 2009
4. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, 2ndEd. PHI Learning PVT., LTD, New Delhi, 2008
5. C.V.Agarwal , C.P.Naidu , "A text book of Engineering Chemistry", BS Publication , Hyderabad.

Web References

1. https://water.usgs.gov/edu/hardness.html
2. https://www.polymer-project.org/
3. www.materials.unsw.edu.au/tutorials/online-tutorials/corrosion
4. www.electrochem.org/redcat-blog/4-useful-electrochemistry-websites-2/
5. https://serc.carleton.edu/research_education/equilibria/phaserule.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	2	1	-	-	-	1	1	-	-	-	-	1	2	2	1
2	2	1	-	-	-	1	1	-	-	-	-	1	2	2	1
3	2	1	-	-	-	1	1	-	-	-	-	1	3	2	1
4	2	1	-	-	-	1	1	-	-	-	-	1	1	-	-
5	2	1	-	-	-	1	1	-	-	-	-	1	2	1	2

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

T104	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to all branches)	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To understand and gain basic knowledge about magnetic and electrical circuits
- To gain basic knowledge about single phase and three phase power measurement
- To understand the operating principles of stationary and rotating machines
- To understand the characteristics and applications of semiconductor devices
- To provide the basic knowledge in Digital electronics
- 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 - Analyze the basic concepts, various laws and theorems used in DC circuits. **(K3)**

CO2 - Analyze and solve the AC circuits and develop resonance circuits for transmitter and receiver. **(K4)**

CO3 - Gain the knowledge of power production in power system and application of transformers and motors in real time. **(K2)**

CO4 - Understand the operations of semiconductor diode, BJT, FET and its applications. **(K2)**

CO5 - Summarize the digital electronics concepts for sequential and combinational circuits. **(K2)**

CO6 - Explain and Relate different Communication Systems. **(K2)**

PART A – ELECTRICAL

UNIT I DC CIRCUITS **(10 Hrs)**

Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Division of current in Series & parallel circuits - star/delta conversion - Node and mesh methods of analysis of DC circuits

UNIT II AC CIRCUITS **(10 Hrs)**

Concepts of AC circuits – rms value, average value, form and peak factors – Simple RLC series circuits – Concept of real and reactive power – Power factor - Introduction to three phase system - Power measurement by two wattmeter method.

UNIT III ELECTRICAL MACHINES AND POWER PLANTS **(10 Hrs)**

Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer and single phase induction motor (Qualitative approach only) - Simple layout of thermal and hydro generation (block diagram approach only).Fundamentals of fuses and circuit breakers.

PART B – ELECTRONICS

UNIT IV ELECTRONIC CIRCUITS **(10 Hrs)**

V-I Characteristics of diode - Half-wave rectifier and Full-wave rectifier – with and without capacitor filter - Transistor - Construction & working - Input and output characteristics of CB and CE configuration - Transistor as an Amplifier - Principle and working of Hartley oscillator and RC phase shift oscillator - Construction and working of JFET & MOSFET.

UNIT V DIGITAL ELECTRONICS **(10 Hrs)**

Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem - Logic gates -Implementation of Boolean expressions - Flip flops - RS, JK, T and D. Combinational logic - Half adder, Full adder and Subtractors. Sequential logic - Ripple counters and shift registers.

UNIT VI COMMUNICATION AND COMPUTER SYSTEMS **(10 Hrs)**

Model of communication system - Analog and digital - Wired and wireless channel. Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system. Network model - PAN, LAN, MAN and WAN - Circuit and packet switching - Overview of ISDN.

Text Books

1. Kothari D P and Nagrath I J , Basic Electrical Engineering, Tata McGraw Hill,2009.(For Units I to III)
2. Rajendra Prasad, "Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition,

2011. (For Unit IV)
3. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008. (For Unit V)
4. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Sixth Edition, Pearson Education, 2004. (For Unit VI)

Reference Books

1. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004.
2. J.B.Gupta, A Course in Electrical Power, Katson Publishing House, New Delhi, 1993.
3. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, Fourth Edition, 2008
4. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications," 6th edition,Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008.
5. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, Dhanpat Rai & Co, 2013.
6. Jacob Millman and Christos C. Halkias, "Electronic Devices and Circuits" Tata McGraw Hill
7. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Private Limited, Ninth Edition, 2008
8. M.S.Sukija and T.K.Nagasarkar, "Basic electrical and Electronics Engineering", Oxford University Press, 2012.

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1. https://nptel.ac.in/courses/108/108/108108076/
2. https://www.electrical4u.com/
3. https://nptel.ac.in/courses/108/102/108102146/
4. http://electrical-engineering-portal.com/
5. http://www.electronics-tutorials.ws
6. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
7. https://nptel.ac.in/courses/117/102/117102059/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	3	-	-	-	-	-	-	-	1	-	-
2	3	3	2	2	3	-	-	-	-	-	-	-	1	-	-
3	3	3	2	2	3	-	-	-	-	-	-	-	1	-	-
4	3	1	2	2	-	-	-	-	-	-	-	-	1	-	-
5	3	2	2	2	-	-	-	-	-	-	-	-	1	2	-
6	3	-	2	-	-	-	-	-	-	-	-	-	2	2	-

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

T105	ENGINEERING THERMODYNAMICS (Common to all branches)	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To understand the basics of the thermodynamic principles
- To establish the relationship of these principles to thermal system behaviors
- To develop methodologies for predicting the system behavior
- To establish the importance of laws of thermodynamics applied to energy systems
- To explain the role of refrigeration and heat pump as energy systems and develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world

Course Outcomes

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

CO1- Understand the fundamental thermodynamic concepts and its basic laws. **(K2)**

CO2 - Apply first law of thermodynamics concepts to calculate the system work for closed and open systems. **(K3)**

CO3 - Apply Second Law of Thermodynamics and entropy concepts to evaluate the performance of heat engine, heat pump and refrigerator.**(K3)**

CO4 - Apply the principles of gas power cycles to calculate its thermal performance. **(K3)**

CO5 - Understand the basic working principle of refrigeration systems.**(K2)**

UNIT I BASIC CONCEPTS AND DEFINITIONS **(12 Hrs)**

Energy conversion and efficiencies - system, property and state – Thermal equilibrium – Temperature – Zeroth law of Thermodynamics – Pure substance – P, V and T diagrams – Thermodynamic diagrams.

UNIT II FIRST LAW OF THERMODYNAMICS **(12 Hrs)**

The concept of work and adiabatic process – First law of thermodynamics – conservation of Energy Principle for closed and open systems – Calculation of work for different processes of expansion of gases

UNIT III SECOND LAW OF THERMODYNAMICS **(12 Hrs)**

Equilibrium and the second law – Heat engines – Kelvin-Plank statement of second law of thermodynamics – Reversible and irreversible processes – Carnot principle – Clausius inequality – Entropy

UNIT IV GAS POWER CYCLES **(12 Hrs)**

Air standard cycles: The air standard carnot cycle – Air standard Otto cycle, Diesel cycle, Dual cycle and Brayton cycles and their efficiencies

UNIT V REFRIGERATION CYCLES AND SYSTEMS **(12 Hrs)**

Reverse Carnot cycle – COP – Vapor compression refrigeration cycle and systems (only theory) – Gas refrigeration cycle – Absorption refrigeration system – Liquefaction – Solidification (only theory).

Text Books

1. P.K.Nag, "Engineering Thermodynamics", 4th edition, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2008.
2. R. K. Singal, Mridul Singal "A text book of Engineering Thermodynamics", I.K. International Publishing House Pvt. Limited, 2010.
3. Er.S.K.Gupta, "Engineering Thermodynamics", S. Chand publishers, 2013.

Reference Books

1. Arora, C.P., "Thermodynamics", Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2010.
2. Burghardt, M.D., "Engineering Thermodynamics with Applications", 4th edition, Harper & Row, N.Y., 2009.
3. Huang, F.F., "Engineering Thermodynamics" 2nd edition, Macmillan Publishing Co. Ltd., N.Y., 2011.

4. Cengel, Y.A. and Boles, M.A., "Thermodynamics – An Engineering approach", 5th edition, Mc Graw Hill, 2008.
5. Wark, K., "Thermodynamics", 4th edition Mc-Graw Hill, N.Y., 2009.

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1. https://nptel.ac.in/courses/112105266/
2. https://nptel.ac.in/courses/112108148/
3. https://nptel.ac.in/courses/112/103/112103275/
4. https://www.linkedin.com/company/heat-transfer-and-process-design-htpd
5. https://www.udemy.com/course/an-introduction-to-heat-transfer/

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

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

T106	COMPUTER PROGRAMMING	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.
- To study the basic concepts of File operations.

Course Outcomes

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

CO1: Identify and understand the working components of a computer system. **(K2)**

CO2: Understand, analyze and implement like algorithm, pseudo codes and programming structures. **(K2)**

CO3: Analyze and make use of logical structure of a C program. **(K3)**

CO4: Make use of pointers, memory allocation and data handling to implement C programs. **(K3)**

CO5: Understand the working of files and directives. **(K3)**

UNIT I INTRODUCTION TO COMPUTERS **(12 Hrs)**

History of Computers – Block diagram of a Computer – Components of a Computer system –Classification of computers - Hardware – Software – Categories of Software – Operating System – Applications of Computers – Network structure – Internet and its services – Intranet – Study of word processor – Preparation of worksheets.

UNIT II INTRODUCTION TO C **(12 Hrs)**

Problem solving techniques – Program – Program development cycle – Algorithm design– Flowchart - Pseudo code. Introduction to C – History of C – Importance of C - C tokens – data types – Operators and expressions – I/O functions.

UNIT III DECISION MAKING AND ARRAYS **(12 Hrs)**

Decision making statements – branching and looping – arrays – multidimensional arrays– Functions – Recursion – Passing array to functions. Storage classes – Strings – String library functions.

UNIT IV STRUCTURES AND POINTERS **(12 Hrs)**

Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types – Union. Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and Structures.

UNIT V FILE MANAGEMENT AND PREPROCESSORS **(12 Hrs)**

Files – operations on a file – Random access to files – command line arguments. Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy, E, "Programming in ANSI C", Tata McGraw Hill, Sixth edition, 2012.
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Kenneth A. Reek, "Pointers on C", Pearson Education, 2007.

Reference Book

1. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
5. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007.

Web References

1. https://www.geeksforgeeks.org/classification-of-computers/
2. http://www.btechsmartclass.com/c_programming/C-Program-Development-Life-Cycle.html
3. https://www.learn-c.org/en/Multidimensional_Arrays
4. https://www.tutorialspoint.com/cprogramming/c_structures.htm
5. https://www.w3schools.in/c-tutorial/command-line-arguments/

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

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

P101	COMPUTER PROGRAMMING LABORATORY	L	T	P	C	Hrs
		0	0	3	2	30

Course Objectives

- To study and understand the use of OS commands
- To gain a hands on experience of compilation and execution of 'C' programs
- To understand the working of control statements
- To design functional methods.
- To make use pointers in various programs

Course Outcomes

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

CO1 - Apply and practice logical ability to solve the problems. **(K6)**

CO2 - Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs. **(K3)**

CO3 - Understand and apply the in-built functions and customized functions for solving the problems. **(K2)**

CO4 - Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems. **(K2)**

CO5 - Document and present the algorithm's, flowcharts and programs in form of user-manuals. **(K2)**

List of Exercises

1. Study of OS Commands
2. Write a simple C program to find the Area of the triangle.
3. Write a simple C program to find the total and average percentage obtained by a student for 6 subjects.
4. Write a simple C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units
   for an input of 172.
5. Write a simple C program to check whether a given character is vowel or not using Switch – Case statement.
6. Write a simple C program to print the numbers from 1 to 10 along with their squares.
7. Write a simple C program to find the sum of 'n' numbers using for, do – while statements.
8. Write a simple C program to find the factorial of a given number using Functions.
9. Write a simple C program to swap two numbers using call by value and call by reference.
10. Write a simple C program to find the smallest and largest element in an array.
11. Write a simple C program to perform matrix multiplication.
12. Write a simple C program to demonstrate the usage of Local and Global variables.
13. Write a simple C program to perform various string handling functions: strlen, strcpy, strcat, strcmp.
14. Write a simple C program to remove all characters in a string except alphabets.
15. Write a simple C program to find the sum of an integer array using pointers.
16. Write a simple C program to find the Maximum element in an integer array using pointers.
17. Write a simple C program to create student details using Structures.
18. Write a simple C program to display the contents of the file on the monitor screen.
19. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
20. Write a simple C program to pass the parameter using command line arguments.

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Sixth edition, 2012.
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Kenneth A. Reek, "Pointers on C", Pearson Education, 2007.

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1. VikasVerma, "A Workbook on C ", Cengage Learning, SecondEdition,2012
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007
5. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007

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1. https://www.javatpoint.com/factorial-program-in-c
2. https://www.studytonight.com/c/programs/array/largest-and-smallest-element-in-array
3. https://www.programiz.com/c-programming/examples/information-structure-array
4. https://www.geeksforgeeks.org/c-program-print-contents-file/
5. https://www.studytonight.com/c/command-line-argument.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	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

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

P102 **ENGINEERING GRAPHICS** (Common to all branches)

L	T	P	C	Hrs
2	0	3	2	60

Course Objectives

- To convey the basics of engineering drawing
- To explain the importance of an engineering drawing
- To teach different methods of making the drawing
- To establish the importance of projects and developments mode in drawing that are used in real systems
- To develop the role of computer aided design Auto Cad and significance of using these drawings

Course Outcomes

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

CO1 - Understand the basic concepts of engineering drawings. **(K2)**

CO2 - Apply various concepts like dimensioning, conventions and BIS codes, the theory and methods of projection. **(K3)**

CO3 - Improve their imagination and visualization skills to design new products. **(K4)**

CO4 - Create engineering drawing of physical object representing engineering systems. **(K4)**

CO5 - Analysis the different views and computer aided drafting tools. **(K3)**

UNIT I **(12 Hrs)**

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes

UNIT II **(12 Hrs)**

Projection of Solids and Sections of solids.

UNIT III **(12 Hrs)**

Development of surfaces – Intersection of surfaces (Cylinder-Cylinder, cylinder-cone)

UNIT IV **(12 Hrs)**

Isometric projections and Orthographic projections

UNIT V **(12 Hrs)**

Computer Aided Drafting: Introduction to computer Aided Drafting hardware- overview of application software – 2D drafting commands (Auto CAD) for simple shapes – Dimensioning.

Text Books

1. K.R. Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.
2. Dhananjayan A. Jolhe, Engineering Drawing with introduction to Autocad, Tata McGrawHill Publishing company Limited, 2008.
3. Basant Agrwal and Agarwal C W., Engineering Drawing, Tata Tata McGrawHill Publishing company limited, 2008.

Reference Books

1. N.D. Bhatt, Engineering Drawing, 49th edition, Chorotar Publishing House, 2006.
2. K. Venugopal, Engineering Drawing and Graphics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004.
3. David I cook and Robert N Mc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int., 1989.
5. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
6. BIS, Engineering Drawing practice for Schools & Colleges, 1992.

Web References

1. http://nptel.ac.in/courses/112103019
2. https://en.wikipedia.org/wiki/Engineering drawing
3. https://nptel.ac.in/courses/105/104/105104148/
4. https://onlinecourses.nptel.ac.in/noc20_me79/preview
5. https://www.btechguru.com/courses--nptel--engineering-drawing----video-lecture.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	1	-	-	3	-	-	-	-	-	-	3	1	-	-
2	3	1	-	-	3	-	-	-	-	-	-	3	1	-	-
3	3	1	-	-	3	-	-	-	-	-	-	3	1	-	-
4	3	1	-	-	3	-	-	-	-	-	-	3	1	-	-
5	3	1	-	-	3	-	-	-	-	-	-	3	1	-	-

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

P103	BASIC ELECTRICAL AND ELECTRONICS LABORATORY (Common to all branches)	L	T	P	C	Hrs
		0	0	3	2	45

Course Objectives

- To get an exposure on the basic electrical tools, applications and precautions
- To gain training on different types of wiring used in domestic and industrial applications.
- To detect and find faults in electrical lamp and ceiling fan
- To get an exposure on the measurements of voltage and phase using CRO, basic operation and applications devices such as PN junction diode and transistor
- To gain a practical knowledge on the functions and application of basic logic gates and flip flops

Course Outcomes

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

CO1 - Follow the safety procedures when working with electricity and various tools. **(K4)**
CO2 - Do line diagram and wiring practices for domestic application. **(K5)**
CO3 - Use the protection circuits for electrical networks. **(K3)**
CO4 - Design and verify the kirchoff's law. **(K4)**
CO5 - Analyze the characteristics of PN diode and use it for rectifier applications. **(K4)**
CO6 - Gain knowledge on digital electronics to solve problems related to boolean algebra. **(K4)**

ELECTRICAL LAB

List of Experiments

1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor's room wiring.
6. Bed room wiring.
7. Go down wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses, circuits breakers and A.C and D.C meters.

ELECTRONICS LAB

List of Experiments

1. Study of CRO
   (a) Measurement of AC and DC voltages
   (b) Frequency and phase measurements (using Lissajou's figures)
2. Verification of Kirchoff's Voltage and Current Laws
   Determine the voltage and current in given circuits using Kirchoff's laws theoretically and verify the laws experimentally.
3. Characteristics and applications of PN junction diode.
   Forward and Reverse characteristics of PN junction diode.
   Application of Diode as Half wave Rectifier – Measurement of ripple factor with and without capacitor filter
4. Frequency Response of RC Coupled Amplifiers
   Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.
5. Study of Logic Gates
   (a) Verification of Demorgan's theorems
   (b) Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D
   (c) Implementation of digital functions using logic gates and Universal gates.

Reference Books

1. Kothari D P and Nagrath I J, Basic Electrical Engineering, Tata McGraw Hill, 2009.
2. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004
3. Sudhakar and S. P. Shyam Mohan, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th Edition, 2010.
4. Rajendra Prasad, "Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition, 2011.
5. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications," 6th edition, Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008
6. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008
7. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, "Electrical and Electronics Technology", Pearson Education Limited, New Delhi, 10th Edition, 2010.

Web References

1. https://www.electrical4u.com/
2. https://www.allaboutcircuits.com/
3. https://www.circuitlab.com/
4. http://www.electronics-tutorials.ws
5. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
6. https://nptel.ac.in/courses/117/102/117102059/

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	-	-	-	-	-	-
2	3	3	3	3	3	-	-	-	3	-	-	-	1	-	-
3	3	3	2	3	3	-	-	-	3	-	-	-	1	-	-
4	3	3	2	3	2	-	-	-	3	-	-	-	2	1	-
5	3	3	2	3	2	-	-	-	3	-	-	-	1	1	-
6	3	3	2	3	2	-	-	-	3	-	-	-	2	2	-

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

	MATHEMATICS – II	L	T	P	C	Hrs
T107	(Common to all branches)	3	1	0	4	60

Course Objectives

- To familiarize the concept of matrices.
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus
- To equip themselves familiar with Laplace transform
- To solve the differential equations using Inverse Laplace transform techniques.
- To gain good knowledge in application of Fourier transform.

Course Outcomes

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

CO1 – Understand the concept of Eigen values and Eigen vectors, Diagonalization of a matrix. **(K2)**
CO2 – Understand the use of vector calculus. **(K2)**
CO3 – Apply Laplace transform of simple function. **(K3)**
CO4 – Apply inverse Laplace transform of simple functions. **(K3)**
CO5 – Compute Fourier transforms of various functions. **(K3)**

UNIT I MATRICES **(12 Hrs)**

Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigenvectors. Cayley-Hamilton Theorem, Diagonalization of matrices.Reduction of a quadratic form to canonical form by orthogonal transformation.Nature of quadratic forms.

UNIT II VECTOR CALCULUS **(12 Hrs)**

Gradient, divergence and curl, their properties and relations.Gauss divergence theorem and Stoke's theorem (without proof).Simple application problems.

UNIT III LAPLACE TRANSFORMS **(12 Hrs)**

Definition, Transforms of elementary functions, properties. Transform ofderivatives and Integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and Final value theorems.

UNIT IV APPLICATIONS OF LAPLACE TRANSFORM **(12 Hrs)**

Methods for determining inverse Laplace Transforms, convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT V FOURIER TRANSFORMS **(12 Hrs)**

Fourier Integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms their properties, convolution and Parseval's identity.

Text books

1. Venkataraman M.K., Engineering Mathematics, National Publishing Company, Chennai, 2012
2. Kandasamy P. et al, Engineering Mathematics, Vol.2 & 3, S. Chand & Co., New Delhi.

Reference books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 1st Edition, 2011.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig Advanced Engineering Mathematics, John Wiley & Sons, New Delhi.
5. Bali N. and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

Web References

1. https://www.youtube.com/watch?v=1wjXVdwzgX8
2. http://www.snggdcg.ac.in/pdf/study-material/mathematics/SMch18.pdf
3. https://www.youtube.com/watch?v=MLSfh33ZCwE
4. https://www.khanacademy.org/math/differential-equations/laplace-transform/convolution-integral/v/the-convolution-and-the-laplace-transform

5. http://www-users.math.umn.edu/~mille003/fouriertransform.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	3	-	1
2	2	1	-	-	-	1	1	-	-	-	-	1	3	-	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	-	1
4	3	2	1	1	-	1	-	-	-	-	-	1	3	-	1
5	3	2	1	1	-	1	-	-	-	-	-	1	3	-	1

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

		L	T	P	C	Hrs
T108	**MATERIAL SCIENCE** (Common to all Branches)	4	0	0	3	45

Course Objectives

- To understand the importance of Material Science as a subject that revolutionized modern day technologies
- To understand the significance of material science in the development of new materials and devices for all branches of Engineering
- To impart knowledge to the Engineering students about some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology

Course Outcomes

After completion of the course, students will be able to

CO1 - Identify crystal lattices and their structures, crystalline planes and directions in a crystal lattice in terms of Miller Indices. To interpret X-ray diffraction studies and different types of lattice defects and their impact. **(K2)**

CO2 -To identify the nature of polarization in a dielectric material and to explain the various dielectric material and their characterization. **(K2)**

CO3 - Understand the source of a materials magnetic behaviour and be able to distinguish types of magnetism. Having Basic idea about the read/ write mechanism of various magnetic storage devices.**(K3)**

CO4 - Differentiate semiconductors; calculate the intrinsic carrier concentration in semiconductors.Understand the phenomenon of superconductivity: Student is able to define basic properties of superconducting materials and identify potential areas of their applications. **(K1)**

CO5 - Able to differentiate between nanomaterials and conventional materials. Have a broad understanding of the techniques used to synthesize nanomaterials, evaluate the properties of nanomaterials, identify the role of nanomaterials in current nanotechnology revolution, and be prepared for more advanced courses in Materials Science and Engineering. **(K3)**

UNIT I CRYSTAL STRUCTURE AND LATTICE DEFECTS **(9 Hrs)**

Crystal structure - Bravais Lattices, Crystal Systems — Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices- Powder X Ray Diffraction Method Lattice defects – Qualitative ideas of point, line, surface and volume defects

UNIT II – DIELECTRIC PROPERTIES **(9 Hrs)**

Dielectric Polarization and Mechanism –Temperature dependence of polarization, Internal or local Field-Clausius-Mossotti relation. Basic ideas of Dielectric loss - frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and Applications

UNIT III – MAGNETIC PROPERTIES **(9 Hrs)**

Origin of atomic magnetic moment – Bohr magneton-Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro, antiferro & Ferri). – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis – Heisenberg Theory of Exchange Interaction (without derivation) – Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic data storage – Magnetic tapes, Hard disks, Magneto optical recording

UNIT IV – SEMICONDUCTORS AND SUPERCONDUCTORS **(9 Hrs)**

Semiconductors -Derivation of Carrier concentration in intrinsic Semiconductors –Basic ideas of Electrical conductivity in intrinsic and extrinsic semiconductors (without derivations) -temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors -- Application of Hall Effect, Basic Ideas of Compound Semiconductors (II-VI & III-V)

Superconductivity - Basic concepts – transition temperature – Meissener effect – Type I and II superconductors – high temperature superconductors – 123 superconductor – Applications of superconductors.

UNIT V – ADVANCED MATERIALS (9 Hrs)

Liquid Crystals – Types – Application as Display Devices Metallic Glasses – preparation by melt spinning. Twin roller system, properties and applications. Shape Memory alloys (SMA), Shape memory effect, Properties and applications of SMA. Nanomaterials- Nano materials (one, Two & three Dimensional) –Methods of synthesis (PVD, CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nano materials. Carbon nanotubes– Properties and applications.

Text books

1. V Rajendran, Engineering Physics, *2nd Edition*, TMH, New Delhi *2011*.

Reference Books

1. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
2. William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
3. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & sons, Singapore, 2007.
4. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.
5. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and James Murday, Text book of Nanoscience and Nanotechnology, Universities Press, Hyderabad 2012
6. M.N. Avadhanulu, Enginerring Physics- Volume-II, S.Chand &Co, New Delhi, 2009
7. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.

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1. https://swayam.gov.in/nd1_noc20_ph15/preview
2. https://swayam.gov.in/nd1_noc20_ph22/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	1	2	3	1	1	1	2	3	3	1	2	1
2	3	3	3	1	2	3	1	1	1	2	1	3	2	2	1
3	3	3	3	1	3	3	2	1	1	2	1	3	3	2	2
4	3	3	3	1	3	3	2	1	1	2	2	3	2	1	-
5	3	1	3	1	3	3	2	1	1	2	3	3	2	1	2

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

T109	ENVIRONMENTAL SCIENCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To know about the environment
- To understand about environmental pollution
- To apply the knowledge in understanding various environmental issues and problems

Course Outcomes

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

CO1 - Understand the various environmental segments, its significance to life, also about various natural resources, effects of over utilization and its protection which can lead to sustainable development. **(K2)**

CO2 - Understand the study of ecology of various systems of nature and also about the diverse species present and its protection. **(K3)**

CO3 - Understand various sources of air pollution, the scientific basis behind it and its effect on nature. **(K2)**

CO4 - Understand the various ways of water pollution, its sources and effects, different water pollution monitoring technique, treatment of waste water and also the effects of solid waste and its management. **(K3)**

CO5 - Understand the concept of spectroscopy and its application to monitor pollution. **(K3)**

UNIT I ENVIRONMENT AND ENERGY RESOURCES **(9 Hrs)**

Environmental segments – atmosphere, hydrosphere, lithosphere and biosphere. Atmospheric layers - Pollution definition and classification. Pollutants classification-Forest resources – use and over exploitation, deforestation, forest management. Water resources – use and conflicts over water, dams – benefits and problems. Mineral resources – mineral wealth of India, environmental effects of extracting and using mineral resources. Food resources – world food problems, environmental impact of modern Agriculture – fertilizer and pesticides. Energy resources – growing needs, renewable and non-renewable energy resources and use of alternate energy sources. From unsustainable to sustainable development.

UNIT II ECOSYSTEM AND BIODIVERSITY **(9 Hrs)**

Concept of an ecosystem - structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic (fresh water, esturine and marine) ecosystems. Biodiversity – definition, genetic species and ecosystem diversity. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, human wildlife conflicts. Endangered and endemic species. Conservation of biodiversity – in-situ and ex-situ conservation of biodiversity.

UNIT III AIR POLLUTION **(9 Hrs)**

Definition and classification. Chemical and photochemical reaction in different layers of atmosphere. Causes, sources, effects and control measures of air pollutants - oxides of Nitrogen, oxides of Carbon, oxides of Sulfur, hydrocarbons, chloro-fluoro carbons and particulates. Mechanism and effects of air pollution phenomenon – Global Warming, Ozone Depletion, Acid Rain, Sulfurous Smog and Photochemical Smog.

UNIT IV WATER AND LAND POLLUTION **(9 Hrs)**

Water pollution – causes and effects of organic water pollutants – pesticides, insecticides, detergents and surfactants.Causes and effects of inorganic water pollutants – heavy metal pollution due to Hg, Pb, Cr & Cu. Water pollution control and monitoring – DO, COD, BOD & TOC. Land Pollution – Solid waste management – causes, effect and control measures of urban and industrial wastes. Thermal and radioactive pollution.

UNIT V POLLUTION CONTROL AND MONITORING **(9 Hrs)**

Basic concepts and instrumentation of IR, UV-VIS, atomic absorption spectrometry, Gas Chromatography and Conductometry.Analysis of air pollutants – NO_x, CO_x, SO_x, H_2S, Hydrocarbons and particulates.

Text Books

1. PK. De, "Environmental chemistry" 7th Ed; New age international (P) Ltd, New Delhi, 2010.
2. K. RaghavanNambiar, "Text Book of Environmental Studies" 2nd Ed, Scitech Publications (India) Pvt Ltd, India, 2010.

3. G. S. Sodhi, Fundamental concepts of environmental chemistry, I Ed, Alpha Science International Ltd, India, 2000.
4. Essentials of Ecology and Environmental Science, S. V. S. Rana , PHI learning, 2009
5. Basics of Environmental Science and Engineering, Sivashanmugam, P., new publishing book house, 2007

Reference Books

1. B.K. Sharma, "Environmental chemistry" 11th Ed, KRISHNA Prakashan Media (P) Ltd, Meerut, 2007.
2. S.S.Dara, and D.D. Mishra "A text book of environmental chemistry and pollution control, 5th Ed, S.Chandand Company Ltd, New Delhi, 2012.
3. Richard T. Wright, Environmental Science: Toward a Sustainable Future, 10/hedition, Prentice Hall, 2008
4. Environmental Science, P N Palanisamy , Pearson publications,2012
5. Fundamentals of Environmental Studies, Mahua Basu, Xavier Savarimuthu, SJ, Cambridge University Press· 2017

Web References

1. www.ifpri.org/topic/environment-and-natural-resources
2. https://www.iucn.org/content/biodiversity
3. http://www.world.org/weo/pollution
4. www.water-pollution.org.uk/
5. https://www.tceq.texas.gov/airquality/monops/sites
6. https://guides.library.illinois.edu/c.php?g=347044&p=2349046

COs/POs/PSOs Mapping

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

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

T110	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to all branches)	L	T	P	C	Hrs
		4	0	0	4	45

Course Objectives

- To be able to differentiate the type of buildings according to national building code.
- To understand building components and their functions.
- Discuss the different types of roads, bridges and dams.
- To describe different types of combustion systems such as Internal and External Combustion systems
- To discuss various Energy Resources available for power generation.
- To explain the working of various different manufacturing process.

Course Outcomes

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

CO1 - Understand the basic concepts of different types of buildings and building materials. **(K3)**

CO2 - Learn various types of building components and their functions. **(K3)**

CO3 - Describe the importance of the basic infrastructure. **(K3)**

CO4 - Understand the classification of engines, low pressure Steam generators, its mounting and accessories. **(K2)**

CO5 - Apply the knowledge of thermal systems and equipment's in power plants and analyze the way of harnessing the renewable energies and its utilization. **(K3)**

CO6 - Understand the basic principles of machining, manufacturing and metal joining processes such as Lathe machine, Drilling, Grinding, Welding, green sand moulding foundry process. **(K2)**

PART – A CIVIL ENGINEERING

UNIT I BUILDINGS, BUILDING MATERIALS (8 Hrs)

Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick , cement, cement-mortar, concrete, steel-their properties and uses.

UNIT II BUILDINGS AND THEIR COMPONENTS (8 Hrs)

Buildings: Various Components and their functions. Soils and their classification. Foundation: function and types. Masonry-function and types. Floors: definition and types of floors. Roofs: definition and types.

UNIT III BASIC INFRASTRUCTURE (7 Hrs)

Surveying: classification, general principles, types, Uses, instruments used. Roads- types: components, types and their advantage and disadvantages. Bridges: components and types of bridges. Dams: purpose, types of dams. Water supply- sources and quality requirements, need and principles of rainwater harvesting.

PART- B MECHANICAL ENGINEERING

UNIT – IV INTERNAL AND EXTERNAL COMBUSTION SYSTEMS (7 Hrs)

IC engines – Classification – Working principles – Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits.

Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.

UNIT – V POWER GENERATION SYSTEMS (7 Hrs)

Conventional and Non-Conventional: Hydraulic – Thermal – Nuclear Power plants – Schemes and layouts (Description only)

Solar – Wind – Geothermal – Wave – Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).

UNIT – VI MANUFACTURING PROCESS **(8 Hrs)**

Machines – Lathe – Drilling – Bending – Grinding – Shearing (Description only) Machine Process – Turning – Planning – Facing – Blanking – Drilling – Punching – Shearing – Bending – Drawing – Filling – Sawing – Grinding.

Moulding and Metal Joining – Pattern making – Green and dry sand moulding – Arc and Gas welding – Brazing – Soldering (process description only).

Text Books

1. Natarajan, K V, Basic Civil Engineering, 11th edition, Dhanalakshmi publications Chennai, 2011.
2. Venugopal , K and Prabhu Raja, Basic Mechanical Engineering, Anuradha Publisher, 2012.
3. K.Pravin Kumar, Basic Mechanical Engineering, Pearson Publications, 2009.
4. Shanmugam G, Palanichamy MS, Basic Civil and Mechanical Engineering, 1st Edition, McGraw Hill Education, 2018.
5. R.Vaishnavi, M.Prabhakaran,V.Vijayan, Basic Civil and Mechanical Engineering, S. Chand Publisher, 2013.

Reference Books

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai, 2001
2. Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New delhi, 2012.
3. Punmia, B.C., et. al., surveying, Vol-1, Laxmi publishers, New Delhi, 2012.
4. Punmia, B.C., et. al., Building Construction, Laxmi publishers, New Delhi, 2012
5. El. Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co., 1985.
6. Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media promoters publishers Pvt. Ltd., Bombay, 2004.
7. Lindberg, R.A. Process and Materials of Manufacture, PHI, 1999.
8. H.N.Gupta, R.C. Gupta and Arun Mittal, Manufacturing Process, New Age Publications, 2001.
9. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

Web References

1. https://nptel.ac.in/courses/112107291/
2. https://nptel.ac.in/courses/112/103/112103262/
3. https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/ lecture-notes/
4. https://nptel.ac.in/courses/105102088/
5. https://nptel.ac.in/courses/105104101/

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	1	1	2	1	-	1	2	1	3	-	-	-
2	3	1	3	1	1	2	1	-	1	2	1	3	-	-	-
3	3	1	3	1	1	2	1	-	1	2	1	3	-	-	-
4	3	2	1	-	-	1	2	-	-	-	-	3	-	-	-
5	3	2	2	2	2	2	2	-	-	-	-	3	-	-	1
6	3	2	2	2	2	2	2	-	-	-	-	3	-	-	1

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

T111 **ENGINEERING MECHANICS** (Common to all branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions.
- To comprehend the effect of friction on equilibrium
- To analysis of trusses and friction
- To understand the laws of motion, the kinematics of motion and the interrelationship and to learn to write the dynamic equilibrium equation
- To emphasis the concepts through solved examples

Course Outcomes

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

CO1 - understand the concepts of Equilibrium of a body, Moment of a force and to convert multiple forces into a single resultant force **(K2)**

CO2 - Apply the principles of internal forces, support reactions on Trusses/beams and friction between two surfaces. **(K3)**

CO3 - Interpret the knowledge of Centroid and center of gravity for different sections to calculate the moment of inertia for sections. **(K3)**

CO4 - Analyze and compare the principle of conservative forces, conservation of energy and D'Alembert's principle **(K4)**

CO5 - Analyze and compare the kinematics and kinetics of rigid bodies.**(K4)**

UNIT I FUNDAMENTAL OF MECHANICS **(12 Hrs)**

Basic Concepts Force System and Equilibrium, Definition of force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, applications in solving the problems on static equilibrium of bodies.

UNIT II PRACTICAL APPLICATION OF FORCE **(12 Hrs)**

Structural member: Definition, degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of trusses-method of joints, method of sections.

Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges.

UNIT III PROPERTIES OF SURFACES **(12 Hrs)**

Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product of moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

UNIT IV KINEMATICS AND KINETICS OF PARTICLES **(12 Hrs)**

Equations of motion – Rectilinear motion, curvelinear motion, relative motion, D'Alembert's principle, work-Energy equation – conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact

UNIT V KINEMATICS AND KINETICS OF RIGID BODIES **(12 Hrs)**

Plane motion, absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

Text Books

1. Rajesekaran, S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2002.

2. Dr.I.S.Gujral, "Engineering Mechanicas" second edition, Lakshmi Publication (P), Ltd., 2011.
3. Dr. Sadhu Singh, A Textbook Of Engineering Mechanics, SChand & company Pvt Ltd., 2013.

Reference Books

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2011.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol.2 Dynamics, McGraw - Hill International Edition, 1997.
3. Bhavikatti,S.S and K.G. Rajashekarappa, Engineering Mechanics, New Age International (p) Ltd, New Delhi, 2010.
4. Arthur P. Boresi and Richard J. Schmidt, "Engineering Mechanics: Statics and Dynamics", Thomson Asia Private Limited, Singapore, 2010.
5. D.P.Sharma "Engineering Mechanics", Dorling Kindersley India Pvt. Ltd, New Delhi, 2010.

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1. http://nptel.iitm.ac.in/video.php?subjectId=112103108
2. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR / Engineering mechanics / Table of Contents.html
3. https://nptel.ac.in/courses/112/106/112106286/
4. https://www.coursera.org/learn/engineering-mechanics-statics
5. https://nptel.ac.in/courses/122/104/122104014/

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

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

T112	COMMUNICATIVE ENGLISH (Common to all Branches)	L	T	P	C	Hrs
		4	0	0	4	45

Course Objectives

- To improve the LSRW skills of I B.Tech students
- To instil confidence and enable the students to communicate with ease
- To equip the students with the necessary skills and develop their language prowess
- To sequence the thought of writing with cohesion and coherence
- To extend knowledge on varied aspects of business correspondence

Course Outcomes

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

CO1 - Procure holistic development of LSRW skills **(K2)**
CO2 - Gain efficacies to compete confidently in the interviews **(K3)**
CO3 - Effectively enhances the oral communication skills **(K3)**
CO4 - Select compile and synthesize information for written mode of communication **(K2)**
CO5 - Familiarize and Excels in different business correspondence in work place **(K3)**

UNIT I BASIC COMMUNICATION THEORY **(9 Hrs)**

Importance of Communication – stages of Communication - modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective - listening skills.

UNIT II COMPREHENSION AND ANALYSIS **(9 Hrs)**

Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing

UNIT III WRITING **(9 Hrs)**

Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary - Writing – Four modes of writing – Use of dictionaries, indices, library references – making - bibliographical entries with regard to sources from books, journals, internet etc.

UNIT IV BUSINESS WRITING / CORRESPONDENCE **(9 Hrs)**

Report writing – Memoranda – Notice – Instruction– Letters – Resumes – Job applications

UNIT V ORAL COMMUNICATION **(9 Hrs)**

Basics of phonetics – Presentation skills – Group Discussions – Dialogue writing – Short Extempore – Debates-Role Plays-Conversation Practice

Text Book

1. Ashraf M.Rizvi., Effective Technical Communication. Tata-McGraw, 2005.

Reference Books

1. Robert J.Dixson. ,Complete Course in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2006.
2. Boove, Courtland R et al., Business Communication Today, Pearson Education, New Delhi,2002.
3. Meenakshi Raman and Sangeeta Sharma., Technical Communication Principles and Practice,OUP, 2007.
4. Robert J.Dixson., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2007.
5. Sethi,J and Kamalesh Sadanand., A Practical Course in English Pronunciation, Prentice-Hall of India Pvt. Ltd, New Delhi, 2007

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1. https://books.google.co.in/books/about/Effective_Tech_Communication.html
2. http://www.prenhall.com/bov
3. https://global.oup.com/academic/product/technical-communication
4. https://www.amazon.in/Everyday-Dialogues-English-Dixson-R-J/dp
5. https://www.sapnaonline.com/books/practical-course-english-pronunciation-w-sethi-j-812032594x-9788120325944

COs/POs/PSOs Mapping

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

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

P104	PHYSICS LABORATORY (Common to all Branches)	L	T	P	C	Hrs
		0	0	3	2	30

Course Objectives

- To provide a practical understanding of some of the concepts learnt in the theory course on Physics.

Course Outcomes

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

CO1 - Ability to operate optical equipments like Spectrometer, Polarimeter to find the optical properties like dispersive power, Resolving power and specific rotatory power. **(K2)**

CO2 - Capable of handling screw gauge, venire caliper and travelling microscope to calculate the required parameters. **(K4)**

CO3 - Acquired basic knowledge about Thermal conduction and magnetic field due to a current carrying coil. **(K3)**

CO4 - Ability to prepare formal laboratory reports describing the results of experiments and to interpret the data from the experiments. **(K5)**

List of experiments (Any 10 Experiments)

1. Thermal conductivity – Lee's DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton's rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly's experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber
16. Electrical conductivity of semiconductor – two probe / four probe method
17. Hall effect in semiconductor

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

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

P105	CHEMISTRY LABORATORY (Common to all Branches)	L	T	P	C	Hrs
		0	0	3	2	30

Course Objectives

- To gain a practical knowledge of Engineering Chemistry in relevance to Industrial applications
- To enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.
- To understand and explain scientifically the various chemistry related problems in the industry
- To develop experimental skills for building technical competence.
- To learn the laboratory skills needed to design, safely conduct and interpret chemical research.

Course Outcomes

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

CO1 - Understand about titrimetric analysis which can be used to estimate the amount of metal in a mineral. **(K2)**

CO2 - Understand about titrimetric analysis which can be used to estimate the amount of chemical present in a sample. **(K3)**

CO3 - Understand about titrimetric analysis which can be used to estimate the quality of any sample. **(K2)**

CO4 - Perform conduct of metric titration and its uses to analyze any sample. **(K3)**

CO5 - Perform experiments by using colorimeter from which concentration of a sample can be determined from absorbance value **(K3)**

List of experiments

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
6. Estimation of acetic acid in vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.

Demonstration Experiments

1. Determination of COD of water sample.
2. Determination of lead by conductometry

Reference Books

1. Vogel's Text book of Macro and Semimicro Qualitative Analysis G. Svehla, Longman Inc., Newyork. 1997
2. Basic Principles of Practical Chemistry, Venkateswaran. V, Veeraswmay. R, Kulandaivelu. A.R., Pearson Education. 1989.
3. Vogel's Text book of Quantitative Analysis, Mendham. J, Denney. R.C, Barnes. J.D, and Thomas, M. Pearson Education. 1989.
4. Practical Chemistry, D. N Bajpai, S. Giri and O P Pandey, Chand Publishing 2013
5. Allied Practical Chemsitry, A R Kulandaivelu , V Venkateswaran & R Veeraswamy, Chand Publications, 2001

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1. https://edu.rsc.org/resources/titration-screen-experiment/2077.article
2. https://edu.rsc.org/resources/aspirin-screen-experiment/1644.article
3. https://www.stem.org.uk/resources/collection/3959/practical-chemistry
4. https://www.scienceinschool.org/2010/issue14/practical
5. http://www.chemlabs.bris.ac.uk/outreach/resources/Teachers_Websites.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	2	2	1	1	1	3	3	2	1	1	1	3	2	2	1
2	2	2	1	1	1	3	3	2	1	1	1	3	2	2	1
3	2	2	1	1	1	3	3	2	1	1	1	3	2	2	1
4	3	2	1	1	3	3	3	2	2	2	2	3	3	2	1
5	3	2	1	1	3	3	3	2	2	2	2	3	3	2	1

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

P106	WORKSHOP PRACTICE (Common to all branches)	L	T	P	C	Hrs
		0	0	3	2	30

Course Objectives

- To convey the basics of mechanical tools used in engineering
- To establish hands on experience on the working tools
- To develop basic joints and fittings using the hand tools
- To establish the importance of joints and fitting in engineering applications
- To explain the role of basic workshop in engineering and underlying physical mechanism used in mechanical machines.

Course Outcomes

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

CO1 - Understand the functioning and usage of basic hand tools of fitting, welding and carpentry. **(K2)**

CO2 - Apply the knowledge of fitting tools and machineries to perform the exercise on fitting joints like symmetric asymmetric and angular fitting. **(K3)**

CO3 - Apply the knowledge of gas and Arc welding principles to perform to join the metal with joints like Lap and V- Butt joints. **(K3)**

CO4 - Apply the knowledge of metal joining process using sheet metals and to perform to make tray and frustum. **(K3)**

CO5 - Apply the knowledge of carpentry tools and equipment's to perform the joints like mortise and half lap joint. **(K3)**

Sl. No.	Trade	List of Exercises
1	Fitting	Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.
2	Welding	Study of arc and gas welding equipment and tools – Edge preparation – Exercise on lap joint and V Butt joints – Demonstration of gas welding
3	Sheet metal work	Study of tools and Machineries – Exercise on simple products like Office tray and waste collection tray.
4	Carpentry	Study of tools and Machineries – Exercises on Lap joints and Mortise joints

LIST OF EXERCISES

I - FITTING

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

II - WELDING

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3.M Single V butt welding (Arc)

III - SHEET METAL WORK

1. Study of tools and machineries
2. Frustum
3. Waste collection tray

IV - CARPENTRY

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint.

Reference Books

1. HS Bawa, Workshop Practices, Tata Mc Graw Hill Publishing Co Ltd, 2015
2. S.K. Hajra Choudhury, A. K. Hajra Choudhury, "Elements of Workshop Technology", Vol I:Manufacturing Processes, 15th Edition Reprinted, Media Promoters & Publishers Pvt Ltd.,2013
3. D.Sathish, Engineering Workshop Practices Laboratory Manual, Notion press publisher, 2019
4. R.K. Rajput, Workshop Practice, Published by Laxmi Publications Pvt. Ltd. 2011
5. RS Khurmi and JK Gupta, Basics of Workshop Practice, S Chand Publisher, 2011

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1. http://www.nptelvideos.in/2012/12/manufacturing-processes-ii.html
2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=3804
3. https://www.tpctraining.com/collections/machine-shop-practices-training
4. https://www.vlab.co.in/broad-area-mechanical-engineering
5. https://nptel.ac.in/courses/112/107/112107219/

COs/POs/PSOs Mapping

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

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

U19ITT31	NUMERICAL METHODS	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE, IT, BME)

Course Objectives

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

Course Outcomes

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

CO1 - Use of Numerical techniques to solve algebraic and transcendental equations. **(K2)**
CO2 - Find the solution of simultaneous equations. **(K2)**
CO3 - Apply the knowledge of differentiation and integration by using numerical methods. **(K3)**
CO4 - Solve the ordinary differential equations by using various methods. **(K3)**
CO5 - Solve the partial differential equations in numerical methods. **(K3)**

UNIT I SOLUTION OF ALGEBRAICAND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS **(9 Hrs)**

The method of bisection – the method of false position – Newton Raphson method (single and system of two equations) – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS **(9 Hrs)**

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

UNIT III INTERPOLATION **(9 Hrs)**

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

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **(9 Hrs)**

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

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **(9 Hrs)**

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

Text Books

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

Reference Books

1. Steven Chapra, "Applied Numerical Methods W/Mat lab", Tata McGraw Hill, 4th Edition, July 2017
2. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, April 2016
3. Timo Heister, Leo G. Rebholz, Fei Xue, "Numerical Analysis an Introduction", Publisher De Gruyter March 2019
4. Graham W. Griffiths, "Numerical Analysis using R solutions to ODEs and PDEs", Kindle 1st Edition,

Cambridge University Press, April 2016
5. K. Sankara Rao,"Numerical Methods for Scientists and Engineers", 3rd Edition, PHI Learning Pvt.Ltd., New Delhi, Jan 2018

Web References

1. http://johndfenton.com/Lectures/Numerical-Methods/Numerical-Methods.pdf
2. http://nptel.ac.in/courses/111107063
3. http://nptel.ac.in/courses/122102009
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

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

		L	T	P	C	Hrs
U19ITT32	**DATA STRUCTURES**	3	0	0	3	45

(Common to CSE and IT)

Course Objectives

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

Course Outcomes

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

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

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES **(9 Hrs)**

Introduction: Basic Terminologies: Elementary Data Organizations. Data Structure Operations: insertion, deletion, traversal. Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques 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. Operations on each type of Queues.

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, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.
2. E.Balagurusamy," Data Structures using C", McGraw Hill Education, 1stEdition, 2017.
3. Aaron M. Tenenbaum, Yedidyah Langsam, "Data Structures Using C ", Pearson, First Edition, 2019.
4. Reema Thareja," Data Structures Using C", Oxford, 2nd Edition, 2014.
5. Salaria," Data Structures & Algorithms using C", 1st Edition, Khanna Publishers.2018.

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

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

U19ITT33	DIGITAL DESIGN AND MICROPROCESSORS	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE and IT)

Course Objectives

- To gain knowledge on Boolean algebra and design combinational circuit.
- To understand the behavior of sequential circuits.
- To understand and learn the architecture and assembly language program of 8085.
- To understand and learn the architecture and assembly language program of 8086.
- To explore the interfacing the peripherals and other chips to 8086

Course Outcomes

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

CO1 - Review the knowledge of Number systems and design of combinational circuits. **(K2)**
CO2 - Understand and experiment the various sequential circuits. **(K2)**
CO3 - Explain the basic architecture of 8085 microprocessors **(K2)**
CO4 - Articulate the knowledge of the architecture and instruction sets of 8086 **(K2)**
CO5 - Summarize the interfacing of various peripherals to various 8086. **(K2)**

UNIT I REVIEW OF NUMBER SYSTEMS AND COMBINATIONAL CIRCUITS **(9 Hrs)**

Review of Number systems – Conversion of Number systems — Binary codes – Boolean Algebra – Boolean functions – canonical forms - Simplifications of Boolean function: Theorems and laws, K'Map and Quine McCluskey method - Introduction to combinational circuits – Design procedures of Combinational circuits – Adders - Subtractors – Binary parallel Adder – Decoder – Encoder – Multiplexer — Demultiplexer.

UNIT II SEQUENTIAL CIRCUITS **(9 Hrs)**

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

UNIT III INTEL 8085 MICROPROCESSORS **(9 Hrs)**

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

UNIT IV INTEL 8086 MICROPROCESSORS **(9 Hrs)**

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

UNIT V PERIPHERALS AND INTERFACING TO 8086 **(9 Hrs)**

Programmable Peripheral Interface (8255) – Serial Communication interface (8251) – Programmable Timer Controller (8254) — Programmable Interrupt Controller (8259) – DMA controller (8237).

Text Books

1. M. Morris Mano and Michael Ciletti, Digital Design, Sixth Edition, Pearson India Education Services, Pvt. Ltd., 2018
2. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publications, Sixth Edition, 2013.
3. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2014.

Reference Books

1. Tocci R J and Widmer N S, "Digital Systems - Principles and Applications", Prentice Hall of India, New Delhi,11th Edition, 2010.

2. Charles H Roth, "Fundamentals of Logic Design", Thomas Publication Company, 7th Edition, 2011.
3. John.F.Wakerly,"Digital Design Principles and Practices", Pearson Education,4th Edition, 2006.
4. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2015
5. Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH 2012.

Web References

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://nptel.ac.in/courses/108/105/108105102/
4. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.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	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
2	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
3	2	1	-	-	-	-	-	-	-	-	-	-	3	2	-
4	2	1	-	-	-	-	-	-	-	-	-	-	3	2	-
5	2	1	-	-	3	-	-	-	-	-	-	-	3	2	-

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

U19ITT34	DATABASE MANAGEMENT SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the various data models, conceptualize E-R diagram and depict using relational model
- To gain knowledge about database languages and frame query using Relational Algebra and SQL
- To understand and design an efficient database schema using the various normal forms
- To impart knowledge on data storage and transaction processing, concurrency control techniques and recovery procedures
- To 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. **(K3)**

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

CO4 - Illustrate 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 AND TRANSACTIONS **(9 Hrs)**

RAID - File Organization - Indexing, Ordered Index, Index files, Hashing - Static and dynamic hashing. 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. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems (7th edition), ,Publisher: Pearson,2016.
3. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

Reference Books

1. Date C J, Kannan A and Swamynathan S, —An Introduction to Database Systemsll, 8th Edition, Pearson Education, New Delhi, 2006.
2. Alan Beaulieu, Mastering SQL Fundamentals, Second Edition, O'Reilly,2009

3. Kristina Chodorow; Shannon Bradshaw MongoDB: The Definitive Guide, 3rd Edition, O'Reilly Media, Inc., 2018.
4. Pramod J. Sadalage (Author), Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence 1stEdition, Kindle Edition

Web References

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

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
CO1	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
CO3	3	2	1	1	-	-	-	-	-	-	-	-	3	3	2
CO4	2	1			-	-	-	-	-	-	-	-	3	3	2
CO5	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2

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

U19ITT35	COMPUTER NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the protocol layering and physical level communication.
- To analyse the basic functionality of datalink layer
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.
- To understand the concepts of application layer protocols.

Course Outcomes

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

CO1 - Discuss the knowledge on principles of computer networks and physical layer signal transmission along with impairments and performance analysis **(K2)**
CO2 - Explain the concepts and functionality of datalink layer **(K2)**
CO3 - Exemplify the functions and different routing algorithms of network layer. **(K2)**
CO4 - Illustrate the various functionalities of the protocols in transport layer **(K2)**
CO5 - Outline the working of various application layer protocols. **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction: Uses of Computer Networks-Network Hardware-Network Software-Reference Models- **Physical Layer:** The Theoretical Basis of Data Communication-Guided Transmission Media-Wireless Transmission-Communication Satellites -MTS

UNIT II DATA LINK LAYER AND MAC SUB LAYER **(9 Hrs)**

Data Link Layer: Design Issues- Framing- Error Detection & Correction-Elementary Data Link Protocols- Sliding Window Protocols-**Mac Sub Layer:** The Channel Allocation problem-Multiple Access Protocols-Ethernet-Wireless LAN's-Bluetooth- Data Link layer switching

UNIT III NETWORK LAYER **(9 Hrs)**

Network Layer Design Issues-Routing Algorithms-Congestion Control Algorithms-Quality of Service-Internetworking-The Network Layer in the Internet

UNIT IV TRANSPORT LAYER **(9 Hrs)**

The Transport Service-Elements of Transport-protocols-A Simple Transpert Protocol-The Internet-Transport Protocol: UDP-The Internet Transport Protocol: TCP

UNIT V APPLICATION LAYER **(9 Hrs)**

The Domain Name System-Electronic Mail-The World Wide Web-Multimedia

Text Books

1. A.S. Tanenbaum, ComputerNetworks, 5thedition, Pearson Education/PHI, New Delhi, India, 2011.
2. Behrouz A .Forouzan, Data communication and Networking, 5thEdition, Mc Graw-Hill, India, 2014.
3. Kurose, Ross, Computer Networking: A top down approach, Pearson Education, India, 2010.

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1. Davie Bruce S. and Peterson Larry L., —Computer Networks - A System Approachll, 5th Edition, Morgan Kaufmann, 2012, Elsevier Inc.
2. Godbole, Achyut S and Kahate Atul., —Data Communication and Networksll, 2nd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011.

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1. https://www.edx.org/learn/problem-solving
2. https://www.tutorialspoint.com/data_communication_computer_network/
3. https://www.geeksforgeeks.org/last-minute-notes-computer-network/

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

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

U19ITT36	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the software process and process models applied for software engineering
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the design process and styles suitable for different software constraints
- To understand the testing strategies applied to validate and verify the software.
- To understand the project management techniques for successfully controlling the project development.

Course Outcomes

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

CO1 - Identify the suitable process model for software project development. **(K1)**
CO2 - Describe the requirements engineering process and specification. **(K1)**
CO3 - Apply systematic procedures for complete software design. **(K3)**
CO4 - Demonstrate the various testing level and strategies applied in validating the software. **(K3)**
CO5 - Summarize the project management activities for successful management of the software. **(K2)**

UNIT I SOFTWARE PROCESS **(9 Hrs)**

Introduction to Software Engineering, Software Process, Software Process Models: Waterfall Model, Incremental model, Evolutionary model, Agile process model: Extreme Programming, Scrum.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION **(9 Hrs)**

Functional and non-functional requirements -The software requirements document -Requirements specification - Requirements engineering processes - Requirements elicitation and analysis -Requirements validation - Requirements management

UNIT III SOFTWARE DESIGN **(9 Hrs)**

Design process – Design Concepts-Design Model: Architectural Design : Software Architecture- Architectural styles, DFD Model, Architectural Mapping using Data Flow- Component level Design: Component - Design Guidelines-Cohesion and Coupling-User Interface Design: Golden Rules- Interface analysis and Design.

UNIT IV TESTING **(9 Hrs)**

Software testing fundamentals-Testing Process-Software testing Strategy: Unit Testing – Integration Testing – Validation Testing – System Testing. White box testing- basis path testing and control structure testing-black box testing- Regression Testing - Debugging- Testing Tools.

UNIT V PROJECT MANAGEMENT **(9 Hrs)**

Project Management spectrum- Process and project metrics. Project Planning: Project Estimation – LOC and FP Based Estimation, COCOMO Model, Project Scheduling and Tracking- Work Breakdown Structure, Activity Network, CPM, PERT, Gantt Chart and Earned Value Analysis. Team Management - Software Quality Management, Software Configuration Management, Risk Management and Process Improvement Management.

Text Books

1. Roger Pressman , Bruce Maxim, "Software Engineering – A Practitioner's Approach", Nineth Edition, Mc Graw Hill International Edition, 2019.
2. Ian Sommerville, "Software Engineering", Tenth Edition, Pearson Education Asia, 2016.
3. Rajib Mall, "Fundamentals of Software Engineering", Fifth Edition, PHI Learning Private Limited ,2018.

Reference Books

1. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
2. Watts S. Humphrey., "Managing the Software Process", Pearson Education, 2008.

Web References

1. http://www.nptelvideos.in/2012/11/software-engineering.html
2. https://www.projectengineer.net/the-earned-value-formulas/
3. https://www.smartdraw.com/downloads/
4. https://www.visual-paradigm.com/support/documents/vpuserguide.jsp

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

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

U19ITP31	NUMERICAL METHODS USING C LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

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

Course Outcomes

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

CO1 - Find out the root of the Algebraic and Transcendental equations using C Programming. **(K3)**

CO2 - Know the concept of matrix by power method using C programming. **(K3)**

CO3 - Solve the system of simultaneous equations using C programming. **(K3)**

CO4 - Implement numerical techniques of integration using C programming. **(K3)**

CO5 - Find the numerical solution of parabolic equation using C programming **(K3)**

List of Experiments

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

Reference Books

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

Web References

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

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

U19ITP32	DATA STRUCTURES LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To implement linear and non-linear data structures
- To understand the different operations of binary trees
- To implement graph traversal algorithms
- To get familiarized to sorting algorithms
- To use appropriate algorithm design technique to solve various problems

Course Outcomes

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

CO1 - Implement exemplary applications related to searching and sorting techniques. **(K3)**
CO2 - Compile, run and manipulate Programs using core data structures. **(K3)**
CO3 - Solve problems by applying linear Data Structures. **(K3)**
CO4 - Solve problems by applying non-linear Data Structures **(K3)**
CO5 -.Build solutions for online coding challenges **(K3)**

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. 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, 3rd edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st edition, 2017.
4. Reema Thareja, "Data structures using C", 2nd edition, Oxford University, 2014.
5. Tenebaum Aaron M, "Data Structures using C", Pearson Publisher, 1st edition, 2019.

Web References

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

COs/POs/PSOs Mapping

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

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

U19ITP33	DIGITAL DESIGN AND MICROPROCESSORS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To design and analyze a combinational circuits.
- To design and analyze a sequential circuits.
- To write assembly language programs using 8085 trainer kit.
- To be familiar with MASM-8086
- To apply the knowledge into interfacing and various applications 8085/8086.

Course Outcomes

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

CO1 - Demonstrate the fundamental operations of Combinational Circuits. **(K3)**
CO2 - Experiment the fundamental operations of Sequential Circuits. **(K3)**
CO3 - Implement simple programs and design interfacing circuits with 8085. **(K3)**
CO4 - Experiment assembly language programs using MASM. **(K3)**
CO5 - Implement interfacing concept in various applications of 8085/8086. **(K3)**

List of Experiments

1. Implementation of logic circuits using gates
    1. Full adder/full Subtractor
    2. Implementation of logic functions using universal gates only
    3. Implementation of Boolean functions using MUX
    4. Design of decoder, Demultiplexer.
    5. Design an Asynchronous and Synchronous counter.
2. Assembly language programming on 8085.
    1. Addition
    2. Subtraction
    3. Multiplication
    4. Division
    5. Code conversion
3. Assembly Language programming on 8086.
    1. Addition
    2. Subtraction
    3. Multiplication
    4. Division
    5. Searching element
4. Interfacing program for 8085/8086
    1. Traffic Light Control.
    2. Moving display
    3. Stepper Motor control.

Reference Books

1. Tocci R J and Widmer N S, "Digital Systems - Principles and Applications", Prentice Hall of India, New Delhi,11th Edition, 2010.
2. Charles H Roth, "Fundamentals of Logic Design", Thomas Publication Company, 7th Edition, 2011.
3. John.F.Wakerly,"Digital Design Principles and Practices", Pearson Education,4th Edition, 2006.
4. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2015
5. Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH 2012.

Web References

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://nptel.ac.in/courses/117/105/117105080/

3. https://nptel.ac.in/courses/108/105/108105102/
4. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.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	2	1	1	3	-	-	-	-	-	-	-	3	2	-
2	2	2	1	1	3	-	-	-	-	-	-	-	3	2	-
3	2	2	1	1	3	-	-	-	-	-	-	-	3	2	-
4	2	2	1	1	3	-	-	-	-	-	-	-	3	2	-
5	2	2	1	1	3	-	-	-	-	-	-	-	3	2	-

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

U19ITP34	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand data definitions and data manipulation commands
- To understand data selection and data projection commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To understand design and implementation of typical database applications.

Course Outcomes

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

CO1 - Implement relational database systems using SQL statements. **(K3)**

CO2 - Use typical data definitions and manipulation commands in various applications. **(K3)**

CO3 - Demonstrate applications using Nested and Join Queries. **(K3)**

CO4 - Execute various advance SQL queries related to Transaction Processing. **(K3)**

CO5 - Build commercial relational database systems using trigger and cursor concept. **(K3)**

List of Experiments

Structured Query Language:

1. Data Definition Language
2. Data Manipulation Language
3. Data Selection and Projection statements
4. Aggregate Functions
5. Joins
6. Built in Functions
7. Nested Queries
8. Set Operations
9. View
10. Transaction Control Language
11. Data Control Language

PL/SQL:

12. Simple PI/SQL Programs
13. Trigger
14. Cursor : Implicit Cursor and Explicit Cursor

Reference Books

1. Oracle developer handbook
2. SQL/PL/SQL for Oracle by P.S. Deshpande IIT Madras,Dream tech Press
3. Alan Beaulieu, Mastering SQL Fundamentals, Second Edition, O'Reilly,2009
4. Silberschatz, Korth, Sudarshan, Database System Concepts, 7thEdition – McGraw-Hill Higher Education, International Edition, 2019

Web References

1. www.oracle-developer.net
2. www.oracle.com/DBA

CO-POs/PSOs Mapping

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

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

U19ITT41	DISCRETE MATHEMATICS AND GRAPH THEORY	L	T	P	C	Hrs
		2	2	0	3	60

(Common to CSE and IT)

Course Objectives

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

Course Outcomes

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

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

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS **(12 Hrs)**

Connectives – Statement formulae – Equivalence of Statement formulae – NAND and NOR Connectives – Principal conjunctive and disjunctive normal forms. Introduction – Statements and Notation – Connectives – Tautologies – Two State Devices and Statement logic – Equivalence – Implications – 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 LATTICES **(12 Hrs)**

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

UNIT IV GRAPH THEORY **(12 Hrs)**

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

UNIT V TREES **(12 Hrs)**

Trees – Properties of Trees – Pendant vertices in a Tree – Kruskal's algorithm

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, Published August 17th 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 – Chennai- Mumbai, 1988.
3. Douglas b. West, "Introduction to Graph theory", second edition Pearson Education (Indian), 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.

Web References

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2. https://nptel.ac.in/courses/111/107/111107058/
3. https://nptel.ac.in/courses/106/106/106106183/
4. https://nptel.ac.in/courses/111/106/111106050/
5. http://discrete.openmathbooks.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	-	-	-	-	-	-	-	1	3	-	1
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	2	1	-	-	-	-	-	-	-	-	-	1	3	-	1

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

U19ITT42	PROGRAMMING IN JAVA (Common to CSE and IT)	L	T	P	C	Hrs
		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, 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 – Deque –Set - SortedSet. 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 - Programming Example.

Text Books

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

Reference Books

1. Cay S. Horstmann, Gary cornell, Core Java Volume – I Fundamentals, 9th Edition, Prentice Hall, 2013.

2. H.M.Dietel and P.J.Dietel, Java How to Program, 11th Edition, Pearson Education/ PHI, 2017.
3. Cay.S.Horstmann and Gary Cornell, Core Java, Vol 2, Advanced Features, 8th Edition, Pearson Education, 2008.
4. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:
5. Programming in Java, S.Malhotra and S.Choudary, Oxford Univ. Press.

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

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
CO1	2	1	-	-	2	-	-	-	-	-	-	-	3	2	1
CO2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

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

U19ITT43	OPERATING SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - Define the concepts of operating systems operations, processes and threads. **(K1)**
CO2 - Apply the concepts of CPU scheduling and deadlock techniques **(K3)**
CO3 - Simulate the principles of memory management **(K2)**
CO4 - Identify appropriate file system and disk organizations for a variety of computing scenario **(K2)**
CO5 - Examine the features of various open source operating systems **(K3)**

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 – User and Operating System Interface – System Calls – Types of System Calls – System Programs. Process Scheduling – Operation on Processes – Interprocess Communication. Case Study: Kernel data structures for various open source operating systems.

UNIT II CPU SCHEDULING AND DEADLOCK **(9 Hrs)**

Overview of threads – Multicore programming-Multithreading Models – Threading Issues Basic Concepts of process scheduling – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling, Dead Lock: Characterization, Prevention Detection, Avoidance and Recovery. Case Study: Linux Scheduling.

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT **(9 Hrs)**

Synchronization – The Critical-Section Problem – Peterson's Solution, Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table Segmentation, Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing

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

File Concept – Access Methods – Directory Structure – File Sharing – Protection, File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Case Study: Linux File system

UNIT V CASE STUDY **(9 Hrs)**

Linux System- Basic Concepts; System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen, VMware on Linux Host and Adding Guest OS.

Text Books

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

Reference Books

1. William Stallings, Operating System, Prentice Hall of India, 6th Edition, 2009.

2. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Third Edition, 2013.
3. William Stallings, "Operating System", Pearson Education, Sixth edition, 2015

Web References

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2. http://www.tcyonline.com/tests/operating-system-concepts
3. http://www.galvin.info/history-of-operating-system-concepts-textboo
4. http://www.ittestpapers.com/operating-system-concepts

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

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

U19ITT44	INTERNET AND WEB TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand basic web concepts and design of web page.
- To understand client side programming to create a dynamic webpages.
- To understand the role of XML and AJAX in web design.
- To study the basics of PHP in web application.
- To understand the basics of database connectivity and web services using PHP.

Course Outcomes

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

CO1 - Design a static web page using HTML **(K3)**
CO2 - Develop dynamic client-side web page using client-side scripting languages. **(K3)**
CO3 - Design XML database and rich internet applications. **(K3)**
CO4 - Write client-server programs using PHP. **(K3)**
CO5 - Design a web service using PHP and database connectivity. **(K3)**

UNIT I BASIC WEB CONCEPTS, HTML, CSS3, WEB 2.0 **(9 Hrs)**

Internet Principles: TCP/IP model- Web Protocols - Web Concepts: Web Server- Browser- Browser and Server Communication- Web Application Architecture: MVC- Multitier Architecture-Web Design Layout-Website types - Web2.0 and collaboration tools. HTML5 - Basic Tags - Lists - Tables- Forms - Frames. CSS3: Cascading Style Sheets: Style rules and CSS types.

UNIT II CLIENT SIDE SCRIPTING **(9 Hrs)**

Scripting language- JavaScript: Introduction to JavaScript – Functions - Event and Error Handling - Built-in Classes - Form Validation. JQuery: Selectors – Methods – Events – Effects - UI. Angular JS: Expressions – Directives – Controllers – Modules – Scopes - Data Binding – Events – Services – Forms – Tables - Validation.

UNIT III XML AND AJAX **(9 Hrs)**

Introduction to XML - Defining XML tags - their attributes and values - XML Namespace - XML technologies: Document Type Definition - XML Schemas – Xpath – XSLT - XML Stylesheet - Document Object Model - XML Parser – DOM and SAX Parsers. JSON: Introduction – Syntax - Data types- Objects - Arrays. Rich Internet Application: AJAX - Evolution - AJAX Framework – XML Http Request object - Web Application Using AJAX - AJAX with JSON - AJAX with JQuery.

UNIT IV PHP **(9 Hrs)**

Language basics-Lexical Structure, Variables, Data types, operator- Flow control statements- Looping Statements -Functions- Strings- Regular Expression- Arrays- Objects. PHP in Web Application: Configuration variables- GET and POST variables- Embedding PHP into web page- Processing Forms: Parameter handling- Form Validation-- Maintaining State :Sessions and Cookies-File Handling.

UNIT V PHP DATABASE CONNECTIVITY AND WEB SERVICES **(9 Hrs)**

Data base Connectivity: PHP Data Objects- MySQLi extension- Create Database- Insert data- update data- select data- delete data. PHP and XML- PHP and AJAX - PHP and JSON- PHP and Python. Web services: web services basics - SOAP and REST web services- Create- publish and consume web services in PHP. Web Application Frameworks: Introduction to Bootstrap - Ruby on Rails – Laravel – Django - ReactJS and NodeJS frameworks.

Text Books

1. Deital & Deital, "Internet and World Wide Web-How to Program", Pearson Education Fifth Edition, 2012.
2. Green B, Seshadri S, "AngularJS", O'Reilly Media, Inc.; First Edition.2014.
3. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

Reference Books

1. Robert W. Sebasta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.
2. Bassett, Lindsay, "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, Inc., 2015.
3. Nixon, Robin. "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", O'Reilly Media, Inc., 2014.
4. Tatroe, Kevin, and Peter MacIntyre, "Programming PHP: Creating Dynamic Web Pages", O'Reilly Media, fourth edition, 2020.

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1. http://www.w3school.com/https://www.allaboutcircuits.com/video-tutorials/transistors/
2. https://www.coursera.org/learn/duke-programming-web
3. https://www.tutorialspoint.com/angularjs/index.htm
4. https://examples.javacodegeeks.com/enterprise-java/jws/jax-ws-web-services-on-tomcat/
   https://nptel.ac.in/courses/106/105/106105084/

COs/POs/PSOs Mapping

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

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

U19ITP41	PROGRAMMING IN JAVA LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to CSE and IT)

Course Objectives

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

Course Outcomes

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

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

List of Experiments

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

Reference Books

1. Java: The Complete Reference 11th Edition, 2018, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, ISBN: 9781260440249.
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentalsll, 9th Edition, Prentice Hall, 2013.
3. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

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

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
CO1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
CO5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

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

U19ITP42	OPERATING SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn about the installation of different OS Platforms
- To learn the shell programming concepts
- To implement different Operating system scheduling algorithm
- To understand how system processes work and how to manage them
- To simulate deadlock, file allocation and organization techniques.

Course Outcomes

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

CO1 - Experiment with UNIX commands and shell programming used to execute OS operations. **(K3)**
CO2 - Choose the best Scheduling and deadlock mechanism s for given problem instance **(K3)**
CO3 - Identify the performance of various page replacement algorithms **(K3)**
CO4 - Use and apply the file allocation and organization strategies. **(K3)**
CO5 - Demonstrate the resource allocation for given problem instance scenario **(K3)**

List of Experiments

1. Installing of operating system and resource allocation.
2. Shell Programming: Creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
3. Simulate the following CPU scheduling algorithms.
4. Simulate Bankers Algorithm for Dead Lock Avoidance.
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate all file allocation strategies.
7. Process synchronization using semaphores.
8. Simulate all File Organization Techniques.
9. Simulate all page replacement algorithms.
10. Study of Linux OS, Microsoft, Mobile OS.

Reference Books

1. Abraham Silberschatz Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley 8th Edition.
2. Garry. J. Nutt, Operating Systems: A Modern Perspective, Addison-Wesley
3. Andrew S. Tanenbaum and Herbert Bros, Modern Operating Systems (4th Edition), Pearson
4. Russ Cox, FransKaashoek, Robert Morris , xv6: a simple, Unix-like teaching operating system

Web References

1. https://www.geeksforgeeks.org/operating-systems/
2. http://www.inf.ed.ac.uk/teaching/courses/os/prac/
3. http://www.scribd.com/doc/7137624/OS-Practical-File/
4. http://www.cl.cam.ac.uk/freshers/raspberrypi/tutorials/os/introduction.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	2	1	1	3	-	-	-	-	-	-	-	3	1	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	1

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

U19ITP43	WEB TECHNOLOGY LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand basic web concepts and design of web page.
- To understand client side programming to create a dynamic webpage.
- To understand the benefits of XML in web design.
- To learn the basics of PHP in web application.
- To learn the benefits of PHP and web services.

Course Outcomes

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

CO1 - Design static web pages using HTML **(K3)**

CO2 - Design dynamic web pages using Scripting Languages **(K3)**

CO3 - Design a XML database to handle data for the web application. **(K3)**

CO4 - Design a dynamic web application using PHP and Database connectivity **(K3)**

CO5 - Implement a web service application to process client service request. **(K3)**

List of Experiments

1. Create the static Web Page using appropriate HTML tags.
2. Dynamic Web Page Design Using JavaScript, Angular Js and JQuery.
3. Design an XML document and validate it using DTD and XML Schema.
4. Develop an XSL Style sheet to transform and display an XML document in the web page.
5. Develop an AJAX program using JSON, JQuery and PHP.
6. Implement a dynamic web page using PHP.
7. Develop a web application using PHP with database Connectivity.
8. Design a dynamic web page using PHP and JSON.
9. Implement a web application using PHP, Python and Database Connectivity.
10. Create a web service using PHP to handle the client request.

Reference Books

1. Deitel & Deitel, "Internet and World Wide Web-How to Program", Pearson Education Fifth Edition, 2012.
2. Green B, Seshadri S. "AngularJS ", O'Reilly Media, Inc.", First Edition.2014.
3. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
4. Robert W. Sebasta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.
5. Bassett, Lindsay. "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, Inc.", 2015.
6. Nixon, Robin. "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", O'Reilly Media, Inc.", 2014.
7. Tatroe, Kevin, and Peter MacIntyre. "Programming PHP: Creating Dynamic Web Pages", O'Reilly Media, fourth edition, 2020.

Web References

1. http://www.w3school.com/
2. https://www.coursera.org/learn/duke-programming-web
3. https://www.tutorialspoint.com/angularjs/index.htm

COs/POs/PSOs Mapping

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

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

U19ITT51	PROBABILITY AND STATISTICS (Common to CSE, IT)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To acquire skills in handling situation including more than one random variable.
- To familiarize the student about the continuous random variables and their applications.
- To study the basic concepts of Statistics.
- To learn the concept of testing of hypothesis using statistical analysis.
- To learn the concept of Small sampling.

Course Outcomes

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

CO1 - Apply the concept of probability in random variables. **(K3)**
CO2 - Apply the basic rules of continuous random variables. **(K3)**
CO3 - Understand the basic concepts of Statistics. **(K2)**
CO4 - Derive the inference for various problems using testing of hypothesis in large samples **(K3)**
CO5 - Solve the problems related to testing of hypothesis in small samples **(K3)**

UNIT I DISCRETE RANDOM VARIABLES **(12 Hrs)**

Random Variables and their event spaces – The probability mass function – Distribution functions – Binomial – Geometric – Negative Binomial and Poisson.

UNIT II CONTINUOUS RANDOM VARIABLES **(12 Hrs)**

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

UNIT III STATISTICS **(12 Hrs)**

Measures of central tendency – Arithmetic Mean, Median and Mode – Measures of dispersion and Standard deviation – Skewness and Measures of Skewness – Pearson's coefficient of skewness – Moments – Correlation – Rank correlation and regression.

UNIT IV LARGE SAMPLES **(12 Hrs)**

Curve fitting by the method of least squares – fitting of straight lines – second degree parabolas and more general curves – Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations.

UNIT V SMALL SAMPLES **(12 Hrs)**

Test for single mean – Difference of means and correlations of coefficients – Test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

Text Books

1. B.S.Grewal, "Higher Engineering Mathematics", KHANNA PUBLISHERS - Paperback – 3rd Edition - 2017.
2. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill Education, 2008.
3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1 2019.

Reference Books

1. Ravish R. Singh, Mukul Bhatt "Engineering Mathematics", McGraw-Hill, 1st Edition, 2017.
2. William Mendenhall, Robert J. Beaver, Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning; 15th Edition 2019.
3. Richard .A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, "An Introduction to Probability and Statistics", Wiley – 2008.
5. E. Rukmangadachari, "Probability and Statistics", Pearson Education India – 2012.

Web References

1. http:// www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

COs/POs/PSOs Mapping

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

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

U19ITT52	MOBILE COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basic concepts of mobile computing
- To be familiar with the network protocol stack
- To learn the basics of mobile telecommunication system
- To be exposed to Ad-Hoc networks
- To gain knowledge about different mobile platforms and application development

Course Outcomes

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

CO1 - Explain the basics of mobile telecommunication system **(K2)**
CO2 - Articulate the required functionality at each layer for given application **(K2)**
CO3 - Identify solution for all functionality at each layer. **(K1)**
CO4 - Use simulator tools and design Ad hoc networks **(K3)**
CO5 - Develop a mobile application **(K6)**

UNIT I INTRODUCTION **(9 Hrs)**

Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER **(9 Hrs)**

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT III MOBILE TELECOMMUNICATION SYSTEM **(9 Hrs)**

Global System for Mobile Communication (GSM) – Services & Architecture- Protocol-Connection Establishment – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS) – Handover - Security.

UNIT IV MOBILE AD-HOC NETWORKS **(9 Hrs)**

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS **(9 Hrs)**

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M- Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

Text Books

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.
2. Jochen H. Schiller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

Reference Books

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,TataMcGraw Hill Edition ,2006.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.

Web References

1. Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter: http://developer.windowsphone.com 9. BlackBerry Developer : http://developer.blackberry.com/

COs/POs/PSOs Mapping

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

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

U19ITT53	DATA WAREHOUSING AND DATA MINING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Be familiar with the concepts of data warehouse and data mining.
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- To understand data pre-processing and data visualization techniques.
- To study algorithms for finding hidden and interesting patterns in data.
- To understand and apply various classification and clustering techniques using tools.

Course Outcomes

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

CO1 - Describe a data warehouse **(K2)**
CO2 - Apply pre-processing techniques **(K3)**
CO3 - Interpret correlation based frequent patterns in large data sets **(K2)**
CO4 - Compare and contrast the various classifiers **(K2)**
CO5 - Apply data mining techniques and methods to large data sets **(K3)**

UNIT I INTRODUCTION TO DATA WAREHOUSING **(9 Hrs)**

Data Warehouse: Data warehouse -basic concepts- Modeling – Design and usage- Implementation –Data generalization by Attribute-oriented induction approach – Data cube computation methods.

UNIT II DATA MINING **(9 Hrs)**

Data Mining: Introduction- Kinds of Data and Patterns–Major issues in data mining- Data Objects and attribute types – Statistical description of data - Measuring data similarity and dissimilarity. Data preprocessing: Overview-Data cleaning- Data integration –Data reduction-Data transformation and discretization.

UNIT III ASSOCIATION RULE MINING **(9 Hrs)**

Association Rule Mining: Basic concepts- Frequent item set mining methods: Apriori algorithm- A pattern growth approach for mining frequent item sets—Pattern evaluation methods- Mining multilevel, multi-dimensional space constraint based frequent pattern mining

UNIT IV CLASSIFICATION **(9 Hrs)**

Classification: Basic concepts- Decision Tree Induction - Bayes Classification Methods – Rule Based Classification- Model evaluation and selection techniques to improve classification accuracy –Support Vector Machines Classification using frequent patterns- Other Classification Methods.

UNIT V CLUSTERING **(9 Hrs)**

Clustering: Cluster analysis- Partitioning methods- Hierarchical methods- Density based methods – Grid based methods – Model-Based Clustering Methods – Clustering High Dimensional Data- Constraint based Cluster Analysis – Introduction to outlier analysis -Data Mining Applications.

Text Books

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques‖, 3rd Edition, Elsevier, 2012.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.

Reference Books

1. Gupta G.K., —Introduction to Data Mining with Case Studies‖, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Charu C. Aggarwal, Data Mining: The Textbook‖, Kindle Edition, Springer, 2015.
3. Margret H. Dunham, Data Mining: Introductory and Advanced Topics‖, 17th Edition, Pearson, 2013.

Web References

1. www.cs.waikato.ac.nz/ml/weka

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITT54	NETWORK SECURITY	3	0	0	3	45

Course Objectives

- To provide students with contemporary knowledge in Cryptography and Security and various threats and attacks in a network
- To introduce fundamental concepts of symmetric and asymmetric cipher model.
- To know the concepts of Key management techniques and Cryptographic Hash algorithms
- To understand the various authentication schemes and system control mechanisms
- To understand necessary approaches and techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes

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

CO1 - Classify cryptographic techniques using a mathematical approach by examining nature of attack. **(K2)**
CO2 - Apply the different cryptographic operations using public and private key cryptography **(K3)**
CO3 - Summarize solutions for effective key management distribution and maintain message integrity **(K2)**
CO4 - Identify and use appropriate algorithms for assuring System security and authentication. **(K3)**
CO5 - Outline the security requirements and solutions for wireless networks and distributed systems. **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Security Attack - Non-cryptographic Protocol Vulnerabilities - Software Vulnerabilities - The need for security - Security services - Security Mechanisms- Classical encryption: Classical Techniques

UNIT II SYMMETRIC AND ASYMMETRIC CIPHER **(9 Hrs)**

Symmetric Ciphers: Symmetric and asymmetric cryptography- Key size and Key Range- DES - Triple DES -AES - Blowfish - RC5- Pseudorandom Number Generators - Asymmetric Ciphers: RSA Algorithms - Security of RSA - Knapsack Algorithm - Differential and Linear Cryptanalysis-Number Theory

UNIT III KEY MANAGEMENT AND DATA INTEGRITY ALGORITHMS **(9 Hrs)**

Diffie Hellman key exchange -Elgamal Cryptographic System - Elliptic Curve Arithmetic - Elliptic Curve Cryptography - Cryptographic Hash Functions: Secure Hash Algorithm (SHA-1) -Message authentication codes: HMAC.

UNIT IV AUTHENTICATION **(9 Hrs)**

Digital Signatures -Elgamal Digital Signature Scheme - NIST Digital Signature Algorithm - Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature - Biometric Authentication – Kerberos - X.509 Authentication Service - Public Key Infrastructure.

UNIT V NETWORK AND WIRELESS SECURITY'S **(9 Hrs)**

Email Security: Pretty good privacy – S/MIME-IP Security - Web Security: SSL/ Transport Layer Security - Secure electronic transaction (SET) –System Security- Firewalls design principles. Intrusion detection System - Virtual Private Networks - Wireless security: IEEE 802.11 overview and its security – WEP - WPA.
Case Studies: Snort and Stenographic tools - Bit coin and Crypto currency system.

Text Books

1. William Stallings, "Cryptography & Network Security- Principles and Practices",Pearson Publishers, Seventh Edition, 2017.
2. AtulKahate, "Cryptography and Network Security",McGraw Hill, 3rd Edition, 2011.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger , "Security in computing", Prentice Hall of India,Fifth Edition,2015.

2. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: PRIVATE Communication in a PUBLIC World", Prentice Hall, ISBN 0-13-046019-2
3. Wenbo Mao, "Modern Cryptography: Theory and Practice",Prentice Hall PTR, First Edition,2003.
4. William Stallings, "Network Security Essentials: Applications and Standards",Prentice Hall, Fourth Edition 2007.
5. Douglas R. Stinson, "Cryptography: Theory and Practice",CRC press, Third Edition,2006.

Web References

1. https://www.coursera.org/learn/crypto
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.html

COs/POs/PSOs Mapping

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

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

U19ITP51	MOBILE COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the components and structure of mobile application development.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.
- To develop a new Mobile Application.

Course Outcomes

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

CO1 - Develop mobile applications using GUI and Layouts. **(K3)**

CO2 - Develop mobile applications using Event Listener. **(K3)**

CO3 - Develop mobile applications using Databases. **(K3)**

CO4 - Develop mobile applications using RSS Feed, SMS, Multithreading and GPS. **(K3)**

CO5 - Analyze and discover own mobile app for simple needs. **(K4)**

LIST OF EXPERIMENTS

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

Reference Books

1. Build Your Own Security Lab, Michael Gregg, Wiley India, 2012

Web References

1. http://www.edutechlearners.com/mobile-computing-lab-manual/

COs/POs/PSOs Mapping

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

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

U19ITP52	DATA WAREHOUSING AND DATA MINING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To perform data mining tasks using a data mining toolkit (such as open source WEKA).
- To understand the data sets and data pre-processing.
- To demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression.
- To work with data mining techniques with varied input values for different parameters.
- To obtain Practical Experience Working with all real data sets.

Course Outcomes

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

CO1 - Understand the various kinds of tools. **(K1)**
CO2 - Demonstrate the classification, clustering and etc. in large data sets. **(K3)**
CO3 - Apply mining algorithms as a component to the exiting tools. **(K3)**
CO4 - Apply mining techniques for realistic data. **(K3)**
CO5 - Explore hands-on experience working with all real data sets. **(K3)**

LIST OF EXPERIMENTS

1. Explore various commands given in PL/SQL in Oracle 8.0
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc.
4. Implementation of Text Mining on the data warehouse
5. Explore the correlation-ship analysis between the data set
6. Evaluate attribute relevance analysis on a weather data warehouse
7. Evaluate Information Gain of an attribute in the student database
8. Experiment to predict the class using the Bayesian classification
9. Find out a weight & bias updating using the Back Propagation Neural Network
10. To perform various data mining algorithms on the give data base using WEKA

Reference Books

1. Ramesh Sharda, Dursun Delen, David King Business Intelligence, 2/E; Efraim Publisher Turban,pearson Education, 2011.
2. Berry, Gordon S. Linoff, "Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management", John Wiley & Sons Inc publishers, 3 rd Edition, 2011.
3. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques" 3rd edition ,Morgan Kaufmann, 2012.

Web References

1. www.cs.waikato.ac.nz/ml/weka

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	2	1	1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
CO3	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3
CO5	3	2	1	1	3	3	3	3	3	3	3	3	3	3	3

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

U19ITP53	NETWORK SECURITY LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn different cipher techniques
- To implement the algorithms DES, RSA,SHA-3
- To implement the authentication algorithms.
- To develop a digital signature scheme using Digital signature standard.
- To use network security tools and vulnerability assessment tools

Course Outcomes

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

CO1 - Develop code for classical Encryption Techniques to solve the information security problems. **(K3)**
CO2 - Build cryptosystems by applying symmetric and public key encryption algorithms. **(K3)**
CO3 - Construct code for key exchange and message authentication algorithms. **(K3)**
CO4 - Develop a digital signature scheme using Digital signature standard. **(K3)**
CO5 - Demonstrate the network security system using open source tools, Snort, Net Stumbler KF Sensor. **(K3)**

LIST OF EXPERIMENTS

- Implement the following substitution & transposition techniques:
  a. Caesar Cipher
  b. Playfair Cipher
  c. Hill Cipher
  d. Vigenere Cipher
  e. Rail fence-row & Column Transformation
- Apply DES algorithm for practical applications.
- Implement RSA Algorithm for public key cryptography
- Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
- Design a method to simulate the HTML injections and cross-site scripting (XSS) to exploit the attackers.
- Implementation of RSA based signature system using Digital signature standard
- Calculate the message digest of a text using the SHA-3 algorithm
- Learn to install Virtual Box or any other equivalent software on the host OS
- Demonstrate how to provide secure data storage, secure data transmission and f,or creating digital signatures (GnuPG).
- Setup a honey pot and monitor the honeypot on network (KF Sensor)
- Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)
- Demonstrate intrusion detection system (IDS) using Snort Tool

Text Books

1. Michael Gregg,Build Your Own Security Lab: A field guide for network Testing, Wiley,India edition, ISBN: 9788126516919.

Reference Books

1. Arthur Cobnklin, 'Principles of Computer Security CompTIA Security+ and Beyond', Greg White 5th Edition,2018,McGraw-Hill Education

Web References

1. https://www.coursera.org/learn/crypto
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.html

COs/POs/PSOs Mapping

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

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

U19ITT61	ARTIFICIAL INTELLIGENCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Study the Concepts of Artificial Intelligence.
- To learn the methods of solving problems using Artificial Intelligence.
- To introduce the concepts of Expert Systems and machine Learning.
- To identify problems that is amenable to solve by AI methods.
- To identify appropriate AI methods to solve a given problem.

Course Outcomes

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

CO1 - Recognize appropriate search algorithms for any AI problem **(K2)**
CO2 - Describe a problem propositional and predicate logic **(K2)**
CO3 - Apply the APT agent strategy to solve a given problem **(K3)**
CO4 - Use various Planning and Learning strategies to solve a problem **(K3)**
CO5 - Construct applications for NLP that uses Artificial Intelligence **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction: Introduction to Artificial Intelligence-History of AI- AI Techniques - Data Acquisition and Learning Aspects in AI - Typical Intelligent Agents - General Search algorithm – BFS- A* Search- AO* Search- Memory Bounded Heuristic Search.

UNIT II KNOWLEDGE AND REASONING – I **(9 Hrs)**

Knowledge Representation: Knowledge Representation-Knowledge based Agents - Propositional Logic-Predicate Logic-Unification and Lifting - Forward Chaining-Backward Chaining – Representing Knowledge using Rules-Semantic Networks - Frame Systems

UNIT III KNOWLEDGE AND REASONING – II **(9 Hrs)**

Reasoning Under Uncertainty: Inference - Probabilistic inference - Types of Reasoning- Expectation Maximization - Bayesian networks - Hidden Markov models - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV PLANNING **(9 Hrs)**

Planning and Learning: Planning Problem – Simple Planning agent - Planning as a State space Search - Knowledge based Planning - Blocks world - Execution Monitoring and Re-planning-Continuous Planning-Multi-agent Planning-Job shop Scheduling Problem - Overview of different forms of learning- Learning Decision Trees, Neural Networks.

UNIT V APPLICATIONS **(9 Hrs)**

Applications and Game Playing: Prolog Programming - Natural Language Processing - Speech Recognition – Robot – Hardware – Perception - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games - Case study in AI Applications

Text Books

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education 2013.
3. Patrick Henry Winston, "Artificial Intelligence", 3rd edition Pearson Education, Inc., 2001.

Reference Books

1. Bratko, Prolog,"Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

2. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.
3. Rajendraakerkar, "Introduction to Artificial Intelligence", prentice hall of India, 2005.

Web References

1. https://www.ailab.com.au/resources/online-resources/https://www.allaboutcircuits.com/video-tutorials/transistors/
2. https://aaai.org/Resources/resources.php https://nptel.ac.in/courses/117/106/117106091/
3. https://nptel.ac.in/courses/106/105/106105077/

COs/POs/PSOs Mapping

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

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

U19ITT62	IOT AND EDGE COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Introduce the basic of IoT and various domains that utilize IoT
- Understand the concepts of management of IOT systems that leads to platform design
- Identify various physical devices , endpoints and servers used in IOT
- Infer the role of Data Analytics & security in IT
- Explore various tools and developIoT design for certain Applications.

Course Outcomes

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

CO1 - Explain the basic concepts of IOT and distinguish between IOT & M2M. **(K2)**

CO2 - Explore IoT system Management leading to platform design. **(K2)**

CO3 - Recognize IoT Devices and connect them to cloud servers. **(K2)**

CO4 - Illustrate the use of Data analytics and need for security in IoT. **(K3)**

CO5 – Identify the IoT tools and explore to create a real time example **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction :Definition and Characteristics of IoT - Physical Design of IoT - Things in IoT - Logical Design of IoT - IoT Communication Models - IoT Communication APIs - IoT Enabling Technologies. IoT Levels and deployment template. Domain specific IoTs – IoT and M2M - Introduction to M2M - Difference between IoT and M2M - SDN and NFV for IoT

UNIT II SYSTEM MANAGEMENT AND PLATFORM DESIGN **(9 Hrs)**

Need for IoT Systems Management- SNMP- Network Operator Requirements NETCONF - YANG- IoT System Management with NETCONF-YANG.

IoT Platforms Design Methodology - Case study on Weather Monitoring.

UNIT III DEVICES END POINTS AND SERVERS **(9 Hrs)**

IoT Physical Devices and Endpoints: Basic building blocks - Exemplary Device: Raspberry Pi andArduino – interfaces - Programming with python- Python Packages for IOT- other devices: pcDuino -BeagleBone Black - Cubieboard. IoT physical servers and cloud offerings.

UNIT IV DATA ANALYTICS AND SECURITY OF IOT **(9 Hrs)**

Data and Analytics for IoT: An Introduction to Data Analytics for IoT- Big Data Analytics Tools and Technology Edge Streaming Analytics-Network Analytics

Securing IoT- A Brief History of IOT Security - Common Challenges in OT Security - Security Practices and Systems Variation-Formal Risk Analysis Structures: OCTAVE and FAIR- Phased Application of Security in an Operational Environment.

UNIT V TOOLS FOR IOT AND CASE STUDIES **(9 Hrs)**

Tools- CHEF- CHEF Case Study, PUPPET. **Case studies Illustrating IOT design:** Home Automation Environment – Agriculture - Productivity Application IoT in Industry: Smart and Connected Cities-Transportation-Public Safety.

Text Books

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things, A Hands -on Approach", 1st Edition 2015, University Press, ISBN: 978-81-7371- 954-7
2. Oliver Hersent, David Boswarthick, Omar Elloumy, "The Internet of Things",1st Edition, 2017,ISBN: 978-81-265-5686-1

Reference Books

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, —"Architecting the Internet of Things", Springer, 2011.
2. Donald Norris, —"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", Mc.Graw Hill, 2015.

3. CunoPfister, —"Getting Started with the Internet of Things", O'Reilly Media, Inc.,2011
4. Olivier Hersent, David Boswarthick, Omar Elloumi, —"The Internet of Things,Key applications and Protocols", Wiley, 2012
5. Dieter Uckelmann et.al, —"Architecting the Internet of Things", Springer, 2011.

Web References

1. https:\\www.abouttheInternetofThings.com

COs/POs/PSOs Mapping

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

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

U19ITT63	DESIGN THINKING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To make use of practical design thinking methods in every stage of problem with the help of method templates.
- To apply design thinking to a problem in order to generate innovative and user-centric solutions.
- To empathize with end user and initiate a new working culture based on user-centric approach.
- To prototype and run usability tests for unbiased examination of the product in order to identify problem areas.
- To come up with exposure to design thinking for designing innovative products.

Course Outcomes

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

CO1 - Explain the fundamentals of Design Thinking and innovation. **(K2)**
CO2 - Empathize and analyze model action plan. **(K2)**
CO3 - Describe the principles of innovation and idea generation for product design. **(K2)**
CO4 - Apply design thinking techniques for given tasks. **(K3)**
CO5 - Apply the design thinking techniques for solving problems in various sectors. **(K3)**

UNIT I INTRODUCTION TO DESIGN **(9 Hrs)**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design - Introduction to design thinking - history of Design Thinking - New materials in Industry.

UNIT II DESIGN THINKING **(9 Hrs)**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development.

UNIT III INNOVATION AND PRODUCT DESIGN **(9 Hrs)**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications.

UNIT IV DESIGN THINKING FOR STRATEGIC INNOVATION **(9 Hrs)**

An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Startups.

UNIT V DESIGN THINKING IN VARIOUS SECTORS **(9 Hrs)**

Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results.

Text Books

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design thinking in the Class Room by David Lee, Ulysses press.
3. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall

Reference Books

1. Design the Future , by Shrrutin N Shetty , Norton Press
2. Universal principles of design- William lidwell, kritina holden, Jill butter.
3. The era of open innovation – chesbrough.H

Web References

1. https://drive.google.com/file/d/1cplqb1eOWnoNMhFWNP8TyYLF2qHdGY_K/view
2. https://nptel.ac.in/courses/110/106/110106124/#

COs/POs/PSOs Mapping

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

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

U19ITT64	BLOCK CHAIN TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concepts of block chain.
- To learn about Bitcoin, Cryptocurrency.
- To explore the concepts of Ethereum.
- To learn about Hyperledger Fabric model and its architecture.
- To integrate ideas from block chain technology into projects.

Course Outcomes

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

CO1 - Understand the basic concepts of Block Chain Technologies. **(K1)**
CO2 - Explain the functional /operational aspects of Cryptocurrency Ecosystem. **(K2)**
CO3 - Develop application using Ethereum. **(K5)**
CO4 - Compute models for Block Chain Technology. **(K3)**
CO5 - Illustrate Blockchain with IoT and track the emerging trends in Blockchain. **(K3)**

UNIT I INTRODUCTION TO BLOCK CHAIN **(9 Hrs)**

Block Chain - History of Block Chain – Types of Block Chain – Consensus – CAP Theorem and Block Chain – Decentralization using Block Chain – Block Chain and full ecosystem decentralization – Platforms for decentralization.

UNIT II INTRODUCTION TO CRYPTOCURRENCY **(9 Hrs)**

Bitcoin – Digital keys and addresses – Transactions – Mining – Bitcoin Network and Payments – Wallets – Bitcoin Payments Alternative coins – Theoretical Foundations - Bitcoin limitations – Name coin – Lite coin – Prime coin – Zcash – Smart contracts – Ricardian contracts.

UNIT III ETHEREUM **(9 Hrs)**

Introduction – Ethereum network – Components of the Ethereum ecosystem – Programming Languages – Ethereum Development Environment – Development Tools and Frameworks. **Illustrative:** Setup the Ethereum development environment.

UNIT IV WEB3 AND HYPERLEDGER **(9 Hrs)**

Introduction to Web3 – Contract Deployment – Development Frameworks – Hyperledger as a protocol – Reference Architecture – Hyperledger Fabric - Sawtooth Lake – Corda. **Illustrative:** Creating and deploying a business network on Hyperledger Composer Playground, Implementation of business network in Blockchain using Hyperledger Fabric.

UNIT V BLOCK CHAIN APPLICATIONS **(9 Hrs)**

IoT with Block Chain – Block Chain based voting system - Border Control – Medical Record Management System - Alternative Blockchains – Kadena – Ripple – Rootstock – Quorum - Scalability – Privacy – Other Challenges.

Text Books

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.

Reference Books

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies by Andreas M. Antonopoulos.
2. Mastering Ethereum: Building Smart Contracts and DApps by Andreas M. Antonopoulos, 1st Edition.
3. Building Blockchain Projects by Narayan Prusty, 2017.

Web References

1.https://developer.ibm.com/technologies/blockchain/
2.https://www.edx.org/course/introduction-to-hyperledger-blockchain-technologie/
3.https://nptel.ac.in/courses/106104220/blockchain technology and applications/
4.https://blockgeeks.com/

COs/POs/PSOs Mapping

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

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

U19ITP61	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To study the concepts of Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence.
- To introduce the concepts of Expert Systems and machine learning.
- To identify problems that is amenable to solve by AI methods.
- To identify appropriate AI methods to solve a given problem.

Course Outcomes

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

CO1 - Identify appropriate idealizations for converting real world problems into AI search problems. **(K2)**

CO2 - Analyze and formalize the given search problem. **(K2)**

CO3 - Explain proofs in first order and propositional logic. **(K2)**

CO4 - Choose and implement appropriate learning algorithms for supervised learning problem. **(K3)**

CO5 - Describe the basic construction of Turing machine and its recursive languages and functions. **(K2)**

LIST OF EXPERIMENTS

1. Study of PROLOG. Write the following programs using PROLOG
2. Write a program to solve 8 queens problem
3. Solve any problem using depth first search.
4. Write a program to solve the Monkey Banana problem
5. Write a program to solve water jug problem using LISP
6. Solve any problem using best first search.
7. Solve 8-puzzle problem using best first search
8. Solve Robot (traversal) problem using means End Analysis
9. Solve traveling salesman problem.
10. WAP in turbo prolog for medical diagnosis and show the advantage & disadvantage of green and red cuts
11. Implementation of A* Search Algorithm
12. Implementation of AO* Search Algorithm
13. Implementation of Wumpus World Problem
14. Implementation of Decision Tree Learning

Text Books

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education 2013.

Reference Books

1. Bratko, —Prolog: "Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2. David L. Poole and Alan K. Mackworth, - "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.
3. RajendraAkerkar, "Introduction to Artificial Intelligence", Prentice hall of India, 2005.
4. Patrick Henry Winston, "Artificial Intelligence", 3rd edition Pearson Education, Inc., 2001.

Web References

1. https://www.ailab.com.au/resources/online-resources/
2. https://aaai.org/Resources/resources.php
3. https://nptel.ac.in/courses/106/105/106105077/

COs/POs/PSOs Mapping

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

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

U19ITP62	IOT AND EDGE COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To provide an Introduction about basic command of Rasberry pi working in Linux terminal.
- To demonstrate about interfacing various sensors with raspberry pi.
- To explore Rasberry Pi and IoT Tool Kits.
- To explore Arduino tool kit.
- Enable the students to do a mini project.

Course Outcomes

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

CO1 - Explain basic commands of Rasberry pi. **(K2)**
CO2 - Understand the basics commands of Rasberry pi. **(K2)**
CO3 - Apply basic connectivity of sensors with Rasberry pi. **(K3)**
CO4 - Use basic connectivity of sensors with Arduino. **(K3)**
CO5 - Develop a mini project in IoT. **(K6)**

LIST OF EXPERIMENTS

1. Start Raspberry Pi and try various Linix commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division.Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name 'n' times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds.Read a file line by line and print the word count of each line.
3. Light an LED through Python program.Get input from two switches and switch on corresponding LEDs. Flash the LED at a given on time and off time cycle, where the two times are taken from a file and also Flash an LED based on cron output (acts as an alarm)
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Access images through a Pi web cam and verify whether any animal is entering a farm or similar region.
6. Control a light source using web page.
7. Use sensors to measure the vital signs of human and store it in a database.
8. Use appropriate sensors to find out the climate of a particular region
9. Implement an intruder system that sends an alert to the given email.
10. Get the status of a bulb at a remote place (on the LAN) through web.
11. Get an alarm from a remote area (through LAN) if smoke is detected.
12. Implement a fall alarm for an elder person and inform to his caretaker through mobile.

Any one mini project with team of two: (sample given below)

- Smart irrigation system
- Traffic control system
- Healthcare application
- Smart Home system

Reference Books

1. CunoPfister, —"Getting Started with the Internet of Things", O'Reilly Media, Inc., 2011.
2. Donald Norris, —"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", Mc.Graw Hill, 2015.

Web References

1. https:\\www.electronicsforu.com/iot-project-ideas.

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

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

U19ITP63	CREATIVE INNOVATIVE PROJECT LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the software engineering concepts practically with CASE Tools
- To learn the modelling concepts for an application
- To practice object oriented analysis and design concepts
- To understand mapping of design to code
- To demonstrate the testing concepts

Course Outcomes

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

CO1 - Select appropriate software engineering models and techniques with relevance to application. **(K2)**

CO2 - Apply UML diagrams to an application/ project **(K3)**

CO3 - Identify project management techniques for a project **(K2)**

CO4 - Use design patterns to implementation constructs **(K3)**

CO5 - Generate and develop test cases for a project **(K5)**

LIST OF EXPERIMENTS

1. Study of case tools such as rational rose or equivalent tools like Argo UML, Visual suite, SDE for Eclipse / IBM Websphere etc.
2. Problem Identification and defining Problem statement
3. Requirements Implementation of requirements engineering activities such as elicitation, validation, management and prepare SRS document
4. OO Analysis – Identify scenarios and Identify Use Cases and develop the Use Case model
5. Using the identified scenarios find the interaction between objects and represent them using UML Sequence diagrams. Draw relevant state charts and activity diagrams.
6. Study and usage of software project management tools such cost estimates and scheduling
7. Identify appropriate software architecture style and design modeling and prepare Design document
8. Documentation of the complete modeling practice using software engineering paradigms
9. Data modeling using automated tools.
10. Applying design patterns during implementation
11. Exposure towards test plan generators, test case generators, test coverage and software metrics.

Application Domain: Agriculture – Education - Health care - Digital Marketing - online shopping - Banking and finance - Smart cities - Travel.
Preferred SOFTWARE TOOLS: 30 user Licensed Rational Suite
Open Source Alternatives: ArgoUML

Web References

1. www.uml.org
2. www.holub.com/goodies/uml

COs/POs/PSOs Mapping

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

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

U19ITT71	CLOUD COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To familiarize the basics of cloud computing
- To understand the importance of cloud computing mechanisms
- To understand virtualization concepts and Xen Hypervisor architecture
- To develop knowledge about different cloud platforms
- To understand the advancements in cloud.

Course Outcomes

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

CO1 - Articulate the main concepts, key technologies, strengths and limitations of cloud computing. **(K2)**
CO2 - Identify the architecture, infrastructure and security mechanism of cloud computing. **(K2)**
CO3 - Summarize the core issues of virtualization and implement the levels of virtualization. **(K2)**
CO4 - Choose the appropriate cloud platforms for applications to be developed. **(K2)**
CO5 - Illustrate the Working of Energy efficiency and third party cloud services. **(K2)**

UNIT I CLOUD COMPUTING BASICS **(9 Hrs)**

Cloud Computing Overview, Applications - Intranets and the Cloud - Hybrid Clouds - Cloud Delivery Models: IaaS – PaaS -SaaS - Open Source Private Cloud Software: Eucalyptus - Open Nebula - Open Stack.

UNIT II CLOUD COMPUTING MECHANISM **(9 Hrs)**

Cloud Infrastructure Mechanism: Cloud Storage - Cloud Usage Monitor - Resource Replication - Specialized Cloud Mechanism: Load Balancer - SLA Monitor - Pay-per-use Monitor - Audit Monitor - Failover System – Hypervisor - Resource Cluster - Multi Device Broker - State Management Database. Cloud Security Mechanism: Hashing - Digital Signature and Identity and Access Management.

UNIT III VIRTUALIZATION **(9 Hrs)**

Virtualization - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Life cycle of VM -Virtualization and Cloud Computing - Pros and Cons of Virtualization - Implementation Levels of Virtualization - Tools and Mechanisms: Xen –VMWare - Microsoft Hyper-V.

UNIT IV CLOUD PLATFORMS IN INDUSTRY **(9 Hrs)**

Amazon Web Services - Compute, Storage and Communicate services - Google App Engine - Architecture and Application life cycle - Microsoft Azure - SQL Azure, Azure Platform Appliance.

UNIT V ADVANCEMENTS IN CLOUD **(9 Hrs)**

Energy efficiency in clouds - Market-based management of clouds - Federated clouds/Inter-Cloud - Third-party cloud services

Text Books

1. Raj Kumar Buyya, Christian Vecchiola, S.ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill Education; First edition July 2017.
2. Thomas Erl, ZaighamMahood, Ricardo Puttini,"Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2013.
3. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.

Reference Books

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010.
2. Nikos Antonopoulos, Lee Gillam, "Cloud Computing: Principles, Systems and Applications", Springer, 2012.

3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010.
4. Matthew Portney, "Virtualization Essentials", John Wiley and Sons, 2012
5. Anthony T. Velte, Robert Elsenpeter,"Cloud Computing: A Practical Approach", Mc Graw Hill, 2009

Web References

1. https://www.ibm.com/cloud/computing.

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

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

U19ITT72	DATA SCIENCE AND ANALYTICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To gain knowledge about the concepts involved in data analytics.
- To discover insights in data using R programming.
- To summarize the operations involved in Hadoop Map Reduce.
- To make use of algorithms related to regression and classification.
- To examine data using time series analysis and text analysis

Course Outcomes

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

CO1 - Experiment with data analytics using R language. **(K3)**

CO2 - Demonstrate clustering algorithms and association rules. **(K2)**

CO3 - Use algorithms related to regression and classification. **(K3)**

CO4 - Examine data using time series analysis and text analysis. **(K2)**

CO5 - Utilize Hadoop platform to solve map reduce problems. **(K3)**

UNIT I DATA ANALYTICS USING R **(9 Hrs)**

Big Data Overview- Big Data Vs Data Science -Examples of Big Data Analytics-Data Analytics Lifecycle overview-Phases in the lifecycle-GINA Case Study-Introduction to R programming-Exploratory Data Analysis-Statistical Methods for Evaluation.

UNIT II REGRESSION AND CLASSIFICATION **(9 Hrs)**

Scope of Regression Techniques-Linear Regression-Logistic Regression-Additional Regression models-Scope of Classification Techniques-Decision Trees-Naïve Bayes-Diagnostics of Classifiers-Additional Classification Methods-Applications: Prediction of crop yield

UNIT III CLUSTERING AND ASSOCIATION RULES **(9 Hrs)**

Overview of clustering-Scope of Clustering Techniques- K Means clustering- Additional Algorithms- Clustering in practise: Fake news identification-Overview of Association rules-Apriori Algorithm-Evaluation of Candidate Rules-Applications of Association Rules-An Example: Transactions in a grocery store-Validation and Testing-Diagnosis

UNIT IV TIME SERIES ANALYSIS AND TEXT ANALYSIS **(9 Hrs)**

Overview of Time Series Analysis-ARIMA Model-Additional Methods-Text Analysis Steps-A Text Analysis Example-Collecting Raw Text-Representing Texts-TFIDF-Categorizing documents by topics-Determining Sentiments-Gaining Insights.

UNIT V HADOOP MAP REDUCE AND DATA ANALYTICS **(9 Hrs)**

Installing and Understanding Hadoop-HDFS and Map Reduce Architecture-Hadoop Map Reduce Example-Hadoop Map Reduce in R-Data Analytics Problems: Exploring web pages categorization - Computing the frequency of stock market change-Real Time Recommender model using Apache Spark.

Text Books

2. David Dietrich, Barry Heller and Beibei Yang, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, Reprint 2015, Wiley, ISBN: 9788126556533.
3. VigneshPrajapathi, "Big Data Analytics with R and Hadoop", Packt Publishing, 2013, Birmingham, Mumbai.

Reference Books

2. Roger D. Peng, "R Programming for Data Science", LeanPub, 2015.
3. Bart Baesens , "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding opportunities in Huge DataStreams with Advanced Analytics", John Wiley & sons, 2012.

Web References

1. www.ibm.com/Data Analytics/
2. https://www.ijser.org/researchpaper/Importance-of-Clustering-in-Data-Mining.pdf
3. https://datafloq.com/read/7-innovative-uses-of-clustering-algorithms/6224
4. https://publications.waset.org/10011058/improving-fake-news-detection-using-k-means-and-support-vector-machine-approaches
5. https://statisticsbyjim.com/regression/when-use-regression-analysis/

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

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

U19ITP71	BUSINESS BASICS FOR ENTREPRENEURS	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To develop a clear understanding on Business Plans and their significance.
- To be familiar with various forms of business appropriate for an individual entrepreneur
- To understand various ways of judging a successful opportunity for an entrepreneur
- To know the ways to formulate a successful Operation Plan
- To be aware of things to know to prepare effective financial and marketing plans

Course Outcomes

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

CO1 - Impact comprehensive knowledge of an entrepreneurial ecosystem. **(K6)**

CO2 - Understand the need and significance of Business Plan in the success of an Enterprise. **(K2)**

CO3 - Understand the ways to judge the economic and business viability of proposed venture. **(K2)**

UNIT I: THE ENTREPRENEURIAL PERSPECTIVE **(10 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 **(10 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 **(10 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

Reference Books

1. Friend, G., & Zehle, S. (2004). *Guide to business planning*. Profile Books Limited.
2. Lasher, W. (2010). *The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your bus iness*. Broadway Books.
3. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
4. Arthur R. DeThomas – Writing a Convincing Business Plan.
5. Ben Horowitz – The Hard Thing About Hard Things.
6. Guy Kawasaki – The Art of Start 2.0
7. 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/

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

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

U19ITP72	CLOUD COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To develop and install Virtual Machine.
- To develop cloud based web applications.
- To familiarize the basics of Cloud Platforms and services.
- To learn the design and development process involved in creating a cloud based application.
- To learn and use parallel programming using Hadoop.

Course Outcomes

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

CO1 - Configure various virtualization tools such as Virtual Box, VMware workstation. **(K5)**

CO2 - Design and deploy a web application in a PaaS environment. **(K6)**

CO3 - Simulate a cloud environment to implement new schedulers. **(K6)**

CO4 - Install and use a generic cloud environment that can be used as a private cloud. **(K6)**

CO5 - Manipulate large data sets in a parallel environment. **(K2)**

LIST OF EXPERIMENTS

1. Install Virtual box/VMware Workstation with windows OS on top of windows8 and Higher.
2. Creating a Warehouse Application in SalesForce.com.
3. Install Google App Engine. Create hello world app and a simple web applications using python/java.
4. Simulate a cloud scenario using CloudSim and run a scheduling algorithm in CloudSim.
    i. Space Shared - Batch Process scheduling.
    ii. Time Shared - Round-Robin scheduling.
5. Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and Guest O.S.
6. Transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack/Amazon Web Service (Online Open stack/AWS Demo Version).
8. Installation and Configuration of Hadoop.
9. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
10. Case study on Paas(Facebook) and AWS.

Reference Books

1. Tim Cerfing, Jeff Buller, Chuck Enstall, Richard Ruiz, "Mastering Microsoft Virtualization", Wiley publications, 2010.

Web References

1. https://aws.amazon.com/getting-started/hands-on/launch-windows-vm/
2. https://cloud.google.com/appengine/docs/standard/nodejs/building-app/creating-project
3. https://www.cloudsimtutorials.online/cloudsim-simulation-toolkit-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	3	3	2	1	2	-	-	-	-	-	-	-	2	2	3
2	3	3	2	1	2	-	-	-	-	-	-	-	2	2	3
3	3	3	2	1	2	-	-	-	-	-	-	-	2	2	3
4	3	3	2	1	2	-	-	-	-	-	-	-	2	2	3
5	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3

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

U19ITP73	DATA SCIENCE LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To introduce the basic concepts of Machine Learning and Python / R.
- To apply supervised learning techniques.
- To implement unsupervised learning algorithms.
- To visualize the graphical models of machine learning algorithms.
- To implement advancement learning techniques.

Course Outcomes

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

CO1 - Elaborate program in Python / R for various Learning algorithms. **(K2)**
CO2 - Design and implement various machine learning algorithms in a range of real-world applications. **(K3)**
CO3 - Evaluate and interpret the results of Algorithms **(K5)**
CO4 - Explore graphical models of machine learning algorithms **(K4)**
CO5 - Summarize the various learning techniques. **(K2)**

LIST OF EXPERIMENTS

1. Study and usage of python and R language.
2. Explore the packages required for machine learning including numpy, scikit-learn, and matplotlib and pgmpy.
3. Implement FIND-S algorithm, for finding the most specific hypothesis.
4. Implement Regression to predict the house price from training data. The input variables will be locality, size of a house, etc.
5. Implement SVM for any Dataset.
6. Implement the Decision Tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
7. Implement EM algorithm to cluster a set of data stored in a file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
8. Implement the Naive Bayesian classifier for a sample training data set.
9. Implement Naive Bayes classifier for credit card analysis.
10. Implement HMM for an application.
11. Implement bagging and boosting techniques
12. Implement reinforcement learning and develop a game of your own.

Data Sets: https://www.kaggle.com and http://archive.ics.uci.edu/ml/datasets.html

Reference Books

1. EthemAlpaydin, —Introduction to Machine Learning 3E (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014.
3. Stephen Marsland, —Machine Learning – An Algorithmic Perspectivell, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
4. Tom M Mitchell, —Machine Learningll, First Edition, McGraw Hill Education, 2013.

Web References

1. https://towardsdatascience.com/machine-learning/home/
2. https://www.geeksforgeeks.org /machine-learning/

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

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

U19ITP74	COMPREHENSIVE VIVA VOCE	L	T	P	C	Hrs
		0	0	2	1	30

The students will be tested for their understanding of subjects of study in the curriculum from 1st semester to 7th semester. A comprehensive examination, preferably with objective type questions, will be conducted and evaluated the performance of the students for 50 marks. A comprehensive viva voce examination will be conducted for 50 marks with one internal examiner and one external examiner.

Upon completion of the course, the students will be in a position to

- To grasp all the subjects they have learnt related to IT so far.
- face the placement tests conducted for the campus recruitment

U19ITW71	PROJECT PHASE-I	L	T	P	C	Hrs
		0	0	4	2	60

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.
- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - State the problem definition clearly. **(K3)**
CO2 - Prepare SRS for projects. **(K3)**
CO3 - Prepare SDS for projects. **(K3)**
CO4 - Develop presentation skills. **(K3)**
CO5 - Develop project management skills. **(K3)**

EXCERCISES

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

1. Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

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

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

U19ITW72	INTERNSHIP/INPLANT TRAINING	L	T	P	C	Hrs
		0	0	0	2	30

Students may undergo training or internship during summer / winter vacation at Industry/ Research organization / University (after due approval from the Mentor, Class advisor and Departmental Consultative Committee (DCC). In such cases, the internship/training should be undergone continuously (without break) in one organization. Normally no extension of time is allowed. However, DCC may provide relaxation based on the exceptional case. The students are allowed to undergo three to four weeks internship in established industry / esteemed institution during vacation period.

		L	T	P	C	Hrs
U19ITT81	C# AND .NET	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 learn the product development.

Course Outcomes

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

CO1 - Illustrate about MS.NET framework developed by Microsoft. **(K2)**
CO2 - Articulate and implement Applications with C#. **(K2)**
CO3 - Identify the interface for application development. **(K2)**
CO4 - Understand the .NET framework and deployment in the .NET. **(K2)**
CO5 - Explore Assemblies and Deployment in .NET enterprise applications. **(K2)**

UNIT - I INTRODUCTION **(9 Hrs)**

The .NET Framework - Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assemblies – Namespaces.

UNIT – II C# FUNDAMENTALS **(9 Hrs)**

C# class - object - string formatting - Types - scope - Constants - C# iteration - Control flow - Operators - Array - String - Enumerations - Structures - Custom namespaces. Programming constructs – value types and reference types – object oriented concepts – Encapsulation – Inheritance – polymorphism – Interfaces – collections – Multithreading.

UNIT - III GRAPHICS & WINDOW FORMS **(9 Hrs)**

Tool box controls – Container control – Menu – Tool bar – Tool tip Controls during design time – Event Handlers -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, 2009.
3. Keogh, "J2EE The Complete Reference", Tata McGraw-Hill, 2015.

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. Adrew Stellman and Jennifer Greene, Head First C#, Third Edition, O'Reilly, 2013.

Web References

1. https://www.c-sharpcorner.com/csharp-tutorials
2. 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
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2	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3
4	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3
5	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3

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

U19ITP81	ENTREPRENEURSHIP MANAGEMENT	L	T	P	C	Hrs
		0	0	2	1	30

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

Reference 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..
3. Brian Tracy – The Psychology of Selling.
4. Dale Carnegie – How to Win Friends & Influence People.
5. Robert Kiyosaki and Sharon Lechter – Rich Dad, Poor Dad.
6. Reid Hoffman – The Startup of You: Adapt to the Future, Invest in Yourself, and Transform Your Career.
7. Michael E. Gerber – The E-Myth Revisited.
8. Chris Guillebeau – The Art of Non-Conformity.
9. Eric Ries – The Lean Startup.
10. Kevin D. Johnson – The Entrepreneur Mind.

Web References

1. https://www.helpguide.org/articles/stress/stress-management.htm
2. https://bscdesigner.com/8-entrepreneurial-kpis.htm
3. https://www.inc.com/ilya-pozin/5-problems-most-entrepreneurs-face.html
4. https://www.inc.com/jessica-stillman/how-to-network-with-super-successful-people.html
5. https://www.entrepreneur.com/article/251603
6. https://seraf-investor.com/compass/article/understanding-crowdfunding

COs/POs/PSOs Mapping

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

U19ITW81	PROJECT PHASE-II	L	T	P	C	Hrs
		0	0	16	8	60

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.
- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - Use the techniques and skills for the project. **(K3)**

CO2 - Identify, formulate, and solve engineering problems. **(K3)**

CO3 - Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health care, safety and sustainability **(K4)**

CO4 - Develop presentation skills. **(K4)**

CO5 - Develop project management skills. **(K4)**

EXCERCISES

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

1. Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

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

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

U19ITE41	STORAGE TECHNOLOGIES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand about Backup, Business Continuity, and Disaster Recovery principles
- To understand basics of storage technologies
- To understand Storage devices principles including structure, host I/O processing, & front end connectivity.
- To understand Storage classes (SAN, NAS. CAS), interconnection protocols, and management principles
- To understand about Networked storage capabilities (Snaps, mirroring, virtualization)

Course Outcomes

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

CO1 - Know about various storage technologies. **(K1)**
CO2 - Search, retrieve and synthesize information from a variety of systems and sources. **(K2)**
CO3 - Evaluate systems and technologies in terms of quality, functionality, cost-effectiveness and adherence to professional Commands **(K4)**
CO4 - Integrate emerging technologies into professional practice. **(K3)**
CO5 - Develop and validate a test plan **(K3)**

UNIT I INTRODUCTION TO STORAGE TECHNOLOGY **(9 Hrs)**

Data proliferation and the varying value of data with time and usage - Sources of data and states of data creation - Data center requirements and evolution to accommodate storage needs. Overview of basic storage management skills and activities- The five pillars of technology- Overview of storage infrastructure components- Evolution of storage - Information Lifecycle Management concept.

UNIT II STORAGE SYSTEMS ARCHITECTURE **(9 Hrs)**

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure- components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols..

UNIT III NETWORKED STORAGE **(9 Hrs)**

DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments - elements, connectivity, & management, Storage Area Networks (SAN) - elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS) - elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, Content Addressable Storage (CAS) - elements, connectivity options, standards, and management principles, Hybrid Storage solutions

UNIT IV INTRODUCTION TO INFORMATION AVAILABILITY **(9 Hrs)**

Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques , Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis , Problem reporting, prioritization, and handling techniques

UNIT V STORAGE SECURITY **(9 Hrs)**

Importance of Information security, elements and attributes of security, Developing a storage security model (Restricting Access Path, Vulnerability Management, Understanding Vulnerabilities), Securing Data Storage (Storage Security domains, Risk assessment Methodology, Security elements, threats against applications, Controlling user access to data, threats again backup , recovery and archive).

Text Books

1. "Information Storage and Management", Wiley Publication, ISBN: 978-81-265-2147-0
2. "Building Storage Networks", Marc Farley Osborne, Tata McGraw Hill

Reference Books

1. "Storage Networks: The Complete Reference", Robert Spalding, Tata McGraw Hill

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

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

U19ITE42	COMPUTER VISION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Computer Vision focuses on development of algorithms and techniques to analyse and interpret the visible world around us.
- To understand the fundamental concepts related to multi-dimensional signal processing.
- To understand the fundamental concepts related to feature extraction.
- To understand the fundamental concepts related to pattern analysis.
- To understand the basics of Neural Networks and Convolutional Neural Networks.

Course Outcomes

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

CO1 - Recognize and describe both the theoretical and practical aspects of computing with images. **(K2)**
CO2 - Describe the foundation of image formation and filtering. **(K2)**
CO3 - Become familiar with the major technical approaches involved in multiple views and motion. **(K2)**
CO4 - Get an exposure on pattern analysis concepts. **(K3)**
CO5 - Build computer vision applications using the mentioned techniques and algorithms. **(K3)**

UNIT I IMAGE FORMATION AND FILTERING **(9 Hrs)**

Introduction to computer vision - Light, Color and Image Filtering - Convolution and Filtering - Image Enhancement, Restoration, Histogram Processing.

UNIT II FEATURE DETECTION AND MATCHING **(9 Hrs)**

Interest points and corners - Local image features - Model fitting, Hough Transform - RANSAC and transformations.

UNIT III MULTIPLE VIEWS AND MOTION **(9 Hrs)**

Stereo intro and Camera Calibration - Stereo Correspondence and Optical Flow - Background Subtraction and Modeling - Optical Flow, KLT – Spatio - Temporal Analysis - Dynamic Stereo - Motion parameter estimation.

UNIT IV PATTERN ANALYSIS **(9 Hrs)**

Clustering - K-Means, K-Medoids, Mixture of Gaussians - Classification - Discriminant Function, Supervised, Un-supervised, Semi-supervised – Classifiers - Bayes, KNN, ANN models - Dimensionality Reduction - PCA, LDA.

UNIT V DEEP LEARNING **(9 Hrs)**

Neural networks Basics and Convolutional Networks - Object Detectors Emerge in Deep Scene CNNs and Deeper Deep Architectures - Structured Output from Deep Networks - Unsupervised Learning and Colorization

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

Reference Books

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.https://www.microstrategy.com/us/resources/introductory-guides/data-visualization-what-it-is-and-why-we-use-it

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

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

U19ITE43	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the fundamentals of object modelling and activities in the different phases of the object-oriented development life cycle
- To understand the use of UML (Unified Modelling Language) for object oriented analysis
- To understand the use of UML (Unified Modelling Language) for object oriented Design.
- To gain knowledge on system development through domain and application analysis
- To provide an overview on system design concepts

Course Outcomes

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

CO1 - Understand the knowledge of object oriented concept and application of Unified Process **(K1)**
CO2 - Model for solving system modelling and design problem **(K2)**
CO3 - Identify various scenarios and use Object Oriented Analysis techniques **(K2)**
CO4 - Design and implement object oriented models using UML appropriate notations. **(K3)**
CO5 - Apply the concept of domain and application analysis for designing UML Diagrams **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Object oriented system development - object basics– Unified Process –OO Methodology, Unified Modelling Language (UML), and Introduction to modelling a Design technique

UNIT II OBJECT ORIENTED ANALYSIS **(9 Hrs)**

OO analysis - Use case diagram – UML Interaction diagram –Sequence diagram – Collaboration diagram – State machine diagram –Activity diagram – Introduction to state and interaction modelling

UNIT III OBJECT ORIENTED DESIGN **(9 Hrs)**

OO Design Process - UML Class diagrams – Component diagram – Object diagram – Deployment diagrams – Package diagram– Association – Aggregation and Composition User interface design – View layer classes – Access layer classes – Micro level processes – Design axioms

UNIT IV SYSTEM DESIGN1 – CONCEPTION, ANALYSIS AND MODELLING **(9 Hrs)**

System Conception: Devising a system concept; Domain Analysis and Application Analysis.
System Design -1: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy.

UNIT V SYSTEM DESIGN 2 –DESIGN, IMPLEMENTATION AND DESIGN PATTERNS **(9 Hrs)**

Handling boundary conditions; Setting the trade-off priorities; Common architectural styles or Patterns.; Class design and optimizing design Overview of implementation; Fine-tuning classes; Testing; Patterns and Architecture Design patterns: Pattern categories- Creational, structural and behavioural; Relationships between patterns; Pattern description. Illustration Using ATM Case Study.

Text Books

1. Ali Brahmi, Object Oriented Systems Development, Tata McGraw-Hill Education Pvt. Ltd., 2008. First edition.
2. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2 nd Edition, Pearson Education, 2005.
3. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.

Reference Books

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3 rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, 2004, O'reily Publications.

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

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

U19ITE44	AGILE METHODOLOGIES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of agile development and testing techniques.
- To understand the benefits and pitfalls of working in an agile team.
- To understand agile development and testing.

Course Outcomes

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

CO1 - Understand agile software development environments. **(K1)**
CO2 - Organize and work in agile teams with time management **(K2)**
CO3 - Understand agile approach to quality assurance **(K1)**
CO4 - Realize the roles in agile teams. **(K2)**
CO5 - Know the ethics in agile process **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction to Agile software development - Overview and objectives – Three perspectives on software engineering- Agile manifesto- Application- Data - Agile software development learning environments. Teamwork –Overview and Objectives- Role in Agile Teams - Implementation of the Role Scheme - Dilemmas in teamwork- Teamwork in learning environments..

UNIT II TIME MANAGEMENT **(9 Hrs)**

Customers and Users - Overview - The customer - The user- Customers and users in learning environments - Time - Overview and objectives- Time-related problems in software projects Tightness of software development methods- Sustainable pace- Time management of Agile projects- Time in learning environments..

UNIT III AGILE SOFTWARE MEASURES **(9 Hrs)**

Overview and objectives- Need of measures – Questions in measures -Measures in learning environments - Quality- Overview and objectives- The Agile approach to quality assurance- Test Driven Development- Measured TDD

UNIT IV AGILE METHODOLOGY **(9 Hrs)**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT -V AGILE PROCESSES **(9 Hrs)**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

Text Books

1. Orit Hazzan and Yael Dubinsky, "Agile Software Engineering", Springer-Verlag London Ltd., 2009.
2. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2012.

3. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

Reference Books

1. Thomas Stober, UweHansmann, "Agile Software Development: Best Practices for Large Software Development Projects", Springer-Verlag London Ltd., 2010.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.
3. Mike Cohn, "Succeeding with Agile : Software Development Using Scrum", Pearson Education, 2010
4. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.

Web References

1. http://www.scrumalliance.org/
2. https://www.coursera.org/specializations/agile-development
3. https://www.udemy.com/course/scrum-methodology/
4. http://www.atlassian.com/jira-software/agile
5. http://agilemanifesto.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	1	-	-	-	-	-	-	-	-	-	1	1	-	-	3
2	3	2	1	1	-	-	-	-	2	-	-	3	-	3	-
3	2	1	-	-	1	-	-	-	-	-	-	3	-	2	-
4	3	2	1	1	-	-	-	-	2	-	-	3	-	3	1
5	3	2	1	1	-	-	-	-	2	-	-	3	-	3	1

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

		L	T	P	C	Hrs
U19ITE45	**INFORMATION CODING TECHNIQUES**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To introduce information theory and channel capacity.
- To understand encoding and decoding of digital data streams and voice.
- To learn the various image and video compression techniques.
- To have a complete understanding of error–control coding.
- To introduce the concept of cryptography.

Course Outcomes

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

CO1 - Understand the notions of information and channel capacity **(K1)**
CO2 - Evaluate the compression and decompression techniques. **(K2)**
CO3 - Analyse the various concepts of Multimedia communication **(K3)**
CO4 - Analyse error correction and detection using linear block codes. **(K3)**
CO5 - Understand the basic concepts of cryptography. **(K1)**

UNIT I INFORMATION THEORY FUNDAMENTALS **(9 Hrs)**

Introduction to Information Theory – Uncertainty and Information – Entropy – Mutual Information – Source Coding Theorem – Kraft Inequality – Huffman Coding – Shannon Fano coding – Discrete Memoryless Channels - Channel Capacity and Coding. Illustrative Program: Huffman coding.

UNIT II DATA AND VOICE CODING **(9 Hrs)**

Introduction - Run length encoding- Arithmetic coding – Lempel Ziv algorithm – Pulse Code Modulation – Differential Pulse Code Modulation - Delta Modulation – Adaptive Delta Modulation – Coding speech at low bit rates - Vocoders – Linear Predictive Coding – Code Excited LPC – Perceptual Coding – Dolby AC-3.

UNIT III IMAGE AND VIDEO CODING **(9 Hrs)**

Introduction – Image Compression – GIF – TIFF – Digitized Documents – JPEG Standards – Video Compression Principles – Motion Compensation and Estimation – H.261 – MPEG Standards.

UNIT IV ERROR CONTROL CODING **(9 Hrs)**

Introduction – Single parity codes – Repetition codes – Linear Block Codes – Hamming Code– Cyclic codes – Syndrome calculation – CRC – BCH - Convolutional codes – Principle of Turbo Coding.

UNIT V CRYPTOGRAPHY **(9 Hrs)**

Introduction – Encryption techniques – Symmetric cryptography – Data Encryption Standard – Asymmetric Cryptography – RSA Algorithm – Pretty Good Privacy – DH Protocol - Introduction to Physical Layer Security: Information - Theoretic Secrecy, Secret Communication Over Noisy Channels, Secret - Key Generation from Noisy Channels, Cooperative jamming. Illustrative Program: RSA algorithm.

Text Books

1. Information Theory, Coding and Cryptography by Ranjan Bose, 3rd Edition, 2016.
2. Digital Communication Systems by Simon Haykin, Wiley India, 2013.
3. Physical Layer Security in Wireless Communications by Xiangyun Zhou, Lingyang Song, Yan Zhang, 1st Edition.

Reference Books

1. A Saha, N Manna and S Mandal, Information Theory, Coding and Cryptography, Pearson.
2. S Gravano, Error Control Codes, Oxford University Press
3. J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009.
4. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013. Lynn Langit, Foundations of SQL Server 2005 Business Intelligence, Apress, 2007

Web References

1. https://nptel.ac.in/courses/117101053/Information Theory and Coding/
2. https://www.elprocus.com/modulation-with-its-block-diagram/
3. https://www.geeksforgeeks.org/modulation techniques/

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

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

U19ITE51	SOFTWARE TESTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study the fundamentals and principles of software testing
- To learn few techniques of testing
- To software quality of the software products
- To analyse Risk management Strategies
- To apply appropriate tools to assess ongoing project performance

Course Outcomes

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

CO1 - Illustrate Manual Test cases for Software Project. **(K2)**
CO2 - Summarize the integration testing which aims to uncover interaction and compatibility problems as early as possible. **(K2)**
CO3 - Apply modern software testing processes in relation to software development and project management. **(K3)**
CO4 - Use automated testing tools. **(K3)**
CO5 - Outline and validate a test plan **(K2)**

UNIT I INTRODUCTION TO SOFTWARE TESTING **(9 Hrs)**

Testing as an Engineering Activity – Role of Process in Software Quality – Testing as a Process – Basic Definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support for Developing a Defect Repository

UNIT II TEST CASE DESIGN STRATEGIES **(9 Hrs)**

Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – White Box Approach to Test design – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing - Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING **(9 Hrs)**

The need for Levels of Testing – Unit Test – Running the Unit tests and Recording results – Integration tests – Integration Testing- Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT **(9 Hrs)**

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program - Defect Management – Defect Severity.

UNIT V TESTING TOOLS, SOFTWARE TEST AUTOMATION **(9 Hrs)**

Selenium, J-Meter, Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

Text Books

1. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006.
2. Ron Patton, —Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com

3. Aditya P. Mathur, —Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

Reference Books

1. Ilene Burnstein, —Practical Software Testingll, Springer International Edition, 2003.
2. Edward Kit Software Testing in the Real World – Improving the Process, Pearson Education, 1995.
3. Boris Beizer, Software Testing Techniques – 2nd Edition, Van Nostrand Reinhold, New York, 1990.

Web References

1. http://seleniumhq.org
2. http://jmeter.apache.org/
3. http://appium.io/

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

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

U19ITE52	DATA VISUALIZATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To develop skills to both design and critique visualization
- To understand why visualization is an important part of data analysis
- To understand the components involved in visualization design
- To understand the type of data impacts the type of visualization
- To understand when to use a particular data visualization, and why

Course Outcomes

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

CO1 - Explain the Principles of data visualization **(K2)**
CO2 - Describe the best practices of data visualization and how to apply them to solve analytics problems **(K2)**
CO3 - Apply Core Skills for visual Analysis **(K3)**
CO4 - Demonstrate Information Dashboard **(K3)**
CO5 - Apply Visualization Techniques **(K3)**

UNIT I DATA PREPARATION **(9 Hrs)**

Importing Data - Text files -Excel spreadsheets -Statistical packages - Databases - Cleaning Data : Selecting variables - Selecting observations - Creating/Recoding variables - Summarizing data - Using pipes - Reshaping data - Missing data - Introduction to ggplot2 -ggplot- geoms - grouping scales - facets -labels-themes - Placing the data and mapping options-Graphs as objects

UNIT II UNIVARIATE GRAPHS **(9 Hrs)**

Categorical : Bar Chart -Pie Chart - Tree Map Quantitative - Histogram - Kernel Density plot - Dot Chart - Bivariate Graphs - Categorical vs. Categorical : Stacked bar chart - Grouped bar chart - Segmented bar chart - Improving the color and labeling - Other plots - Quantitative vs. Quantitative :Scatterplot - Line plot- Categorical vs. Quantitative: Bar chart - Grouped kernel density plots - Box plots -Violin plots -Ridgeline plots - Mean/SEM plots - Strip plots - Beeswarm Plots -Cleveland Dot Charts

UNIT III MAPS **(9 Hrs)**

Dot density maps-Choropleth maps:Data by country-Data by US stateData by US county -Time-dependent graphs: Time series- Dummbbell charts - Slope graphs - Area Charts - Statistical Models : Correlation plots - Linear Regression - Logistic regression - Survival plots - Mosaic plots

UNIT IV 3-D SCATTERPLOT **(9 Hrs)**

Biplots - Bubble charts - Flow diagrams -Sankey diagramsAlluvial diagrams - Heatmaps - Radar charts - Scatterplot matrix - Waterfall charts- Word clouds -Customizing Graphs - Axes: Quantitative axes - Categorical axes - Date axes- Colors: Specifying colors manually-Color palettes: Points & Lines: Points - Lines - Fonts - Legends: Legend location Legend title - Labels- Annotations: Adding text - Adding lines - Highlighting a single group - Themes- Altering theme elements - Pre-packaged themes

UNIT V SAVING GRAPHS **(9 Hrs)**

File formats -External editing - Interactive Graphs - leaflet - plotly -rbokeh - rCharts - highcharter- Best Practices: Labeling - Signal to noise ratio - Color choice- y-Axis scaling - Attribution

Text Books

1. Rob Kabacoff, Data Visualization with R, Bookdown, 2018. Chapters: 1-13

Reference Books

1. Kirthi Raman - Mastering Python Data Visualization -Packt Publishing - 2015 Helen Wright, "Introduction to Scientific Visualization", Springer, 2007. Richard S Gallagher, "Computer Visualization: Graphics Techniques for Engineering and Scientific Analysis", CRC Press, CRC Press LLC, 1994.

Web References

1. https://www.tableau.com/tft/activation
2. https://www.microstrategy.com/us/resources/introductory-guides/data-visualization-what-it-is-and-why-we-use-it
3. https://www.coursera.org/learn/datavisualization

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

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

U19ITE53	BRAIN COMPUTER INTERFACE AND ITS APPLICATIONS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Understand the basic concepts of brain computer interface
- Study the various signal acquisition methods
- Learn about the signal processing methods used in BCI
- Understand the various machine learning methods of BCI.
- Learn the various applications of BCI

Course Outcomes

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

CO1 - Comprehend and appreciate the significance and role of this course in the present contemporary World. **(K2)**

CO2 - Outline the concept of Brain Computer Interface. **(K2)**

CO3 - Infer functions appropriately to the human and to the machine. **(K2)**

CO4 - Select appropriate feature extraction methods. **(K3)**

CO5 - Use machine learning algorithms for translation. **(K3)**

UNIT - I INTRODUCTION TO BCI **(9 Hrs)**

Introduction - Brain structure and function, Brain Computer Interface Types - Synchronous and Asynchronous -Invasive BCI -Partially Invasive BCI - Non Invasive BCI, Structure of BCI System, BCI Monitoring Hardware, EEG, ECoG, MEG, fMRI.

UNIT – II BRAIN ACTIVATION **(9 Hrs)**

Brain activation patterns - Spikes, Oscillatory potential and ERD, Slow cortical potentials, Movement related potentials-Mu rhythms, motor imagery, Stimulus related potentials - Visual Evoked Potentials – P300 and Auditory Evoked Potentials, Potentials related to cognitive tasks.

UNIT - III FEATURE EXTRACTION METHODS **(9 Hrs)**

Data Processing – Spike sorting, Frequency domain analysis, Wavelet analysis, Time domain analysis, Spatial filtering -Principal Component Analysis (PCA), Independent Component Analysis (ICA), Artefacts reduction, Feature Extraction - Phase synchronization and coherence.

UNIT - IV MACHINE LEARNING METHODS FOR BCI **(9 Hrs)**

Classification techniques –Binary classification, Ensemble classification, Multiclass Classification, Evaluation of classification performance, Regression - Linear, Polynomial, RBF's, Perceptron's, Multilayer neural networks, Support vector machine, Graph theoretical functional connectivity analysis

UNIT - V APPLICATIONS OF BCI **(9 Hrs)**

Case Studies - Invasive BCIs: decoding and tracking arm (hand) position, controlling prosthetic devices such as orthotic hands, Cursor and robotic control using multi electrode array implant, Cortical control of muscles via functional electrical stimulation. Noninvasive BCIs:P300 Mind Speller, Visual cognitive BCI, Emotion detection. Ethics of Brain Computer Interfacing.

Text Books

1. Rajesh.P.N.Rao, Brain-Computer Interfacing: An Introductionǁ, Cambridge University Press, First edition, 2013.
2. Jonathan Wolpaw, Elizabeth Winter Wolpaw, —Brain Computer Interfaces: Principles and practiceǁ, Oxford University Press, USA, Edition 1, January 2012.
3. Bernhard Graimann, Brendan Allison, GertPfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010

Reference Books

1. Ella Hassianien, A &Azar.A.T (Editors), —Brain-Computer Interfaces Current Trends and Applications‖, Springer, 2015.
2. Ali Bashashati, MehrdadFatourechi, Rabab K Ward, Gary E Birch,‖ A survey of signal Processing algorithms in brain–computer interfaces based on electrical brain signals‖ Journal of Neural Engineering, Vol.4, 2007, PP.32-57
3. Arnon Kohen, —Biomedical Signal Processing‖, Vol I and II, CRC Press Inc, Boca Rato, Florida.
4. Bishop C.M., —Neural networks for Pattern Recognition‖, Oxford, Clarendon Press, 1995. 6. Andrew Webb, —Statistical Pattern Recognition‖, Wiley International, Second Edition, 2002.

COs/POs/PSOs Mapping

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

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

U19ITE54	LINUX INTERNALS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about Linux kernel system
- To gain knowledge about buffers and system calls
- To acquire knowledge about process management and scheduling mechanisms
- To learn the basic concepts in Linux Security

Course Outcomes

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

CO1 - Infer the basics of Linux kernel system. **(K2)**
CO2 - Explain the buffer cache mechanism in Linux kernel. **(K2)**
CO3 - Interpret the various system calls associated with the file system. **(K2)**
CO4 - Summarize about process management and process scheduling. **(K2)**
CO5 - Demonstrate the fundamental security concepts in Linux environment. **(K2)**

UNIT I INTRODUCTION TO LINUX KERNEL **(9 Hrs)**

History of Unix - Introduction to Linux - Overview of Operating Systems and Kernels - Linux versus Classic Unix Kernels - Linux Kernel Versions - Obtaining the Kernel Source - Building the Kernel -GNU C - Synchronization and Concurrency - Importance of Portability.

UNIT II KERNEL BUFFER CACHE **(9 Hrs)**

Cache and its Types - Buffer Headers - Structure of Buffer Pool - Buffer Retrieval Scenarios - Reading and Writing Disk Blocks – Advantages and Disadvantages of Buffer Cache - Case study: Multi-Router Traffic Grapher.

UNIT III SYSTEM CALLS FOR THE FILE SYSTEM **(9 Hrs)**

Structure of a Regular File – Directories - Open - Read - Write – LSeek - File and Record Locking – Close - File Creation - Creation of Special Files - Change Directory – Root – Owner - STAT and FSTAT – Pipes – Dup - Mounting and Unmounting File Systems – Link – Unlink - File System Abstraction - File System Maintenance.

UNIT IV PROCESS MANAGEMENT AND SCHEDULING **(9 Hrs)**

Process Management: The Process - Process Descriptor and the Task Structure - Process Creation - The Linux Implementation of Threads - Process Termination - **Process Scheduling:** Multi-Tasking -Process Scheduling Policy - The Linux Scheduling Algorithm -Process Selection – Preemption and Context Switching - Real Time Scheduling Policies.

UNIT V INTRODUCTION TO LINUX SECURITY **(9 Hrs)**

Running Linux in a Virtual Environment: The Threat Landscape - Introduction to VirtualBox and Cygwin - **Securing User Accounts:** Danger as Root User - Setting Sudo Users - Tips and Tricks for using Sudo - Enforcing Strong Passwords - Preventing Brute Force Attacks - Locking User Accounts.

Text Books

1. Maurice J.Bach, "The Design of the UNIX Operating System", AT and T Bell laboratory, 2015
2. Robert Love, "Linux Kernel Development", Addison Wesley, 2010.
3. Donald A. Tevault, "Mastering Linux Security and Hardening", Packt Publishers, 2018.

Reference Books

1. UreshVahalia, "UNIX Internals: The New Frontiers", Pearson Education 2010.
2. Elien Sevier, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell: A Desktop Quick Reference", O'Reilly, 2009
3. Daniel P. Bovet, Marco Sesati,"Understanding the Linux Kernel", O'Reilly, 3rd Edition, 2004.

Web References

1. http://www.linux-tutorial.info/modules.php?name=MContent&pageid=317
2. https://www.usenix.org/legacy/event/lisa07/tech/full_papers/plonka/plonka_html/
3. http://www.ee.surrey.ac.uk/Teaching/Unix/
4. http://www.cs.sfu.ca/~ggbaker/reference/unix
5. http://www.tutorialspoint.com/unix/unix-useful-commands.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	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
2	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
3	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
4	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
5	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-

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

U19ITE55	AUTOMATION TECHNIQUES AND TOOLS DEVOPS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- The Background and mind set 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 - Illustrate CAMS for DevOps (Culture, Automation, Measurement and Sharing). **(K2)**
CO5 - Construct 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.

Web References

1. www.ibm.com/cloud/devops.
2. www.softwaretestinghelp.com>devops-automation.

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITE61	OPEN SOURCE SOFTWARE	3	0	0	3	45

Course Objectives

- Familiarity with Open Source Technologies
- Study some FOSS Projects to under the principles, methodologies of FOSS.
- Understand the policies, licensing procedures and ethics of FOSS
- Learn some important FOSS tools and techniques
  Learn different Open source tools

Course Outcomes

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

CO1 - Differentiate between Open Source and Proprietary software and Licensing. **(K1)**
CO2 - Recognize the applications, benefits and features of Open Source Technologies. **(K2)**
CO3 - Demonstrate Version Control System along with its commands **(K2)**
CO4 - Explain how to start, manage open source projects. **(K3)**
CO5 - Apply the Open Source Ethics. **(K3)**

UNIT I INTRODUCTION TO OPEN SOURCE **(9 Hrs)**

Open Source - need and principles of OSS - Open Source Standards - Requirements for Software - OSS success - Free Software - Examples - Licensing - Free Vs. Proprietary Software - Public Domain software - History of free software - Proprietary Vs Open Source Licensing Model - use of Open Source Software.

UNIT II FAULT TOLERANT DESIGN **(9 Hrs)**

Principles and Open Source Methodology- History – Open source Initiatives - Open Standards Principles - Methodologies - Philosophy - Software freedom - Open Source Software Development - Licenses – Copyright vs. Copy left - Patents - zero marginal cost - income-generation Opportunities - Internationalization.

UNIT III OPEN SOURCE PROJECT **(9 Hrs)**

Open Source Project: Starting and Maintaining an Open Source Project - Open Source Hardware - Open Source Design - Open Source Teaching (OST) - Open Source Media -License - How to create your own Licenses - Important FOSS Licenses (Apache - BSD - PL - LGPL) - copyrights and copy lefts - Patent.

UNIT IV OPEN SOURCE ETHICS **(9 Hrs)**

Open Source Vs. Closed Source - Open Source Government - Ethics of Open Source - Social and Financial Impact of Open Source Technology -Shared Software - Shared Source - Open Source as a Business Strategy.

UNIT V CASE STUDIES **(9 Hrs)**

Apache - BSD - Linux - Mozilla Firefox - Wikipedia - Git - GNU CC - LibreOffice

Text Books

1. Kailash Vadera, Bhavyesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 2008.

Reference Books

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills, 2015.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media, 2004.

3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

Web References

1. https://www.coursera.org/learn/open-source-software-development-methods#syllabus
2. Philosophy of GNU URL: http://www.gnu.org/philosophy/.
3. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
4. Libre office: http://www.libreoffice.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	1	-	-	-	2	-	-	-	-	-	-	-	3	2	3
2	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3

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

U19ITE62	E-COMMERCE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the fundamentals of E-Commerce.
- To acquire knowledge on various business applications.
- To study the infrastructure of E-commerce.
- To explore about payments and security in E-Commerce.
- To learn the legal and privacy issues in E-commerce.

Course Outcomes

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

CO1 - Explain the basic concepts of E-Commerce. **(K2)**
CO2 - Use various applications of E-Commerce. **(K3)**
CO3 - Illustrate the various infrastructure of E-commerce. **(K2)**
CO4 - Outline various payments and security in E-Commerce. **(K2)**
CO5 - Explore the various legal and privacy issues in E-Commerce. **(K2)**

UNIT I FUNDAMENTAL OF E-COMMERCE **(9 Hrs)**

Driving forces – benefits and limitations of e-commerce. Basics of Data mining, data warehousing and network infrastructure requirements. Overview of IP, TCP, HTML, OLAP and Cryptography.

UNIT II BUSINESS APPLICATIONS IN E-COMMERCE **(9 Hrs)**

Retailing in E-commerce – market research on internet customers – e- commerce for service sector – Advertising in e-commerce – B2B ecommerce.

UNIT III E-COMMERCE INFRASTRUCTURE **(9 Hrs)**

Intranet, Internet & Extranet – Structure, Architecture, Applications & Business Models.

UNIT IV E-COMMERCE PAYMENTS AND SECURITY **(9 Hrs)**

E-Payments and Protocols-Security schemes against internet fraud. Principles of e-fund transfer, credit and debit card usage, E-check and unified payment systems.

UNIT V LEGAL AND PRIVACY ISSUES IN E-COMMERCE **(9 Hrs)**

Legal, Ethics and Privacy issues – Protection needs and methodology - Consumer protection, Cyber laws, contracts and warranties. Taxation and Encryption Policies.

Text Books

1. Efraim Turban et al., 'Electronic Commerce – A managerial perspective', Pearson Education Asia, 2002.
2. Kalakota et al, 'Frontiers of Electronic Commerce', Addison Wesley, 2001.

Reference Books

1. Sandeep Krishnamurthy, 'E-Commerce Management – Text and Cases', Thomson Learning, 2003.
2. Greenstein Firsman, 'Electronic Commerce', Tata McGraw Hill, 1999.
3. Nabil Adam et al, 'Electronic Commerce – Technical, Business and Legal Issues'. Prentice Hall. 1998.

Web References

1. www.ncertbooks.guru/
2. http://www.vssut.ac.in/lecture_notes/lecture1428551057.pdf

3. https://irp-cdn.multiscreensite.com/1c74f035/files/uploaded/introduction-to-e-commerce.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	-	-	-	-	-	-	-	-	-	-	-	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	-	2	3
3	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
4	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
5	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3

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

U19ITE63	PARALLEL AND DISTRIBUTED SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Understand the fundamental principles and engineering trade-offs involved in designing modern parallel computers.
- Develop programming skills to effectively implement parallel architecture
- Design the future system and analyse the GPU with respect to different application
- To understand the foundations and characteristics of distributed systems.
- To understand the concepts of Inter process communication and distributed objects in distributed systems

Course Outcomes

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

CO1 - Comprehend parallel architecture and its importance in solving engineering problems. **(K2)**
CO2 - Analyze the type of cache design with respect to its access time. **(K2)**
CO3 - Demonstrate the future system and analyse the GPU with respect to different application **(K2)**
CO4 - Elucidate the foundations and issues of distributed systems **(K2)**
CO5 - Analyze the concepts of Inter process communication and distributed objects in distributed systems **(K2)**

UNIT I INTRODUCTION TO PARALLEL COMPUTER **(9 Hrs)**

The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multicores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture.

UNIT II CACHE DESIGN **(9 Hrs)**

Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access.

UNIT III GRAPHICS PROCESSING UNIT **(9 Hrs)**

Architecture of a modern GPU, Evolution of Graphics Pipelines, GPGPUs, Scalable GPUs, Architectural characteristics of Future Systems, Implication of Technology and Architecture for users, Vector addition, Applications of GPU.

UNIT IV INTRODUCTION TO DISTRIBUTED SYSTEMS **(9 Hrs)**

Characterization of Distributed Systems and System Models: Introduction-Examples of distributed systems- Resource sharing and the Web- Challenges-Architectural models- Fundamental models

UNIT V INTER-PROCESS COMMUNICATION AND DISTRIBUTED OBJECTS **(9 Hrs)**

System Model -Inter process Communication: Introduction- The API for the Internet protocols- External data representation and marshalling- Client -Server communication- Group communication. Distributed File Systems- Distributed Objects and Remote Invocation: Communication between distributed objects-Remote procedure call- RMI.

Text Books

1. D. E. Culler, J. P. Singh, and A. Gupta, Parallel Computer Architecture, MorganKaufmann, 2004
2. Rajeev Balasubramonian, Norman P. Jouppi, and Naveen Muralimanohar, Multi-Core Cache Hierarchies, Morgan & Claypool Publishers, 2011
3. Peter and Pach Eco, An Introduction to Parallel Programming, Elsevier, 2011

Reference Books

1. James R. Larus and Ravi Rajwar, Transactional Memory, Morgan & Claypool Publishers, 2007
2. David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors: A Hands-on Approach, 2010
3. Barbara Chapman, F. Desprez, Gerhard R. Joubert, Alain Lichnewsky, Frans Peters Parallel Computing: From Multicores and GPU's to Petascale, 2010
4. Andrew S. Tanenbaum "Distributed Systems: Principles and Paradigms",Pearson Education , 2nd Edition 2007.
5. Liu M.L,"Distributed Computing, Principles and Applications", Pearson Education, First Edition ,2004.

Web References

1. https://www.coursera.org/learn/parprog1
2. https://www.pinterest.com/pin/557953841332890190/
3. https://nptel.ac.in/courses/106/106/106106168/
4. http://www.webopedia.com/TERM/D/distributed_computing.html
5. http:// www.distributed.net/

COs/POs/PSOs Mapping

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

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

U19ITE64	BIG DATA	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn tips and tricks for Big Data use cases and solutions.
- To learn about reliable, scalable, distributed systems with Apache Hadoop.
- To explore the concepts of Hadoop Architecture.
- To apply Hadoop ecosystem components.
- To understand the concepts of Hive, HBase and HIVEQL.

Course Outcomes

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

CO1 - Describe the basic concepts of Big Data. **(K2)**
CO2 - Explain the functional /operational aspects of Hadoop. **(K2)**
CO3 - Illustrate the architecture of Hadoop. **(K2)**
CO4 - Explore the various Hadoop ecosystem components. **(K2)**
CO5 - Identify the various purposes of HIVEQL and HBase **(K2)**

UNIT I INTRODUCTION TO BIG DATA **(9 Hrs)**

Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, big data analytics, big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

UNIT II INTRODUCTION HADOOP **(9 Hrs)**

Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT III HADOOP ARCHITECTURE **(9 Hrs)**

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT IV HADOOP ECOSYSTEM AND YARN **(9 Hrs)**

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New FeaturesNameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT V HIVE AND HIVEQL, HBASE **(9 Hrs)**

Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase conceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Text Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
3. Vignesh Prajapati,"Big Data Analytics with R and Haoop", Packet Publishing 2013.

Reference Books

1. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.
2. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
3. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013.

Web References

1. http://www.bigdatauniversity.com/

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITE65	**BIO INSPIRED COMPUTING**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To learn bio-inspired theorem and algorithms
- To understand random walk and simulated annealing
- To learn genetic algorithm and differential evolution
- To learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in image processing

Course Outcomes

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

CO1 - Implement and apply bio-inspired algorithms. **(K2)**
CO2 - Explain random walk and simulated annealing. **(K2)**
CO3 - Use and apply genetic algorithms. **(K3)**
CO4 - Outline swarm intelligence and ant colony for feature selection. **(K2)**
CO5 - Apply bio-inspired techniques in image processing **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction to algorithm - Newton' s method - optimization algorithm-Search for Optimality - No-Free-Lunch Theorems - Nature-Inspired Meta heuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control.

UNIT II RANDOM WALK AND ANEALING **(9 Hrs)**

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy- Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT III GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION **(9 Hrs)**

Tailing, cohesive end, use of linkers, blunt end methods; Labeling and detection techniques PCR and its application, DNA Synthesis and Sequencing, site directed Mutagenesis, protein engineering

UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM **(9 Hrs)**

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation – varients-Ant colony optimization toward feature selection.

UNIT -V APPLICATION IN IMAGE PROCESSING **(9 Hrs)**

Bio-Inspired Computation and its Applications in Image Processing: An Overview - FineTuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search

Text Books

1. Xin-She Yang, "Nature Ispired Optimization Algorithm,Elsevier First Edition ,2014
2. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image processing",Elsevier,2016

Reference Books

1. Yang ,Cui,Xiao,Gandomi,Karamanoglu ,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition ,2013
2. Eiben,A.E.,Smith,James E, "Introduction to Evolutionary Computing", Springer, 2015.

3. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech, 2013

Web References

1. https://programsandcourses.anu.edu.au/course/comp8420
2. https://www.uio.no/studier/emner/matnat/ifi/INF3490/index.html
3. https://swayam.gov.in/nd1_noc20_cs17/preview
4. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs23/

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITE71	MACHINE LEARNING	3	0	0	3	45

Course Objectives

- To understand the basic concepts of machine learning and probability theory.
- To understand supervised learning techniques.
- To understand unsupervised learning techniques.
- To understand the theoretical and practical aspects of probabilistic graphical models.
- To learn advanced machine learning aspects.

Course Outcomes

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

CO1 - Elucidate the basic concepts of machine learning and probability theory. **(K2)**
CO2 - Use supervised learning techniques for different types of applications. **(K3)**
CO3 - Design and implement unsupervised learning algorithms. **(K3)**
CO4 - Apply appropriate graph models for any real time application. **(K3)**
CO5 - Explain advanced learning techniques. **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Machine Learning – Types of Machine Learning – Basic Concepts of Machine Learning - Machine Learning Process – Weight Space - Testing Machine Learning Algorithms - Turning Data into Probabilities – The Bias-Variance Trade off – Concept Learning and General-to-Specific Ordering.

UNIT II SUPERVISED LEARNING **(9 Hrs)**

Linear Discriminants – Perceptron – Linear Separability – Linear Regression - Multi Layer Perceptron – Going Forward – Going Backward - Support Vector Machine Algorithm - Decision Tree Learning – Random Forest Model.

UNIT III UNSUPERVISED LEARNING **(9 Hrs)**

K-means Algorithm –Hierarchical clustering - EM algorithm – Dimensionality Reduction Techniques - Vector Quantization – Self Organising Feature Map.

UNIT IV GRAPHICAL MODELS **(9 Hrs)**

Bayesian Networks – Conditional Independence - Markov Random Fields – Naive Bayes Classifier - Hidden Markov Model – Tracking Methods.

UNIT V ADVANCED LEARNING **(9 Hrs)**

Reinforcement Learning – The Learning Task – Q Learning – Temporal Difference Learning – Generalization – Relationship to Dynamic Programming - Ensemble Learning – Boosting – Bagging – Deep Learning. Case studies on Machine learning.

Text Books

1. Stephen Marsland,"Machine Learning – An Algorithmic Perspective", Second Edition,
2. Chapman ,"Machine Learning and Pattern Recognition Series", 2014.
3. Tom M Mitchell, "Machine Learning", McGraw Hill Education, First Edition, 2013

Reference Books

1. Ethem Alpaydin,"Introduction to Machine Learning 3E (Adaptive Computation and Machine Learning Series), MIT Press, Third Edition, 2014.
2. Miroslav Kubat, " An Introduction to Machine Learning", Springer Publications, 2nd Edition, 2017.
3. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, First Edition, 2012.
4. Jason Bell,"Machine learning – Hands on for Developers and Technical Professionals", Wiley, First Edition, 2014.

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1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-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	1	-	-	2	-	-	-	-	-	-	-	2	2	3
2	3	2	1	1	2	-	-	-	-	-	-	-	2	2	3
3	3	2	1	1	2	-	-	-	-	-	-	-	2	2	3
4	3	2	1	1	2	-	-	-	-	-	-	-	2	2	3
5	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3

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

U19ITE72	INFORMATION MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide a brief knowledge Database Modelling, Management and Development.
- To demonstrate about security threats and privacy.
- To provide understanding about data governance.
- To provide detailed knowledge of Information Architecture.
- To make them understand about information life cycle management.

Course Outcomes

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

CO1 - Explain the core relational database topics including logical and physical design and modelling. **(K2)**
CO2 - Design and implement a complex information system that meets regulatory requirements. **(K3)**
CO3 - Define and manage an organization's key master data entities. **(K2)**
CO4 - Create and maintain data warehouses. **(K3)**
CO5 - Explore recent advances in NOSQL, Big Data and related tools. **(K2)**

UNIT I DATABASE MODELLING, MANAGEMENT AND DEVELOPMENT (9 Hrs)

Database Design and Modelling - Business Rules and Relationship - Java Database Connectivity (JDBC) - Database Connection Manager - Stored Procedures. Trends in Big Data Systems including NoSQL - Hadoop HDFS – Map Reduce - Hive and Enhancements.

UNIT II DATA SECURITY AND PRIVACY (9 Hrs)

Program Security - Malicious Code and Controls against Threats - OS Level Protection - Security – Firewalls - Network Security Intrusion Detection Systems. Data Privacy Principles - Data Privacy Laws and Compliance.

UNIT III INFORMATION GOVERNANCE (9 Hrs)

Master Data Management (MDM) – Overview - Need for MDM – Privacy - Regulatory Requirements and Compliance. Data Governance – Synchronization and Data Quality Management.

UNIT IV INFORMATION ARCHITECTURE (9 Hrs)

Principles of Information Architecture and Framework - Organizing Information - Navigation Systems and Labelling Systems - Conceptual Design - Granularity of Content.

UNIT V INFORMATION LIFECYCLE MANAGEMENT (9 Hrs)

Data Retention Policies - Confidential and Sensitive Data Handling - Lifecycle Management Costs. Archive Data using Hadoop - Testing and Delivering Big Data Applications for Performance and Functionality - Challenges with Data Administration.

Text Books

1. Alex Berson, Larry Dubov, "Master Data Management and Data Governance", Tata McGraw Hill, 2nd Edition, 2011.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Prentice Hall, 4th Edition, 2006.
3. Peter Morville, Louis Rosenfeld, "Information Architecture for the World Wide Web", O'Reilly Media, 1998.

Reference Books

1. Jeffrey A. Hoffer, HeikkiTopi, V Ramesh, "Modern Database Management", Pearson, 10th Edition, 2012.
2. Jeffrey Carr, "Inside Cyber Warfare: Mapping the Cyber Underworld", O'Reilly Media, 2nd Edition, 2011.

Web References

1. http://nosql-database.org/
2. http://ibm.com/big-data

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

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

U19ITE73	ROBOTICS PROCESS AUTOMATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the role of the Artificial Intelligence in Automation
- To learn the evolution and future of Robotic Process Automation
- To Learn Web, Windows, Email, Excel, PDF, Database, API and Image Automation using UI path
- To learn Blue Prism process and operations for operating system of Digital Workforce.
- To learn Automation Anywhere and automate any business process with intelligent, scalable software robots

Course Outcomes

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

CO1 - Apply basic principles of AI in solutions that require problem solving, knowledge and automation **(K3)**

CO2 - Identify processes suitable for RPA and recognize how RPA is transforming businesses **(K2)**

CO3 - Design automation strategy using orchestrator, queues, and bots **(K3)**

CO4 - Illustrate cost-effective through automation and with improved accuracy by creating a virtual workforce. **(K2)**

CO5 - Explore process team's consistency, automate workflows, create IQ bots and manage them effectively. **(K2)**

UNIT I AI AND AUTOMATION **(9Hrs)**

AI Foundations- AI Data, AI Capabilities framework- Associated Technologies of AI - AI Prototyping- Industrialising AI - Cognitive Automation tools- Natural language processing- AI Resources -Future of AI.

UNIT II INTRODUCTION TO RPA **(9Hrs)**

RPA Foundations- History of RPA-Difference between RPA and AI- Benefits of RPA-Components of RPA-RPA Architecture- RPA Skills- Process Methodologies in RPA- Planning for RPA-RPA Platforms- Types of Bots- Deployment platforms- Future of RPA.

UNIT III UI PATH **(9Hrs)**

Introduction to UI Path: UI Path Studio-UI Path Robot-UI path Orchestrator-Task Recorder- Sequence, Flowchart, and Control Flow- Sequencing the workflow- Data Manipulation- Application with Plug-ins and Extensions Terminal Plug-in- Handling User Events and Assistant Bots- Deploying and Maintaining the Bot.

UNIT IV BLUE PRISM **(9Hrs)**

Introduction-Process Studio- Pages, Actions, Decisions, Choices and collections-Implementing business objects-Spying Elements-Working with excel –Sending and receiving email, Control room and work queues-Exception Handling

UNIT -V AUTOMATION ANYWHERE **(9Hrs)**

Introduction of Automation Anywhere-Tasks-Tasks Editors-Integration and collaboration with Automation Anywhere- working with web pages and JSON Data- Citrix Automation- E-mail Automation- PDF integration-Web Recorder-Creating IQ bots -Deploying and Maintaining the Bot.

Text Books

1. Tom Taulli ,"Artificial Intelligence Basics: A Non-Technical Introduction ",First Edition,Apress,2019
2. Alok Mani Tripathi ,"Learning Robotic Process Automation Create Software robots and automate business processes with the leading RPA tool – UiPath", First Edition, Packt Publishing ,2018
3. Lim Mei Ying ,"Robotic Process Automation with Blue Prism Quick Start Guide ",First Edition ,Packt Publishing ,2018

4. Tom Taulli ,"The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", First Edition,Apress,2020

Reference Books

1. Palgrave Macmillan," The Executive Guide to Artificial Intelligence: How to identify and impement application for AI in your organization", Springer press ,2018
2. Jonathan Sireci ,"The Practitioner's Guide to RPA: A Practical Guide for Deploying Robotics Process Automation,Kindle Edition,2020

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3. https://community.blueprism.com/communities/community-home/
4. https://www.blueprism.com/
5. https://www.automationanywhere.com/in/

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

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

U19ITE74	WIRELESS SENSOR NETWORK	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn wireless Sensor Network fundamentals and have an in-depth knowledge on network architectures
- To have an exposure to know the concepts of networking concepts and protocols
- To understand the different routing protocols
- To understand the sensor network programming platform and tools in Sensor networks
- To have an exposure to mote security issues and different applications of sensor networks

Course Outcomes

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

CO1 - Explain the basics of wireless sensor networks and its architecture **(K2)**

CO2 - Apply the knowledge to identify appropriate physical and MAC layer protocols **(K3)**

CO3 - Apply knowledge to identify the suitable routing algorithm based on the network and user requirement **(K3)**

CO4 - Explore OS and tools used in Wireless Sensor Networks and build basic modules. **(K2)**

CO5 - Understand the security issues possible in sensor networks and aware of different applications **(K2)**

UNIT I INTRODUCTION AND ARCHITECTURES **(9 Hrs)**

Components, Motivation, Classification, Characteristics, Challenges, Comparison between wireless sensor networks and wireless mesh networks, Limitations, Design challenges. ARCHITECTURES: The Sensing Subsystem, prototypes -Single-Node Architecture – Network Architecture -, Optimization Goals and Figures of Merit, Gateway Concepts Case Study: Energy Consumption of Sensor Nodes.

UNIT II WSN NETWORKING CONCEPTS AND PROTOCOLS **(9 Hrs)**

MAC Protocols, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols-Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT III ROUTING PROTOCOLS **(9 Hrs)**

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification , Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing, Case Study: Location Discovery

UNIT IV SENSOR NETWORK PLATFORMS AND TOOLS **(9 Hrs)**

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming. Case Study : CONTIKI OS

UNIT -V SECURITY IN WSNs **(9 Hrs)**

Network Security Requirements, Issues and Challenges, Network Security Attacks, Key Management, Layer wise attacks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS

Applications : Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active volcano, Underground Mining Node

Text Books

1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Jagannathan Sarangapani ,"Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control ", CRC Press, 1st edition, 2007.

3. C. Siva Ram Murthy and B.S.Manoj ,"Ad Hoc Wireless Networks: Architectures and Protocols", PHI,2004.

Reference Books

1. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Web References

1. https://nptel.ac.in/courses/106/105/106105160/
2. https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/
3. https://www.intechopen.com/books/wireless-sensor-networks-technology-and-protocols/overview-of-wireless-sensor-network

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

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

U19ITE75	GREEN COMPUTING	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 CASE STUDIES **(9 Hrs)**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – 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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1. https://www.greenit.net/greenit_training.html
2. https://www.athabascau.ca/syllabi/comp/comp635.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	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
2	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
3	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
4	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3
5	2	1	-	-	-	-	-	-	-	-	-	-	-	2	3

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

U19ITE80	ASSISSTIVE TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concept of the Human computer Interaction.
- To learn the design techniques and fundamentals of Human Computer Interaction
- To know the various types of existing interfaces and evaluation techniques
- To understand the appropriate use of computers and other technology in instructional Programming.
- To understand the applications of HCI in emerging trends

Course Outcomes

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

CO1 - Understand the requirements and specifications for the interaction design. **(K2)**

CO2 - Illustrate about an efficient and user-friendly human computer interface **(K2)**

CO3 - Analyse and implement cognitive models **(K2)**

CO4 - Explore various assistive technologies from low-technology to high- technology. **(K2)**

CO5 - Analyse and identify user models, user support, socio-organizational issues and implement the Ubiquitous computing applications. **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Historical evolution of the field- Concept of usability - definition and elaboration, HCI and software engineering, GUI design and aesthetics, Prototyping techniques- Psychology & design of interactive systems; Computer – Text entry devices Positioning, Pointing & drawing – Display devices for Virtual reality, 3D-Interaction styles – WIMP Interfaces – context; paradigms for Interaction.

UNIT II DESIGN AND IMPLEMENTATION **(9 Hrs)**

Interaction design basics – Interactive design & prototyping; Design rules – Principles for usability – standards –guidelines – golden rules – HCI patterns-Implementation support – Windowing system elements – using tool kits – user interface management; Evaluation techniques – goals – expert analysis – choosing a method; universal design principles – multimodal interaction; user support – requirements – Approaches – adaptive help systems – designing user support systems

UNIT III COGNITIVE MODELS **(9 Hrs)**

Goal & task hierarchies – Linguistic models – Physical & device models – architectures; communication & collaboration models – Face-to- face communication – conversation – text based – group working; Task analysis –difference between other techniques – task decomposition – Knowledge based analysis – ER based techniques –uses.

UNIT IV ASSISTIVE TECHNOLOGY **(9 Hrs)**

Overview of Assistive Technology, Framework for Assistive technologies-Disabled Human user of assistive technologies-General purpose Assistive technologies Human Assistive technology-Assistive Technologies in the context of classroom and work.

UNIT -V UBIQUITOUS COMPUTING **(9 Hrs)**

Application research – virtual & augmented reality – Information & data visualization- Understanding hypertext – finding things – Web Technology & issues – Static Web content – Dynamic Web content; Groupware systems – Computer mediated communication – DSS – Frameworks for groupware.

Case Studies: Multi-Key press Tamil Text Input Method on a Mobile Phone,Employment Information System for unorganised construction workers on a Mobile Phone

Text Books

1. Alan Dix, Janet Finlay, Gregory D.Abowd, Russell Beale, "Human Computer Interaction", Pearson Education, Third Edition, 2004.

2. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: beyond human-computer interaction", John-Wiley and Sons Inc., 2011.
3. Preece, J., Sharp, H., Rogers, Y. "Interaction Design: Beyond Human-Computer Interaction", Fourth Edition, John Wiley, 2015.

Reference Books

1. Jonathan Lazar Jinjuan, Heidi Feng, Harry Hochheiser, "Research Methods in Human-Computer Interaction", Wiley, 2010.
2. Cooper, Reimann, Cronin, & Noessel ,"About Face: The Essentials of Interaction Design", Fourth Edition,2014.
3. Frank Bentley,Edward Barrett ,"Building Mobile Experiences ",MIP Press, Cambridge ,2012.
4. Cook and Hussey, "Assistive Technologies, Principles and Practice", , Mosby, Second Edition 2008.

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2. https://www.udacity.com/course/human-computer-interaction--ud400
3. https://www.coursera.org/courses?query=human%20computer%20interaction

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

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

		L	T	P	C	Hrs
U19ITE81	BUSINESS INTELLIGENCE	3	0	0	3	45

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 - Describe 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 **(K2)**
CO4 - Identify the metrics, indicators and make recommendations to achieve the business goal **(K2)**
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

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

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

U19ITE82	SOCIAL NETWORK ANALYTICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - Explore semantic web related applications. **(K2)**
CO2 - Illustrate knowledge using ontology. **(K2)**
CO3 - Analyze human behaviour in social web and related communities. **(K2)**
CO4 - Understand social networks. **(K2)**
CO5 - Develop social network applications. **(K3)**

UNIT I Introduction to Semantic Web **(9 Hrs)**

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

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION **(9 Hrs)**

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

UNIT III EXTRACTION, MINING COMMUNITIES IN WEB SOCIAL NETWORKS **(9 Hrs)**

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

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES **(9 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 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS **(9 Hrs)**

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

Text Books

1. Peter Mika, "Social Networks and the Semantic Web,", Springer , First Edition ,2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer ,1st Edition, 2010.
3. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web",Springer, 2009.

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.

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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

U19ITE83	MIXED REALITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn basics of VR and AR systems
- To know about basic Augment reality functions
- To know about basic Virtual reality functions
- To know about Virtual reality environment and steps to work on it
- To learn various application on AR and VR

Course Outcomes

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

CO1 - Understand the concepts of VR **(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 **(K2)**

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.

Web References

1. https://www.coursera.org/courses?query=augmented%2Creality
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

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

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

U19ITE84	GAME DEVELOPMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concepts of Game design and development.
- To learn the processes, mechanics and issues in Game Design.
- To be exposed to the Core architectures of Game Programming.
- To know about Game programming platforms, frame works and engines.
- To learn how to develop games

Course Outcomes

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

CO1 - Discuss the concepts of Game design and development **(K2)**
CO2 - Design the processes, and use mechanics for game development. **(K3)**
CO3 - Explain the Core architectures of Game Programming. **(K2)**
CO4 - Use Game programming platforms, frame works and engines **(K3)**
CO5 - Create interactive Games. **(K6)**

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING **(9 Hrs)**

3D Transformations, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Scene Graphs.

UNIT II GAME ENGINE DESIGN **(9 Hrs)**

Game engine architecture-Engine support systems-Resources and File systems-Human Interface devices, Collision and rigid body dynamics-Game profiling.

UNIT III GAME PROGRAMMING **(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 GAMING PLATFORMS AND FRAMEWORKS **(9 Hrs)**

2D and 3D Game development Platforms: Introduction to Flash – DirectX - Python gaming modules and packages

UNIT -V GAME DEVELOPMENT **(9 Hrs)**

Applications on 2D and 3D interactive games: Game engines – Unity DX Studio - Developing Isometric and Tile Based Games - Puzzle games

Text Books

1. Mike McShaffrfy and David Graham, "Game Coding Complete", Cengage Learning, Fourth Edition, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press ,A K Peters, 2009.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2nd Edition, Morgan Kaufmann, 2006.

Reference Books

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall / New Riders, 2nd Edition, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", Course Technology PTR, 3rd Edition, 2011.
3. Jesse Schell, "The Art of Game Design: A book of lenses", CRC Press, 1st Edition, 2008.

Web References

1. https://swayam.gov.in/nd1_noc19_ge32/preview
2. https://www.coursera.org/specializations/game-development
3. www.unity3D.com

COs/POs/PSOs Mapping

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

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

L	T	P	C	Hrs
3	0	0	3	45

U19ITE85 **CYBER SECURITY**

Course Objectives

- To learn the security issues network layer and transport layer
- To be exposed to security issues of the application layer
- To learn computer forensics
- To be familiar with forensics tool
- To analyze and validate forensics data

Course Outcomes

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

CO1 - Discuss the security issues network layer and transport layer **(K2)**
CO2 - Apply security principles in the application layer **(K3)**
CO3 - Explain computer forensics **(K2)**
CO4 - Use forensics tools. **(K3)**
CO5 - Analyze and validate forensics data. **(K2)**

UNIT I NETWORK LAYER SECURITY &TRANSPORT LAYER SECURITY **(9 Hrs)**

IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

UNIT II E-MAIL SECURITY & FIREWALLS **(9 Hrs)**

PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT III INTRODUCTION TO COMPUTER FORENSICS **(9 Hrs)**

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT IV EVIDENCE COLLECTION AND FORENSICS TOOLS **(9 Hrs)**

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT V ANALYSIS AND VALIDATION **(9 Hrs)**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

Text Books

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2006.

Reference Books

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005
2. Richard E.Smith, "Internet Cryptography", 3 rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3 rd Edition, Prentice Hall, 2013

Web References

1. http://forensiceducation.co.in/study.materials.html
2. http://cyberforensics.in/?AspxAutoDetectCookieSupport=1

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

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

		L	T	P	C	Hrs
U19ITE86	COMPUTER ANIMATION: ALGORITHMS AND TECHNIQUES	3	0	0	3	45

Course Objectives

- Understand the basic animation techniques and concepts covered in the film and video technology.
- Knowledge on algorithms of camera specifications and its renderings motion.
- Emphasis is on creative content, experimentation and critical thinking on character and facial Animation

Course Outcomes

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

CO1 - Identify the useful algorithms and techniques to move objects in interesting ways. **(K2)**
CO2 - Develop an understanding of the hardware used for creating film and video technology. **(K3)**
CO3 - Design the animation by manipulating objects, lights and cameras **(K3)**
CO4 - Illustrate the important features of an animation for motion specification. **(K2)**
CO5 - Apply the algorithm for complex motions used in character and facial animations. **(K3)**

UNIT - I ANIMATION AND CONCEPTS **(9 Hrs)**

Introduction - Overview - Perception - The Heritage of Animation - Computer Animation: Background and History - Computer Animation Software - Animation on the WEB.

UNIT – II HARDWARE AND RECORDING TECHNIQUES **(9 Hrs)**

Real-Time Versus Single-Frame Animation - Film Technology - Video Technology – Animation Hardware - Dynamic Web Page Creation - Web advertisements - Web animations.

UNIT - III DISPLAY CONSIDERATIONS **(9 Hrs)**

Display Pipeline and Matrix Transformations - Roundoff Error Considerations - Observer/Camera Specification.

UNIT - IV AIDS TO MOTION SPECIFICATION **(9 Hrs)**

Interpolation - Ease-In/Ease-Out and Velocity Control - Orientation Interpolation - Camera Path Following - Animation Languages - Key Frame/Track-Based Animation, Metamorphosis – Implicit Surface Animation

UNIT - V ALGORITHMIC MOTION SPECIFICATION **(9 Hrs)**

Kinematics and Linked Appendages - Constraint Programming - Rigid Body Animation - Flexible Body Animation - Emergent Behavior: Particles and Flocks - Behavioral Animation - Character Animation: Dynamics - Facial Animation , Walking - Plant Growth
Case Studies : Facial Animation: Human face, Facial models, Animating the face, Lip-Sync animation; Physically-based Animation.

Text Books

1. Rick Parent, Computer Animation: Algorithms & Techniques, Morgan Kaufmann Pub.
2. Watt and Watt, "Advanced Animation and Rendering," Addison-Wesley, New York, 1992.
3. Charles Solomon, "The History of Animation: Enchanted Drawings," Wings Books, New York, 1994.

Reference Books

1. Williams, L., "Performance-Driven Facial Animation," SIGGRAPH'90, pp. 235-242.
2. Ebert, Dave, "Design and Animation of Volume Density Functions," The Journal of Visualization and Computer Animation, Vol. 4, No. 4, 1993, pp. 213-232.

3. Korein, J., and Badler, N., "Temporal Anti-Aliasing in Computer Generated Animation," SIGGRAPH'83, pp. 377-388.

Web References

1. https://www.coursera.org/learn/interactive-computer-graphics
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-838-algorithms-for-computer-animation-fall-2002/

COs/POs/PSOs Mapping

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3	3	2	1	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

		L	T	P	C	Hrs
U19ITE87	DEEP LEARNING	3	0	0	3	45

Course Objectives

- To present the mathematical, statistical and computational challenges of building neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

Course Outcomes

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

CO1 - Understand basics of deep learning **(K2)**
CO2 - Implement various deep learning models **(K2)**
CO3 - Realign high dimensional data using reduction techniques **(K2)**
CO4 - Analyze optimization and generalization in deep learning **(K2)**
CO5 - Explore the deep learning applications. **(K2)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT II DEEP NETWORKS **(9 Hrs)**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow NetworksConvolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT III DIMENTIONALITY REDUCTION **(9 Hrs)**

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

UNIT IV OPTIMIZATION AND GENERALIZATION **(9 Hrs)**

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic OptimizationGeneralization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

UNIT V CASE STUDY AND APPLICATIONS **(9 Hrs)**

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec – Joint Detection - BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

Text Books

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.

Reference Books

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
2. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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2	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3
4	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3
5	2	1	-	-	2	-	-	-	-	-	-	-	-	2	3

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

		L	T	P	C	Hrs
U19ITE88	HIGH PERFORMANCE COMPUTING	3	0	0	3	45

Course Objectives

- Understand the challenges in parallel and multi-threaded programming
- Acquire the knowledge about the various parallel programming paradigms, and solutions
- Acquaint the knowledge of Parallel Programming using OpenMP and MPI

Course Outcomes

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

CO1 - Understand parallelization to process data in parallel in order to execute faster. **(K2)**
CO2 - Implement the Program for Parallel Processors **(K2)**
CO3 - Implement programs using OpenMP in Shared Memory **(K2)**
CO4 - Implement programs using MPI in Distributed Memory **(K2)**
CO5 - Compare and contrast programming for serial processors and programming for parallel **(K2)**

UNIT - I MULTI-CORE PROCESSORS **(9 Hrs)**

Single core to Multi-core architectures - SIMD and MIMD systems - Interconnection networks - Symmetric and Distributed Shared Memory Architectures - Cache coherence - Performance Issues - Parallel program design

UNIT – II PARALLEL PROGRAM **(9 Hrs)**

Performance - Scalability - Synchronization and data sharing - Data races - Synchronization primitives (mutexes, locks, semaphores, barriers)- deadlocks and livelocks - communication between threads (condition variables, signals, message queues and pipes).

UNIT - III SHARED MEMORY PROGRAMMING WITH OPENMP **(9 Hrs)**

OpenMP Execution Model - Memory Model - OpenMP Directives - Work-sharing Constructs – Library functions - Handling Data and Functional Parallelism - Handling Loops - Performance Considerations

UNIT - IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI **(9 Hrs)**

MPI program execution - MPI constructs - libraries - MPI send and receive - Point-to-point and Collective communication - MPI derived datatypes - Performance evaluation.

UNIT - V PARALLEL PROGRAM DEVELOPMENT **(9 Hrs)**

Case studies n-Body solvers Tree Search OpenMP and MPI implementations and comparison.Parallel architecture: Inter-process communication, Synchronization, Mutual exclusion, Basics of parallel architecture, Parallel programming with message passing using MPI

Text Books

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris",Pearson, 2011 (unit 2)
3. Michael J Quinn,"Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
4. Shameem Akhter and Jason Roberts, Multi-core Programming, Intel Press, 2006

Reference Books

1. Georg Hager, Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall / CRC Computational Science series, 2011.
2. Charles Severance, Kevin Dowd, High Performance Computing, O'Reilly Media, 2nd Edition, 1998
3. Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 1984

Web References

1. https://www.udacity.com/course/high-performance-computing--ud281
2. https://hpc.llnl.gov/training/tutorials

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITE89	MULTIMEDIA STREAMING ANALYTICS	3	0	0	3	45

Course Objectives

- Gain knowledge about the Streaming Data and Static Data used in a business environment.
- Impart knowledge on the Data flows, processing & storing streaming data.
- Understand the knowledge on streaming metrics.

Course Outcomes

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

CO1 - Understand the need for stream computing **(K2)**
CO2 - Comprehend the architecture of stream analytics **(K2)**
CO3 - Explore the new initiatives for enhancing data flow management pipelines for streams. **(K2)**
CO4 - Recognize the Processing streaming data **(K2)**
CO5 - Apply the knowledge of streaming metrics for delivery of the results. **(K2)**

UNIT - I INTRODUCTION TO STREAM COMPUTING **(9 Hrs)**

Streaming Data - Sources - Difference between Streaming Data and Static Data. Overview of Large Scale. Stream Processing Engines - Issues in Stream Processing.

UNIT – II STREAMING ANALYTICS ARCHITECTURE **(9 Hrs)**

Phases in Streaming Analytics Architecture - Vital Attributes - High Availability - Low Latency - Horizontal Scalability-Fault Tolerance - Service Configuration and Management - Apache ZooKeeper.

UNIT - III DATA FLOW MANAGEMENT **(9 Hrs)**

Distributed Data Flows - At Least One Delivery - Apache Kafka - Apache Flume - Zero MQ - Messages, Events, Tasks & File Passing.

UNIT - IV PROCESSING **(9 Hrs)**

Distributed Stream Data Processing: Co-ordination, Partition and Merges, Transactions. Duplication Detection using Bloom Filters - Apache Spark Streaming Examples Choosing a storage system – NoSQL Storage Systems.

UNIT - V DELIVERING STREAMING METRICS **(9 Hrs)**

Visualizing Data - Mobile Streaming Apps -Times Counting and Summation - Stochastic Optimization - Delivering Time Series Data.

Text Books

1. Byron Ellis, Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, Wiley,2014.
2. Sherif Sakr, Large Scale and Big Data: Processing and Management, CRC Press, 2014.
3. Bill Franks, Taming The Big Data Tidal Wave Finding Opportunities In Huge Data Streams With Advanced Analytics, Wiley, 2012.

Reference Books

1. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, Mining of Massive Datasets, CambridgeUniversity Press, 2014.
2. Paul C Zikopoulos, Chris Eaton, Paul Zikopoulos , Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill, 2011.

Web References

1. https://www.classcentral.com/course/real-time-streaming-big-data-950
2. https://training.ververica.com/pages/training

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

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

U19EEO42	ELECTRICAL SAFETY (Common to ECE, ICE, MECH, CIVIL, Mechatronics, BME, IT, CSE)	L	T	P	C	Hrs
		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

UNIT II ELECTRICAL SHOCKS AND THEIR PREVENTION **(9 Hrs)**

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

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

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

UNIT IV HAZARDOUS ZONES **(9 Hrs)**

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

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS **(9 Hrs)**

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

Text books

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

Reference books

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

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

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

	CONSUMER ELECTRONICS	L	T	P	C	Hours
U19ECO42	(Common to EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To enable the troubleshoot 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 to test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

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

CO1- Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker **(K1)**

CO2 - Explain the working of digital console, digital FM tuner and troubleshoot the audio systems **(K2)**

CO3 - Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera **(K2)**

CO4 - Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players **(K3)**

CO5 - Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera **(K2)**

UNIT -1 AUDIO FUNDAMENTALS AND DEVICES **(9 Hrs)**

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 **(9 Hrs)**

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 **(9 Hrs)**

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 **(9 Hrs)**

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 **(9 Hrs)**

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

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

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

U19ICO41	SENSORS AND TRANSDUCERS (Common to ECE, CSE, IT, MECH, CIVIL)	L	T	P	C	Hrs
		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 JacobFraden - 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. BelaG. 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	-	-	-	-
2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	-
3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	-
4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	-
5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	-

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

U19ICO42	CONTROL SYSTEM ENGINEERING (Common to CSE, IT, MECH)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems
- To introduce stability analysis of control systems.
- To introduce compensation technique.

Course Outcomes

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

CO1- Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form. **(K2)**

CO2 - Perform time domain analysis of various models of linear system **(K3)**

CO3 - Do frequency domain analysis of various models of linear system **(K4)**

CO4 - Determine and analyse the stability of the system **(K4)**

CO5 - Design the compensation technique that can be used to stabilize control systems. **(K3)**

UNIT I SYSTEM CONCEPTS **(9 Hrs)**

Types of system – open loop systems, closed loop systems, Basic elements in control system – Mathematical models of physical system: Differential equation- transfer functions of simple electrical networks – D.C and A.C servo motor – Mechanical system- Translational and Rotational system – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS **(9 Hrs)**

Standard test signals -Time response of first and second order system, Time domain- specifications- Generalized error series – Steady state error and error constants

UNITIII FREQUENCY RESPONSE ANALYSIS **(9 Hrs)**

Frequency response of the system – Correlation between time and frequency response – Gain and Phase margin – Bode plot, Polar Plot.

UNIT IV STABILITY ANALYSIS **(9 Hrs)**

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Nyquist stability criterion.

UNIT V COMPENSATION NETWORKS **(9 Hrs)**

Introduction to compensation networks - Lag, Lead and Lag Lead networks - Effect of providing Lag, Lead and Lag-Lead compensation on system performance and design using bode plot

Text Books

1. Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017

2. Ogata K, —Modern Control Engineeringll, Prentice-Hall of India Pvt Ltd., New Delhi, Fifth Edition, 2015.

Reference Books

1. Norman S Nise, Control System Engineering , John Wiley and sons, inc., Seventh Edition, 2015
2. Benjamin C Kuo, —Automatic Control Systemsll, Prentice Hall India Pvt. Ltd, Ninth Edition, 2015
3. Smarajith Ghosh, —Control Systems Theory and Applicationsll, Pearson Education, Singapore, Sixth Edition, 2015
4. Richard C. Dorf, Robert H Bishop, —Modern Control Systemsll, Pearson Education, Twelfth Edition, 2017

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1. https://lecturenotes.in/notes/6579-note-for-control-system-engineering-cse-by-gyana-ranjan-biswal
2. https://www.smartzworld.com/notes/control-systems-pdf-notes-cs/

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

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

U19CEO41	ENERGY AND ENVIRONMENT (Common to EEE, ECE, MECH, BME, IT, Mechatronics)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Explain the importance of energy, classifications of energy sources and energy demand scenario
- Analyze the impacts of energy on environment & sustainability energy options
- Outline the harness of hydropower and geothermal energy sources
- Discuss the aspects of solar and wind energy
- To study the importance of biomass energy and its applications

Course Outcomes

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

CO1 - Apply the knowledge of science & engineering to the contemporary issues of Energy for better humankind & environment **(K3)**

CO2 - Identify, review & analyze the complex problems of Energy crises in environment **(K4)**

CO3 - Designing solutions for the energy crises in the form of renewable energy systems to meet the needs by understanding the limitations **(K4)**

CO4 - Understanding the impact of energy on environment and providing solutions for sustainable development. **(K5)**

CO5 – Apply biomass energy under relevant technologies **(K3)**

UNIT I ENERGY **(9 Hrs)**

Introduction, Importance of energy, role of energy consumption in economic and social transformation, Energy needs and crisis. Energy production and utilization. Types and classification of energy sources, Conventional & unconventional energy, Renewable sources & Nonrenewable sources of energy advantages, limitations, comparisons

UNIT II ENVIRONMENT **(9 Hrs)**

Impact of energy on economy &environment. Regional impacts of temperature change - Global warming, Greenhouse effect, Acid rain, Ozone layer depletion. Indian environment degradation, Environmental laws - Water Act-1974 (Prevention & control of pollution), The environment protection act 1986, Air act.

UNIT III HYDROPOWER & GEOTHERMAL ENERGY **(9 Hrs)**

Hydropower Energy – Introduction, Site selection, layout of hydro power plant, components & working, classifications, power station, structure and control. Geothermal Energy - Introduction, Site selection, layout of power plant, components & working, Advantages and disadvantages.

UNIT IV SOLAR & WIND ENERGY **(9 Hrs)**

Sun as source of energy - Introduction, Site selection, layout of power plant components & working, classifications, Types of collectors, collection systems efficiency, Solar cells. Wind Energy - Introduction, advantages/limitations, Site selection, layout of power plant, components &working, classification.

UNIT V BIOMASS ENERGY **(9 Hrs)**

Introduction, advantages/limitations, Photosynthesis, biomass fuel, biomass gasification, biogas from waste biomass, factors affecting biogas generation, types of biogas plant, Biomass programme in India,

Text Books

1. Trivedi R.R. and Jalka K.R, "Energy Management", Commonwealth Publication, 20177.

2. Diamant R.M.E., "Total Energy", Pergamon, OxfordPublishers, 2017.
3. N.G. AJJANNA " Energy auditing & demand side management" first edition, Gouthami Publications, Shimoga
4. Chakrabarti, M.L.Soni, P.V. Gupta,U.S. Bhatnagar " Power system Engineering" 2001, DhanpatRai&Co, New Delhi.
5. D.P.Kothari, K.C Singal, Rajesh Ranjan, "Renewable Energy sources and Emerging Technologies" second edition , PHI , India

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1. Boyle G, Everett B and Ramett J, "Energy systems and sustainability", Oxford University Press, 2018
2. "Pollution Control Acts, Rules and Notifications", CPCB, Pollution Control series, PC/2/2014, Vol.I,2014
3. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
4. S.Rao, Dr. BB Parulekar "Energy Technologies" Khanna Publications , New Delhi
5. David M Buchla, Thomas E Kissel, Thomas L Floyd "Renewable Energy systems" Pearson, India
6. Godfrey Boyle "Renewable Energy power for sustainable future" oxford Publications , New Delhi

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3. www.iucn.org
4. www.cites.org
5. www.thesummitbali.com/
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COs/POs/PSOs Mapping

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

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

	MEDICAL ELECTRONICS	L	T	P	C	Hrs
U19BMO41	(Common to EEE, ECE, CSE, IT, ICE, MECH, Mechatronics)	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

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

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

U19BMO42	TELEMEDICINE (Common to EEE, ECE, CSE, IT, ICE)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives:

- To understand the classification of telemetry.
- To gain knowledge about biotelemetry principles
- To know about the applications of telemetry in various fields
- To provide the idea about the value of telemedicine
- To know the various applications in telemedicine.

Course Outcomes:

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

CO1 - Categorize the telemetry systems **(K2)**
CO2 - Understand the principles of biotelemetry in transmission of biological signals **(K3)**
CO3 - Apply the various Biotelemetry applications for diagnostics **(K3)**
CO4 - Acquire clear idea about the fundamentals of telemedicine **(K2)**
CO5 - Know about various applications of telemedicine **(K3)**

UNIT I INTRODUCTION TO TELEMETRY **(9 Hrs)**

Basic system, Classification, Non electrical telemetry systems, Mechanical and Pneumatic type, Voltage and Current telemetry systems, Local transmitters and Converters, Frequency telemetry system, Power Line carrier communication (PLCC).

UNIT II BIOTELEMETRY **(9 Hrs)**

Radio Telemetry principles, FM, AM, PCM, Transmission of biological data through radio telemetry.

UNIT III APPLICATION OF BIOTELEMETRY **(9 Hrs)**

Wireless Telemetry - Single Channel and Multi-channel Telemetry systems, Multi Patient Telemetry, Implantable Telemetry Systems, Ambulatory patient monitoring.

UNIT IV FUNDAMENTALS OF TELEMEDICINE **(9 Hrs)**

History and advancements in telemedicine, Benefits of telemedicine, Functional Block of a telemedicine system, Use of computers in distance mode of healthcare delivery, Familiarizing with technology of telemedicine, scanner, electro stethoscope, data reception equipment, Scope for telemedicine, Limitations of telemedicine.

UNIT V APPLICATIONS OF TELEMEDICINE **(9 Hrs)**

Telemedicine in Neuroscience, Telecardiology, Telepathology, Telepediatrics, Telepharmacy, Telepsychiatry and mental health, Veterinary.

Text Books

1. Marilyn J. Field , "A Guide to Assessing Telecommunications in Health Care", Fourth Edition, Academy Press,2011.
2. Bashshur , R. L. , Sanders, J. H and Shannon, G, "Telemedicine: Theory and Practice", Eight Edition, Springer,2014.
3. Olga (EDT), Ferre Roca, M. Sosa, "Handbook of Telemedicine", Third Edition, IOS press 2009.

Reference Books

1. Bemmel, J.H. van, Musen, M.A. (Eds.), "Handbook of Medical Informatics", Second Edition, Springer, 2010.
2. Simpson, W, "Video over IP. A practical guide to technology and applications'", Ninth Edition, Focal Press, Elsevier, 2009.
3. Ferrer-Roca, O., Sosa-Iudicissa, , "Handbook of Telemedicine", IOS Press, 2012

4. Norris, A.C, "Essentials of Telemedicine and Telecare", Eight Edition, Wiley, 2017
5. Wotton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine", Fifth Edition, Royal Society of Medicine Press Ltd., 2014.

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1. https://en.wikipedia.org/wiki/Biotelemetry
2. https://www.who.int/goe/publications/goe_telemedicine_2010.pdf
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5927731/

COs/POs/PSOs Mapping

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

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

	INTRODUCTION TO COMMUNICATION SYSTEMS	L	T	P	C	Hrs
U19CCO42	(Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics)	3	0	0	3	45

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals. **(K2)**

CO2- Comprehend needs of modulation and various analog modulation techniques **(K2)**

CO3- Illustrate pulse modulation and multiplexing **(K3)**

CO4- Explain Digital transmission techniques **(K2)**

CO5- Describe multiple access techniques and advanced communication systems. **(K2)**

UNIT I SIGNAL ANALYSIS **(9 Hrs)**

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform

UNIT II ANALOG COMMUNICATION **(9 Hrs)**

Need for Modulation— Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Superheterodyne receivers

UNIT III PULSE COMMUNICATION **(9 Hrs)**

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

UNIT IV DIGITAL COMMUNICATION **(9 Hrs)**

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION **(9 Hrs)**

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley, 2005
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education 2007.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

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1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

COs/POs/PSOs Mapping

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

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

U19ECO53	ELECTRONIC PRODUCT DESIGN AND PACKAGING (Common to EEE,CSE, IT, ICE,MECH, BME, Mechatronics)	L	T	P	C	Hrs
		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, the students will be 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, vibrationsand 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 parasitics

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 andMixed signal VLSI Circuits", Kluwer Academic Publishers.2000.
5. M. Abramovici, M. A. Breuer, and A.D. Friedman, "Digital System Testing and Testable Design", ComputerScience 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

U19ICO53	FUZZY LOGIC AND NEURAL NETWORKS (Common to CSE, IT, CIVIL, BME)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To expose the students to learn different architecture of neural network.
- To provide adequate knowledge about different training algorithm of neural network. -
- To provide adequate knowledge about properties and operations of fuzzy sets.
- To provide comprehensive knowledge of fuzzy logic control to real time systems.
- To provide adequate knowledge of Neuro-fuzzy logic controllers.

Course Outcomes

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

CO1 - Understand properties of fuzzy set, fuzzy relations, fuzzy rule base and algorithm **(K2)**
CO2 - Understand fuzzy logic controllers and its applications. **(K2)**
CO3 - Understand neural network architecture. **(K2)**
CO4 - Learn various training algorithm of neural network and its application. **(K2)**
CO5 - Understand Neuro-fuzzy logic controllers. **(K2)**

UNIT I INTRODUCTION TO FUZZY LOGIC **(9 Hrs)**

Fuzzy sets – properties of fuzzy sets – operations on fuzzy sets. Fuzzy relations linguistic variables – Linguistic approximation. Fuzzy statements: Assignments, Conditional and unconditional statements fuzzy rule base – fuzzy algorithm

UNIT II FUZZY LOGIC CONTROL SYSTEM **(9 Hrs)**

Fuzzy logic controller – Fuzzification, Membership functions. Triangular, Trapezoidal, Grassian – Membership value assignments using neural networks, intention, inference – knowledge base – Inference Mechanism –Defuzzification case study: Fuzzy logic controller for a temperature process – inverted pendulum control problem.

UNIT III INTRODUCTION TO NEURAL NETWORK **(9 Hrs)**

Motivation for the development of neural networks – artificial Neural networks –biological neural networks – Typical architecture – Training common Activation functions. McCulloh Pitts neuron: Architecture, algorithm and applications – Back propagation neural net – standard architecture – Algorithm – derivation of learning rules – number of hidden layers – Hopfield net architecture algorithm and applications Adaptive Resonance Theory: Architecture and operation

UNIT IV NEURAL NETWORKS BASED ON COMPETITION **(9 Hrs)**

Kohinoor's Self Organizing map- Counter propagation Networks – Neural networks for control: Schemes of neuro control –Inverse dynamics. Case study: Neuro controller for a temperature process and Inverted Pendulum problem

UNIT V NEURO FUZZY LOGIC CONTROL **(9 Hrs)**

Adaptive fuzzy controller – self timing and self organizing controllers – stability of FLC – Non linear Fuzzy control – Fuzzy neuron.

Text Books

1. LaureneFausett, "Fundamentals of Neural Networks", Pearson Education, 2008
2. Timothy J. Ross , "Fuzzy Logic with Engineering Applications", McGraw- Hill International Editions,2010
3. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA .2015

Reference Books

1. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2019
2. Rajasekaran. S, Pai. G.A.V. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice-Hall of India, 2003
3. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Pearson Education 2007
4. W.T.Miller, R.S.Sutton and P.J.Webrose, Neural Networks for Control, MIT Press, 1996.
5. C.Cortes and V.Vapnik, Support-Vector Networks, Machine Learning, 1995.

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3. https://nptel.ac.in/courses/106/105/106105173/.

COs/POs/PSOs Mapping

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

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

DISASTER MANAGEMENT

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

	L	T	P	C	Hrs
U19CEO53	3	0	0	3	45

Course Objectives

- To understand the basic conceptual understanding of disasters
- To understand approaches of Disaster Management
- To build skills to respond to disaster
- To understand the safety precaution
- To 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, Navale Pandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication

Reference Books

1. Disaster Management by Mrinalini Pandey 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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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

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

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

	AIR POLLUTION AND SOLID WASTE MANAGEMENT	L	T	P	C	Hrs
U19CEO54	(Common to EEE, ECE, CSE, IT, ICE, MECH, BME)	3	0	0	3	45

Course Objectives

- To provide general understanding of air pollution, air pollutants, their sources and their effects
- To provide knowledge about meteorological parameters, air sampling and measurement of pollutants.
- To provide knowledge of air pollution controlling technologies, air pollution due to automobiles and general Idea of noise pollution.
- To study the importance of solid waste management by processing, treatment, disposal and reuse of solid waste.
- To study about the equipment used for waste collection and transportation of solids waste.

Course Outcomes

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 **(8 Hrs)**

Introduction to solid waste management, sources, quantification and characterisation, classification and components, sampling and analysis, Method of collection

UNIT V EQUIPMENT **(12 Hrs)**

Equipment used for collection and transportation, transfer stations, solid waste processing and management. Treatment and disposal methods: composting, sanitary landfills, Incineration – concept, components and applications, leachate management.

Text Books

1. M.N. Rao & H.V.N. Rao, 1988, Air Pollution, Tata McGraw Hill Publishing Co. Ltd.
2. C.S. RAO, 2007, Environmental Pollution Control Engineering, New Age International, Wiley Estern Ltd. New Delhi.
3. Stern A. C., 1973, Air pollution, Academic Press.

4. A.D. Bhide & Sunderesan B.B., 1983, Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tohobanoglous, 1993, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd.

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1. P. Aarne Vesilind, William Worrell & Debra Reinhart, 2002, Solid Waste Engineering, Cengage Learning India pvt. Ltd.
2. Dr. Y Anjaneyulu, 2002, Air Pollution and Control Technologies, Allied Publisher pvt. Ltd.
3. Waste Management: A Reference Handbook. Contributors: Jacqueline Vaughn - Author. Publisher: ABC-Clio
4. K. V. S. G. Murlikrishna, 1995, Air Pollution, Kaushal& Company.

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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
CO1	2	3	2	3	2	3	3	3	3	3	2	3	3	2	3
CO2	3	3	2	3	3	3	3	2	3	2	2	3	3	3	3
CO3	3	3	3	2	2	2	3	3	3	3	2	3	3	3	2
CO4	2	3	2	3	2	3	2	3	3	2	2	3	3	3	3
CO5	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
U19BMO53	**BIOMETRIC SYSTEMS** (Common to EEE, ECE,CSE, IT,ICE, 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 - Analyse 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 Karthik Nandakumar " 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, Davide Maltoni, Dario Maio, "Biometric Systems, Technology Design and Performance Evaluation",Springer,2005
5. Nikolaos V. Boulgouris,Konstantinos N. Plataniotis ,Evangelia Micheli-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	1	-
2	3	2	2	1	1	2	-	-	-	-	-	1	1	1	-
3	3	2	2	1	2	2	-	-	-	-	-	1	1	1	-
4	3	1	1	1	1	1	-	-	-	-	-	1	1	1	-
5	3	1	2	1	2	2	-	-	-	-	-	1	1	1	-

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

		L	T	P	C	Hrs
U19BMO54	**MEDICAL ROBOTICS** (Common to EEE,ECE,CSE, IT,ICE, 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 BIOMETRIC AUTHENTICATION **(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, *first edition*, 2009

Reference Books

1. J.J.Craig, "Introduction to Robotics", Pearson Education, 2005.
2. Fu, Lee and Gonzalez., "Robotics, control vision and intelligence", McGraw Hill International, 2nd

edition, 2007
3 John J. Craig, "Introduction to Robotics", Addison Wesley Publishing, 3rd edition, 2010.
4. Saeed B. Niku, "Introduction to Robotics: Analysis, Systems, Applications", Prentice Hall, 2001.
5. K. S. Fu, R. C. Gonzales and C. S. G. Lee, "Robotics", McGraw Hill, 2008.

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1. https://nptel.ac.in/courses/112/105/112105249/
2. https://www.intechopen.com/books/medical_robotics/motion_tracking_for_minimally_invasive_robotic_surgery
3. https://www.intechopen.com/books/medical_robotics/robotic_applications_in_neurosurgery
4. https://www.intechopen.com/books/medical_robotics/medical_robotics_in_cardiac_surgery
5. https://www.worldscientific.com/worldscinet/jmrr

COs/POs/PSOs Mapping

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

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

U19ADO51	PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand basic principles of Artificial Intelligence
- To learn and design Knowledge representation
- To understand the concept of reasoning
- To master the fundamentals of machine learning, mathematical framework and learning algorithms
- To understand the reinforcement and statistical learning.

Course Outcomes

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

CO1 - Understand foundational principles of artificial intelligence. **(K2)**

CO2 - Understand formal methods of knowledge representation. **(K2)**

CO3 - Understand the fundamental issues and challenges of Reasoning. **(K2)**

CO4 - Analyze the underlying mathematical relationships with Machine Learning algorithms. **(K3)**

CO5 - Apply various models for Artificial Intelligence programming techniques. **(K4)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction to Artificial Intelligence - Artificial Intelligence Problems -Timelines of Artificial Intelligence - Production Systems - State Space Representation - Branches of Artificial Intelligence - Application of Artificial Intelligence.

UNIT II KNOWLEDGE REPRESENTATION **(9 Hrs)**

Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge representation - Issues in Knowledge representation - Knowledge base. First order Logic – Frames — Conceptual Dependency.

UNIT III REASONING **(9 Hrs)**

Types of reasoning - reasoning with Fuzzy Logic - Rule based Reasoning - Diagnosis Reasoning.

UNIT IV LEARNING **(9 Hrs)**

Types of Learning - Machine Learning - Intelligent agents - Association Learning: Apriori Algorithm - Case Study: Customer Sequence and SCADA Application – k-Means Clustering - Fuzzy Clustering - Cluster Similarity

UNIT V REINFORCEMENT AND STATISTICAL LEARNING **(9 Hrs)**

Markov Decision Problem - Hidden Markov Model - Linear Classifier - decision Trees: Random forest - Bayesian Network – ANN - ANN Learning process - Types of Network – Perceptron - RBF Network - Case studies: Character recognition.

Text Books

1. Anand Hareendran S., Anand Hareendran, And Vinod Chandra S.S. "Artificial Intelligence and Machine Learning" PHI Publication, 2014.
2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Science, 1997.
3. Peter Harrington, "Machine Learning in action", Manning Publication, 2012.

Reference Books

1. Charu C. Aggarwal "Data Classification Algorithms and Applications", Chapman & Hall/CRC Data Mining and Knowledge Discovery Series.
2. Andreas C. Mueller and Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, Inc. First Edition, 2016.
3. Eremy Watt, Reza Borhani, and Aggelos K. Katsaggelos "Machine Learning Refined Foundations, Algorithms, and Applications", Cambridge University Press, 2016.
4. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

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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

U19ADO52	DATA SCIENCE APPLICATION OF VISION (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the capability of a machine to get and analyse visual information and make decisions
- To learn methods and algorithms for Vision
- To learn how to use deep learning for Vision tasks
- To understand the neural network concepts
- To study the real world applications using computer vision

Course Outcomes

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

CO1 - Understand the methods and algorithms for image processing. **(K2)**

CO2 - Apply object detection and segmentation concepts for image processing. **(K4)**

CO3 - Apply scalable algorithms for large datasets in vision. **(K4)**

CO4 - Analyze deep learning and neural network architectures for image and video processing. **(K3)**

CO5 - Apply vision-based solutions for specific real-world applications. **(K4)**

UNIT I IMAGE FUNDAMENTALS **(9 Hrs)**

Pixels - The Building Blocks of Images - The Image Coordinate System - RGB and BGR Ordering - Scaling and Aspect Ratios. Image filters - Gaussian blur - Median filter - Dilation and erosion - Custom filters - Image thresholding - Edge detection - Sobel edge detector - Canny edge detector.

UNIT II OBJECT DETECTION AND SEGMENTATION **(9 Hrs)**

Image Features - Harris corner detection - Local Binary Patterns - Image stitching - Segmentation: Contour detection - The Watershed algorithm - Super pixels - Normalized graph cut.

UNIT III MACHINE LEARNING WITH COMPUTER VISION **(9 Hrs)**

Data pre-processing - Image translation through random cropping - Image rotation and scaling - Applications of machine learning for computer vision - Logistic regression - Support vector machines - K-means clustering.

UNIT IV IMAGE CLASSIFICATION USING NEURAL NETWORKS **(9 Hrs)**

Image Classification Basics Types of Learning - The Deep Learning Classification Pipeline - Introduction to Neural Networks - The Perceptron Algorithm - Backpropagation and Multi-layer Networks - The Four Ingredients in a Neural Network Recipe - Weight Initialization - Constant Initialization - Uniform and Normal Distributions - LeCun Uniform and Normal - Understanding Convolutions - CNN Building Blocks - Common Architectures and Training Patterns.

UNIT V COMPUTER VISION AS A SERVICE **(9 Hrs)**

Computer vision as a service – architecture - Developing a server-client model - Computer vision engine.

Text Books

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Cengage Learning, 2007.

3. Gary Bradski, "Learning OpenCV", First Edition, 2008.

Reference Books

1. Alok Kumar Singh Kushwaha, Rajeev Srivastava, "Recognition of Humans and Their Activities for Video Surveillance", IGI Global, 2014.
2. Ying-li Tian, Arun Hampapur, Lisa Brown, Rogerio Feris, Max Lu, Andrew Senior, "Event Detection, Query, and Retrieval for Video Surveillance", IGI Global, 2009.
3. Matthew Turk, Gang Hua, "Vision-based Interaction", First Edition, Morgan Claypool, 2013.
4. Ian Goodfellow, Yoshuo Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", MIT Press, 2017.
5. Fan Jiang, "Anomalous Event Detection from Surveillance Video", ProQuest, 2012.

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1. https://www.kaggle.com/learn/computer-vision
2. https://machinelearningmastery.com/what-is-computer-vision/
3. https://www.udemy.com/course/pythoncv/
4. https://www.analyticsvidhya.com/blog/2019/03/opencv-functions-computer-vision-python/
5. https://www.youtube.com/watch?v=N81PCpADwKQ&ab_channel=ProgrammingKnowledge

COs/POs/PSOs Mapping

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

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

U19HSO61	PRODUCT DEVELOPMENT AND DESIGN	L	T	P	C	Hrs
		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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2. https://www.pdfdrive.com/product-design-and-development-e38289913.html
3. https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/
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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

U19HSO62	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce fundamental aspects of Intellectual Property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- Awareness about current trends in IPR and Government steps in fostering IPR

Course Outcomes

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

CO1: Complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works **(K2)**

CO2: Presenting useful insight on novelty of their idea from state-of-the art search during their project work period. **(K3)**

CO3: Posting Intellectual Property as a career option like R&D IP Counsel, Government Jobs – Patent Examiner, Private Jobs, Patent agent and/or Trademark agent and Entrepreneur **(K5)**

CO4: To disseminate knowledge on Design, Geographical Indication, Plant Variety and Layout Design Protection and their registration aspects **(K1)**

CO5: Organizing their idea or innovations and analyse ethical and professional issues which arise in the intellectual property law context. **(K4)**

UNIT I OVERVIEW OF INTELLECTUAL PROPERTY **(9 Hrs)**

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

UNIT II PATENTS **(9 Hrs)**

Patents - Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

UNIT III COPYRIGHTS **(9 Hrs)**

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

UNIT IV TRADEMARKS (9 Hrs)

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

UNIT V OTHER FORMS OF IP (9 Hrs)

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.

Text Books

1. Nithyananda, K V. Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited, 2019
2. Neeraj, P., & Khusdeep, D. Intellectual Property Rights. India, IN: PHI learning Private Limited. 2014

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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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2. https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub _489.pdf
3. http://cipam.gov.in/
4. https://www.wipo.int/about-ip/en/
5. http://www.ipindia.nic.in/

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

U19HSO63	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

U19HSO64 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

U19HSO65	FINANCE FOR ENGINEERS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To develop a deeper understanding of the fundamentals of Accounting and Finance
- To learn how to apply mathematical principles in Finance and the concepts of Risk and Return
- To understand the need and procedure for conducting Financial Analysis for better decision-making
- To be familiar with the modes of generating funds for business and their implications
- To understand the scientific ways to determine deployment of funds in business

Course Outcomes

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

CO1: Understand basic concepts in accounting and finance and their importance for engineers **(K2)**

CO2: Demonstrate knowledge and understanding of the applications of mathematics in finance **(K3)**

CO3: Conduct Financial Analysis and use the outcome in making informed decisions in investing **(K4)**

CO4: Identify and appreciate various sources of procurement of funds in business and their critical evaluation **(K2)**

CO5: Know how to scientifically determine the investing in long-term and short-term assets in business **(K3)**

UNIT I UNDERSTANDING THE FUNDAMENTALS **(9 Hrs)**

Assets – Need and Functions of Assets – Types of Assets – Factors determining Investments in Assets. Liabilities – Meaning and Functions of Liabilities – Types of Liabilities – Capital as a Liability: Why and How — Concept and Meaning of Finance – Distinction between Accounting and Finance – Significance of Accounting and Finance for Engineers.

UNIT II MATHEMATICS OF FINANCE **(9 hrs)**

Time Value of Money – Computation of Present Value and Future Value – Implications of TVM in Financial Decisions – Concept of Risk and Return – Measuring Risk and Return – Concept of Required Rate of Return and its significance in Investment Decisions.

UNIT III FINANCIAL ANALYSIS **(9 hrs)**

Meaning and Objectives of Financial Analysis – Annual Report As an Input for Analysis – Basic Understanding of Annual Reports - Tools of Financial Analysis – Horizontal Analysis – Vertical Analysis – Trend Analysis – Accounting Ratios – Significance of Ratio Analysis in Decision-making – Snap-shot of the Past to predict the Future – Computation of Key Ratios – Liquidity Ratios – Profitability Ratios – Performance Ratios – Ratios that are helpful for Potential Investors.

UNIT IV FUNDS PROCUREMENT **(9 hrs)**

Meaning of Funds – Sources of Funds – Long-Term Sources – Short-Term Sources – Financing Decisions in Business – Capital Structure – Need and Importance of Capital Structure – Determining Optimum Capital Structure – Concept and Computation of Earnings Before Interest and Tax (EBIT), Earnings Before Tax (EBT), and Earnings After Tax (EAT)(Simple Problems) - Leverage in Finance – Types and Computation of Leverages – Operating Leverage, Financial Leverage, and Combined Leverage.

UNIT V FUNDS DEPLOYMENT (9 hrs)

Investment Decisions – Types of Investment Decisions: Long-Term Investment Decisions. Significance – Methods: Pay-Back Period Method, Net Present Value Method and Benefit-Cost Ratio Method. Short-Term Investment Decisions – Concept of Working Capital – Need and Importance of Working Capital in Business – Determinants of Working Capital in a Business. Components of Working Capital. Dividends: Concept and Meaning – Implications of Dividend Decisions on Liquidity Management.

Text Books

1. R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi. (2015 or later edition)
2. C. Paramasivan and T. Subramanian. Financial Management. New Age International, New Delhi. (2015 or later edition)

Reference Books

1. S.N. Maheswari, Sharad K. Maheswari & Suneel K. Maheswari. Accounting For Management. Vikas Publishing (2017 or later edition)
2. Varun Dawar & Narendar L. Ahuja. Financial Accounting and Analysis. Taxmann Publications. (2018 or later edition)
3. Athma. P. Financial Accounting and Analysis. Himalaya Publishing House. (2017 or later edtion)
4. Prasanna Chandra. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
5. S.C. Kuchhal. Financial Management. Chaitanya Publishing House, Allahabad. (2014 or later edition)

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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/

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	-	-	-
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

U19ECO75	IOT AND ITS APPLICATIONS (Common to EEE, ICE, CSE, IT, MECH, CIVIL)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

Course Outcomes

After completion of the course, students will be able to

CO1-Understand internet of Things and its hardware and software components. **(K2)**
CO2-Demonstrate the Interfacing of I/O devices, sensors & communication modules. **(K3)**
CO3-Understand the concepts of remotely monitor data and control devices. **(K2)**
CO4-Build and deploy a various architecture with their elements. **(K3)**
CO5-Can develop real time IoT based projects. **(K3)**

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

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

UNIT -II ARCHITECTURE OF IoT **(9 Hrs)**

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT - III ELEMENTS OF IoT **(9 Hrs)**

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

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

UNIT - IV IoT APPLICATION DEVELOPMENT **(9 Hrs)**

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

UNIT -V IoT APPLICATIONS **(9 Hrs)**

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, "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, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs 2014

Reference Books

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2012
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2007
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

Web 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
5. https://onlinecourses.nptel.ac.in/noc21_ee85/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	2	2	3	2	-	-	-	-	-	-	-	-			
2	3	-	3	2	-	-	-	-	-	-	-	-			
3	2	3	2	-	-	-	-	-	-	-	-	-			
4	2	2	2	-	-	-	-	-	-	-	3	-			
5	2	3	2	-	3	-	-	-	-	-	3	-			

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

U19ECO76	SENSORS FOR INDUSTRIAL APPLICATIONS	L	T	P	C	Hrs
		3	0	0	3	45

(Common to EEE, ICE, CSE, IT, MECH, CIVIL, BME, Mechatronics)

Course Objectives

- To study principles of sensor and calibration
- To understand different types of motion sensors
- To demonstrate force, magnetic and heading sensors with its application to the learners
- To enhance students to understand the concept of optical, pressure and temperature sensor
- To select suitable sensor for industrial application

Course Outcomes

After completion of the course, students will be able to

CO1 - Explain principles of sensor and illustrate the calibration **(K2)**
CO2 - Demonstrate different types of range and sensors **(K3)**
CO3 - Determine the principles of Force, magnetic and heading sensors **(K3)**
CO4 - Describe different optical and thermal sensors **(K2)**
CO5 - Select suitable sensor for real time applications **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Principles of Physical and Chemical Sensors: Sensor classification, Sensing mechanism of Mechanical,Electrical, Thermal, Magnetic, Optical, Chemical and Biological Sensors.

Sensor Characterization and Calibration: Study of Static and Dynamic Characteristics, Sensor reliability,aging test, failure mechanisms and their evaluation and stability study.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS **(9 Hrs)**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS **(9 Hrs)**

Strain Gage, Load Cell and Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS **(9 Hrs)**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement. Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNITV APPLICATIONS OF SENSORS **(9 Hrs)**

Applications of Sensors for Industry Automation - Design of smart Industry using Temperature, Humidity and Pressure sensors - Applications of Flow sensors in Industries-Applications of Gyro sensor. Applications of Position sensors.

Text Books

1. Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., second edition 2005(revised).

2. Renganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2005(revised).
3. Ernest O. Doebelin, "Measurement systems Application and Design", International Student Edition, VIEdition, Tata McGraw-Hill Book Company, 2012.

Reference Books

1. Kr.Iniewski, "Smart Sensors for Industrial Applications" ,CRC Press ,2017
2. Bolton W, "Mechatronics", Thomson Press, third edition, 2004.
3. Ian R Sinclair, —Sensors and Transducersl, Third Edition, Newnes publishers, 2001.
4. Robert B. Northrop, "Introduction to Instrumentation and Measurement", 3rd Edition", CRC – Press –Taylor and Francis Group, 2005
5. Curtis D. Johnson, "Process Control Instrumentation Technology", Prentice Hall International Edition,2015.

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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

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

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

		L	T	P	C	Hrs
U19ICO75	**INDUSTRIAL AUTOMATION** (Common to EEE, ECE, CSE, IT, MECH, CIVIL, 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

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

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

U19CEO76	GLOBAL WARMING AND CLIMATE CHANGE (Common to EEE, ECE, CSE, IT, ICE, MECH, BME)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- 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 I EARTH'S CLIMATE SYSTEM **(9 Hrs)**

Ozone layer-Role of ozone in environment-ozone depleting -Green House gases- Effects of Greenhouse Gases- Global Warming -Hydrological Cycle – Radiative Effects and Carbon Cycle.

UNIT II ATMOSPHERE AND ITS COMPONENTS **(9 Hrs)**

Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE **(9 Hrs)**

Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV OBSERVED CHANGES AND ITS CAUSES **(9 Hrs)**

Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks –The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India .

UNIT V CLIMATE CHANGE AND MITIGATION MEASURES **(9 Hrs)**

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels ——Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices–Carbon sequestration – Carbon capture and storage (CCS) – International and Regional cooperation- Remedial measures.

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.
2. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
3. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
4. Andrew Dessler and Edward A. Parson **"The Science and Politics of Global Climate Change"** 2009
5. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. JasonSmerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. van Dam,(2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press,.

Web References

1. https://nptel.ac.in/courses/105102089/
2. https://www.warmheartworldwide
3. https://nptel.ac.in/content/storage

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ADO73	**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 MODELING **(9 Hrs)**

Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multi-word Expressions - The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

UNIT V SYNTAX AND SEMANTICS **(9 Hrs)**

Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense. Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs. Applications of NLP.

Text Books

1. Dan Jurafsky, James H. Martin, "Speech and Language Processing", Third Edition, Prentice Hall, 2018.
2. Emily Bender, "Linguistics Fundamentals for NLP", Morgan Claypool Publishers, 2013.
3. Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press, 2019.

Reference Books

1. Chris Manning, Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
2. Cole Howard, Hobson Lane, Hannes Hapke, "Natural Language Processing in Action" Manning Publication 2019.
3. Li Deng, Yang Liu "Deep Learning in Natural Language Processing" Springer, 2018.
4. Tom Hoobyar, Tom Dotz, Susan Sanders, "NLP The Essential Guide to Neuro-Linguistic Programming", William Morrow Paperbacks, 2013.
5. Kate Burton, "Coaching With NLP For Dummies", Wiley, 2011.

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

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

U19ADO74	ARTIFICIAL INTELLIGENCE APPLICATIONS (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME)	L	T	P	C	Hrs
		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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1. https://www.javatpoint.com/application-of-ai
2. https://pytorch.org/tutorials/beginner/chatbot_tutorial.html
3. https://www.mygreatlearning.com/blog/basics-of-building-an-artificial-intelligence-chatbot/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-3-reasoning-goal-trees-and-rule-based-expert-systems/
5. http://www.umsl.edu/~joshik/msis480/chapt11.htm

COs/POs/PSOs Mapping

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

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

		L	T	P	C	Hrs
U19ITC3X	**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.

		L	T	P	C	Hrs
U19ITC4X	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.

		L	T	P	C	Hrs
U19ITC5X	**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.

		L	T	P	C	Hrs
U19ITC6X	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.

U19ITS31 **SKILL DEVELOPMENT COURSE 1**
(GENERAL PROFICIENCY–I)

L	T	P	C	Hrs
0	0	2	0	30

Course Objectives

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

Course Outcomes

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

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

UNIT I - COMPREHENSION ANALYSIS **(6 Hrs)**

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

UNIT II - PERSONALITY DEVELOPMENT **(6 Hrs)**

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

UNIT III - INFERENTIAL LEARNING **(6 Hrs)**

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

UNIT IV - INTERPRETATION AND FUNCTIONAL WRITING **(6 Hrs)**

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

UNIT V – APTITUDE **(6 Hrs)**

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

Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 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.

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

COs/POs/PSOs Mapping

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

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

U19ITS32	SKILL DEVELOPMENT COURSE 2 (Choose anyone of the below three courses)	L	T	P	C	Hrs
		0	0	2	0	30

1. OBJECT ORIENTED PROGRAMMING

Course Content:

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

Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Classes objects - this Pointer - Friend Functions - Friend Classes - Static Functions - Constructors and Destructors - Static variables and Functions in class - Operator Overloading in C++

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

2. HARDWARE AND TROUBLESHOOTING

Course Content:

List of Experiments

1. Front panel indicators & switches and Front side & rear side Connectors.
2. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.
3. Configure BIOS setup program and troubleshoot the typical problems using BIOS utility.
4. Install Hard Disk and configure to the Pc's
5. Install and Configure a DVD Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk.
6. Printer Installation and Servicing and troubleshoot
7. Install and configure Scanner, Web cam, Cell phone and bio-metric device with system and troubleshoot the problems
8. Assemble a system with add on cards and check the working condition of the system and install OS.
9. Install and Configure Dual OS Installation
10. Assembling and Disassembling of Laptop to identify the parts and to install OS and configure it.

3. ELECTRONIC CIRCUITS AND DEVICES

Course Content:

Diode current equation – V-I characteristics of PN junction diode – Applications- Half wave and Full wave rectifiers with and without filters, Zener diode and its application, Clippers, Clampers.

Special devices: Silicon controlled rectifier, Uni-junction transistor, LED, LCD, Schottky Barrier diode, Varactor diode, Tunnel diode, photodiode, and photo-transistor

BJT – Transistor biasing and bias circuits – operating point — FET biasing – Power Amplifier – Types – Transformer coupled Class A Amplifier – Class B Amplifier.

Feedback concept, general characteristics of positive feedback, Oscillators: Barkhausen Criterion-Hartley, Colpitts and Wein bridge oscillators.

Introduction to op-amp, Characteristics of op-amp, Op-amp parameters - Equivalent circuit - Applications: Inverting and non-inverting amplifier, summer, subtractor, voltage follower, differentiator, integrator, comparator, first order low pass and high pass active filters.

U19ITS41	SKILL DEVELOPMENT COURSE 3 (GENERAL PROFICIENCY–II)	L	T	P	C	Hrs
		0	0	2	0	30

Course Objectives

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

Course Outcomes

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

CO1 - Infer ideas to attend international standardized test by broadening receptive and productive skills **(K2)**

CO2 - Interpret the types of writing in different state of affairs **(K2)**

CO3 - Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation **(K3)**

CO4 - Identify the rules of grammar in academic discourse settings **(K3)**

CO5 - Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. **(K2)**

UNIT I -CAREER SKILLS **(6 Hrs)**

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

UNIT II - CORPORATE SKILLS **(6 Hrs)**

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

UNIT III - FUNCTIONAL SKILLS **(6 Hrs)**

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

UNIT IV - TRANSFERABLE SKILLS **(6 Hrs)**

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

UNIT V –APTITUDE **(6 Hrs)**

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

Reference Books

1. 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.

Web References

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

COs/POs/PSOs Mapping

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

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

U19ITS42	SKILL DEVELOPMENT COURSE 4 (Choose anyone of the below three courses)	L	T	P	C	Hrs
		0	0	2	0	30

1. GRAPHIC DESIGN

Course Content:

1. Introduction to Blender Interface
2. Working with viewports
3. Creating & Editing objects
4. Materials & Textures
5. Setting up a world
6. Lighting & Cameras
7. Rendering Movies & Images
8. Ray-Tracing
9. Animation Basics
10. Adding 3D Texts

2. NETWORKING

Course Content:

An Overview of Networks - Layers - Data Rate- Throughput and Bandwidth - Datagram Forwarding - Topology - Routing Loops - Congestion - Packets Again - LANs and Ethernet . -IP - Internet Protocol - DNS - Transport - Some Useful Utilities - IETF and OSI - Berkeley Unix
Ethernet Basics - 10-Mbps Classic -Mbps (Fast) Ethernet -Gigabit Ethernet- Ethernet Switches
Advanced Ethernet -Spanning Tree Algorithm and Redundancy - Virtual LAN (VLAN) - TRILL and SPB- Software-Defined Networking
Wireless LANs -Adventures in Radioland - Wi-Fi - WiMAX and LTE -Fixed
Other LANs -Virtual Private Networks - Carrier Ethernet -Token Ring -Virtual Circuits -Asynchronous Transfer Mode: ATM
Links - Encoding and Framing - Time-Division Multiplexing
Packet Delay - Packet Delay Variability - Packet Size -Error Detection -Epilog
Abstract Sliding Windows - Building Reliable Transport: Stop-and-Wait -Sliding Windows - Linear Bottlenecks

3. COMMUNICATION ENGINEERING

Course Content:

Need for modulation - Amplitude modulation –Frequency spectrum of AM wave – Representation of AM – Power relation – Generation of AM waves – Low level and high level AM transmitters– Suppression of carrier – DSB and SSB.

Frequency modulation and Phase modulation – Mathematical representation of FM – Frequency spectrum of FM wave – Generation of FM wave – Direct and Indirect methods– FM transmitter block diagram

Demodulation of AM waves – Synchronous and envelope detectors. Super heterodyne AM receiver — Demodulation of FM waves – Slope detector –Balanced slope detector. FM receivers block diagram- Receiver characteristics

Principles of pulse modulation – sampling theorem, Generation and demodulation of PAM, PPM and PWM waves. Principle of Pulse code modulation- Delta modulation- DPCM

Principle of ASK- Transmitter and receiver for coherent BPSK, BFSK and QPSK. Basic principle of M-ary PSK and M-ary FSK. Bandwidth efficiency and error performance comparisons of PSK, FSK and QAM (detailed derivations not required)

U19ITS51	SKILL DEVELOPMENT COURSE 5 (Foreign Language / IELTS – I)	L	T	P	C	Hrs
		0	0	2	0	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

U19ITS52	SKILL DEVELOPMENT COURSE 6 (Presentation Skills using ICT)	L	T	P	C	Hrs
		0	0	2	0	30

The methodology used is "learning by doing", a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

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.

U19ITS61	SKILL DEVELOPMENT COURSE 7 (Foreign Language / IELTS – II)	L	T	P	C	Hrs
		0	0	2	0	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.

U19ITS62	SKILL DEVELOPMENT COURSE 8 (Technical Seminar)	L	T	P	C	Hrs
		2	0	0	0	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 overhead 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 and maintain attendance also.

Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.

U19ITS63	SKILL DEVELOPMENT COURSE 9 (NPTEL / MOOC - I)	L	T	P	C	Hrs
		0	0	0	0	30

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation

U19ITS81	SKILL DEVELOPMENT COURSE 10 (NPTEL / MOOC - II)	L	T	P	C	Hrs
		0	0	0	0	30

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation

P107 **NSS / NCC**

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.
2. The above activities shall be carried out outside class hours.
3. In the above activities, the student participation shall be for a minimum period of 30 hours.
4. The above activities will be monitored by the respective faculty in-charge.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. 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

U19ITM31	PHYSICAL EDUCATION	L	T	P	C	Hrs
		0	0	2	-	30

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

U19ITM41	INDIAN CONSTITUTION	L	T	P	C	Hrs
		2	0	0	-	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.

		L	T	P	C	Hrs
U19ITM51	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	-	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 **(6 Hrs)**

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 **(6 Hrs)**

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 **(6 Hrs)**

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) **(6 Hrs)**

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 **(6 Hrs)**

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science andScientists 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

U19ITM61	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

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

Course Outcomes

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

CO1 - Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities andrights 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 andstress 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 BalancedOutlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS Safety **(6 Hrs)**

and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority

– Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES **(6 Hrs)**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

Reference Books

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi,2004.
3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases",Cengage Learning, 2009
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
6. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", OxfordUniversity Press, Oxford, 2001
7. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and SocialResponsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi2013.
8. World Community Service Centre, " Value Education", Vethathiri publications, Erode,2011

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org