



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER SCIENCE AND ENGINEERING

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

MISSION

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

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

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

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

PROGRAMME OUTCOMES (POs)**PO1: Engineering knowledge:**

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

PO2: Problem analysis:

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

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

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

PO5: Modern tool usage:

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

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

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

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

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

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

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

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl.No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	09
2	Basic Sciences(BS)	38
3	Engineering Sciences (ES)	40
4	Professional Core (PC)	57
5	Professional Electives (PE)	18
6	Open Electives (OE)	09
7	Project Work and Internship	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	09
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	-	09
7	Project Work and Internship	-	-	-	-	-	-	4	8	12
8	Employability Enhancement Courses (EEC)*	-	-	-	-	-	-	-	-	-
9	Mandatory Courses (MC)*	-	-	-	-	-	-	-	-	-
Total		30	30	22	21	21	21	20	18	183

** EEC, MC 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	U19CST31	Numerical Methods	BS	2	2	0	3	25	75	100
2	U19CST32	Data Structures	ES	3	0	0	3	25	75	100
3	U19CST33	Digital Design and Microprocessors	ES	3	0	0	3	25	75	100
4	U19CST34	Automata and Compiler Design	PC	2	2	0	3	25	75	100
5	U19CST35	Operating Systems	PC	3	0	0	3	25	75	100
6	U19CST36	Data Communications and Computer Networks	PC	3	0	0	3	25	75	100
Practical										
7	U19CSP31	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
8	U19CSP32	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U19CSP33	Digital Design and Microprocessors Laboratory	ES	0	0	2	1	50	50	100
10	U19CSP34	Linux Internals Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U19CSC3X	CertificationCourse - I	EEC	0	0	4	-	100	-	100
12	U19CSS31	Skill Development Course 1: General Proficiency - I	EEC	0	0	2	-	100	-	100
13	U19CSS32	Skill Development Course 2 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U19CSM31	Physical Education	MC	0	0	2	-	100	-	100
							22	750	650	1400

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CST41	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U19CST42	Programming in Java	ES	3	0	0	3	25	75	100
3	U19CST43	Database Management Systems	PC	3	0	0	3	25	75	100
4	U19CST44	Design and Analysis of Algorithms	PC	2	2	0	3	25	75	100
5	U19CSE4X	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	U19CSP41	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U19CSP42	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP43	Design and Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC4X	Certification Course - II	EEC	0	0	4	-	100	-	100
11	U19CSS41	Skill Development Course 3: General Proficiency - II	EEC	0	0	2	-	100	-	100
12	U19CSS42	Skill Development Course 4 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CSM41	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	1300

* 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	U19CST51	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U19CST52	Handheld Computing: Design and Application Development	PC	3	0	0	3	25	75	100
3	U19CST53	Web Application Development	PC	3	0	0	3	25	75	100
4	U19CST54	Software Engineering and Testing	PC	3	0	0	3	25	75	100
5	U19CSE5X	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	U19CSP51	Handheld Computing Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP52	Web Application Development Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP53	Software Testing Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC5X	Certification Course - III	EEC	0	0	4	-	100	-	100
11	U19CSS51	Skill Development Course 5: Foreign Language / IELTS – I/ Career and Professional Skill development Program -I	EEC	0	0	2	-	100	-	100
12	U19CSS52	Skill Development Course 6: Presentation Skills using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CSM51	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	U19CST61	Artificial Intelligence and Expert Systems	PC	2	2	0	3	25	75	100
2	U19CST62	C# and .Net Programming	PC	3	0	0	3	25	75	100
3	U19CST63	Cloud Computing and Big Data	PC	3	0	0	3	25	75	100
4	U19CST64	Animation and Visual Effects	PC	3	0	0	3	25	75	100
5	U19CSE6X	Professional Elective - III	PE	3	0	0	3	25	75	100
6	U19XXO6X	Open Elective - III	HS	3	0	0	3	25	75	100
Practical										
7	U19CSP61	Artificial Intelligence and Expert Systems Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP62	C# and .Net Programming Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP63	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC6X	CertificationCourse - IV	EEC	0	0	4	-	100	-	100
11	U19CSS61	Skill Development Course 7: Foreign Language / IELTS – II/ Career and Professional Skill development Program -II	EEC	0	0	2	-	100	-	100
12	U19CSS62	Skill Development Course 8: Technical Seminar	EEC	2	0	0	-	100	-	100
13	U19CSS63	Skill Development Course 9: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U19CSM61	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	U19CST71	IoT and Edge Computing	PC	3	0	0	3	25	75	100
2	U19CST72	Data Science and Digital Marketing Analytics	PC	3	0	0	3	25	75	100
3	U19CSE7X	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	U19CSP71	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U19CSP72	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
7	U19CSP73	Data Science and Digital Marketing Analytics Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP74	Comprehensive Viva-Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U19CSW71	Project phase – I	PW	0	0	4	2	50	50	100
10	U19CSW72	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	U19CST81	Block chain and Cryptography	PC	3	0	0	3	25	75	100
2	U19CSE8X	Professional Elective – V	PE	3	0	0	3	25	75	100
3	U19CSE8X	Professional Elective – VI	PE	3	0	0	3	25	75	100
Practical										
4	U19CSP81	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U19CSW81	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U19CSS81	Skill Development Course 10: NPTEL / MOOC -II	EEC	0	0	0	-	100	-	100
							18	315	285	600

ANNEXURE –I PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	Course Code	Course Title
1.	U19CSE41	Database Administration
2.	U19CSE42	E-Business
3.	U19CSE43	Object Oriented Analysis And Design
4.	U19CSE44	Scripting Languages
5.	U19CSE45	Fundamentals of Programming Languages
Professional Elective – II (Offered in Semester V)		
Sl. No.	Course Code	Course Title
1.	U19CSE51	Enterprise Solutions
2.	U19CSE52	Game Development using Unity
3.	U19CSE53	Functional Programming
4.	U19CSE54	Robotics Process Automation
5.	U19CSE55	Software Project Management
Professional Elective – III (Offered in Semester VI)		
Sl. No.	Course Code	Course Title
1.	U19CSE61	Augmented Reality
2.	U19CSE62	Service Oriented Architecture
3.	U19CSE63	Agile Development
4.	U19CSE64	Embedded Systems
5.	U19CSE65	Assistive Technology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	Course Code	Course Title
1.	U19CSE71	Network Security
2.	U19CSE72	Data Mining and Warehousing
3.	U19CSE73	Virtual Reality
4.	U19CSE74	Robotics
5.	U19CSE75	Haptic Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1.	U19CSE80	Ethical Hacking
2.	U19CSE81	Deep Learning
3.	U19CSE82	Mobile Computing
4.	U19CSE83	Pervasive Computing
5.	U19CSE84	Cyber Security and Digital Forensics
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1.	U19CSE85	Quantum Computing
2.	U19CSE86	Trust Computing
3.	U19CSE87	Client Server Computing
4.	U19CSE88	Human Computer Interaction
5.	U19CSE89	Natural Language Processing

ANNEXURE –II

OPEN ELECTIVE COURSES (R-2019)

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
11	U19ICO42	Control System Engineering	ICE	CSE, IT, MECH
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
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 (Offered in Semester V for EEE, ECE, ICE, CIVIL, BME)
2	U19HSO52 / U19HSO62	Intellectual Property and Rights	MBA	

3	U19HSO53 / U19HSO63	Marketing Management and Research	MBA	(Offered in Semester VI for CSE, IT, MECH, Mechatronics)
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	EEE, CSE, IT, ICE MECH, BME, Mechatronics
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
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
15	U19CEO54 / U19CEO64	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
16	U19BMO53 / U19BMO63	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
17	U19BMO54 / U19BMO64	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, MECH, CIVIL , 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.	U19CSCX1	Web Programming – I
2.	U19CSCX2	Python Programming
3.	U19CSCX3	Java Programming
4.	U19CSCX4	CCNA
5.	U19CSCX5	Android Development
6.	U19CSCX6	Software Testing
7.	U19CSCX7	Internet of Things
8.	U19CSCX8	Blockchain
9.	U19CSCX9	Artificial Intelligence and Edge Computing
10.	U19CSCX10	Cloud Computing

ANNEXURE – IV**EMPLOYABILITY ENHANCEMENT COURSES-(B) SKILL DEVELOPMENT COURSES**

Sl. No.	Course Code	Course Title
1.	U19CSS31	Skill Development Course 1: General Proficiency – I
2.	U19CSS32	Skill Development Course 2 *
		1) Computer Assembly and Troubleshooting
		2) Aptitude - I
		3) Electronic Devices and Circuits
3.	U19CSS41	Skill Development Course 3 : General Proficiency – II
4.	U19CSS42	Skill Development Course 4*
		1) Exploring Photoshop
		2) Aptitude - II
		3) Office Automation
5.	U19CSS51	Skill Development Course 5 : Foreign Language/ IELTS –I/ Career and Professional Skill development Program -I
6.	U19CSS52	Skill Development Course 6 : Presentation Skills using ICT
7.	U19CSS61	Skill Development Course 7 : Foreign Language/ IELTS – II/ Career and Professional Skill development Program -II
8.	U19CSS62	Skill Development Course 8 : Technical Seminar
9.	U19CSS63	Skill Development Course 9 : NPTEL / MOOC - I
10.	U19CSS81	Skill Development Course 10 : NPTEL / MOOC-II

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

SEMESTER - I

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 Publishing Company, Chennai, 2010
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41st Edition, 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.

Web Resources

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

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

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

T102	PHYSICS	L	T	P	C	Hrs
	(Common to all Branches)	4	0	0	4	60

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**(12 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 Radars.(elementary ideas).

UNIT II OPTICS (12 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 (12 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, CO₂ 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 (12 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 (12 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.

Web Resources

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

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

T103	CHEMISTRY	L	T	P	C	Hrs
	(Common to all Branches)	4	0	0	4	60

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 (12 Hrs)

Hardness of water-units and calcium carbonate equivalent. Determination of hardness of water-EDTA method. Disadvantages of hardwater – 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 & electrodialysis.

UNIT II POLYMER (12 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, Polyurethane, 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 (12 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–H₂-O₂ fuel cell.

UNIT IV CORROSION AND ITS CONTROL (12 Hrs)

Chemical & electrochemical 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 (12 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, Dhanpat Rai and Sons, New Delhi 15th Ed, 2010.
2. B. Sivasankar (2008), "Engineering Chemistry", Tata McGraw Hill, India
3. Shalee 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, 3rd edition 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, 2nd Ed. PHI Learning PVT., LTD, New Delhi, 2008
5. C.V. Agarwal, C.P. Naidu, "A text book of Engineering Chemistry", BS Publication, Hyderabad.

Web Resources

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/phase-rule.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	-	1	-
2	2	1	-	-	-	1	1	-	-	-	-	1	3	1	-
3	2	1	-	-	-	1	1	-	-	-	-	1	3	1	-
4	2	1	-	-	-	1	1	-	-	-	-	1	1	1	-
5	2	1	-	-	-	1	1	-	-	-	-	1	2	1	-

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

(Common to all Branches)

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, Kirchhoff'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. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2009. (For Units I to III)
2. Rajendra Prasad, "Fundamentals of Electronic Engineering", Cengage Learning, New Delhi, 1st Edition, 2011. (For Unit IV)
3. Morris Mano, "Digital design", PHI Learning, 4th Edition, 2008. (For Unit V)
4. Wayne Tomasi, "Electronic Communication Systems – Fundamentals Theory Advanced", Pearson Education, 6th Edition, 2004. (For Unit VI)

Reference Books

1. R. Muthusubramaniam, S. Salivahanan and K.A. Mureledharan, "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, 4th Edition, 2008
4. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications," Tata McGraw Hill Publishing Company Ltd., New Delhi, 6th Edition, 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, 9th Edition, 2008
8. M.S. Sukija and T.K. Nagasarkar, "Basic electrical and Electronics Engineering", Oxford University Press, 2012.

Web Resources

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

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

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

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-Planck 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.

Web Resources

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-httpd>
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	-
2	3	2	2	2	2	-	-	-	-	-	-	1	-	1	-
3	3	2	3	3	2	-	-	-	-	-	-	1	-	1	-
4	3	2	3	3	-	-	-	-	-	-	-	1	-	2	-
5	3	2	3	3	-	-	-	-	-	-	-	1	-	2	-

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

T106	COMPUTER PROGRAMMING	L	T	P	C	Hrs
	(Common to all Branches)	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. **(K1)**

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 Books

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 Resources

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

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

P101
COMPUTER PROGRAMMING LABORATORY
 (Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	45

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 of 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. Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment. **(K2)**
- CO2** - Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs. **(K2)**
- CO3** - Understand and apply the in-built functions and customized functions for solving the problems. **(K3)**
- CO4** - Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems. **(K3)**
- CO5** - Document and present the algorithm's, flowcharts and programs in form of user-manuals. **(K3)**

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.

Reference Books

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 Resources

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	-	-	-	-	-	-	-	2	1	3
2	2	1	-	-	3	-	-	-	-	-	-	-	2	1	3
3	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
4	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
5	3	2	1	1	3	-	-	-	-	-	-	-	2	1	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	45

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 made 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 - Analyse the different views and computer aided drafting tools. **(K3)**

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

UNIT I (9 Hrs)

Conic sections, Involute, Spirals, Helix. Projection of Points, Lines and planes

UNIT II (9 Hrs)

Projection of Solids and Sections of solids.

UNIT III (9 Hrs)

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

UNIT IV (9 Hrs)

Isometric projections and Orthographic projections

UNIT V (9 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 Resources

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

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, circuit 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, 1st Edition, 2011.

5. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", Tata McGraw Hill Publishing Company Ltd., New Delhi, 6th Edition, 2008.
6. Morris Mano, "Digital design", PHI Learning, 4th 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 Resources

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

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

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

SEMESTER – II

T107**MATHEMATICS – II**
(Common to all Branches)

L	T	P	C	Hrs
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 of derivatives and Integrals. Multiplication by t and division by t . Transform of unit step function, transform of periodic functions. Initial and Final value theorems

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 Resources

1. <https://www.youtube.com/watch?v=1wjXVdwzgX8>
2. <http://www.snggdgcg.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	2	2
2	2	1	-	-	-	1	1	-	-	-	-	1	3	2	2
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2
4	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2
5	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2

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

(Common to all Branches)

4 0 0 4 60

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, the 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** - 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** - 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**(12 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**(12 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**(12 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**(12 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 – Meissner effect– Type I and II superconductors

– high temperature superconductors – 123 superconductor – Applications of superconductors.

UNIT V ADVANCED MATERIALS (12 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 nanomaterials. 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, Engineering Physics- Volume-II, S.Chand & Co, New Delhi, 2009
7. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.

Web Resources

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

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

T109

ENVIRONMENTAL SCIENCE
(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To know about the environment
- To understand about environmental pollution
- To apply the knowledge in understanding various environmental issues and problems
- Communicate clearly and competently matters of environmental concern and understanding to a variety of audiences in appropriate forms
- Evaluate and interpret various forms of evidence, including text, data, and other media about the environment

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**(12 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**(12 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, estuarine 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**(12 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**(12 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**(12 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, H₂S, 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
6. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.

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.Chand and Company Ltd, New Delhi, 2012.
3. Richard T. Wright, Environmental Science: Toward a Sustainable Future, 10th edition, 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 Resources

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

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 (10 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 (10 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 (10 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 (10 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 (10 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 (10 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 Resources

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	1	1	1
5	3	2	2	2	2	2	2	-	-	-	-	3	3	3	1
6	3	2	2	2	2	2	2	-	-	-	-	3	1	1	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 SYSTEM**(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, curvilinear 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 Mechanics" second edition, Lakshmi Publication (P), Ltd., 2011.
3. Dr. Sadhu Singh, A Textbook of Engineering Mechanics, S Chand & company Pvt Ltd., 2013.

Reference Books

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2011.

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

Web Resources

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

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

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**(12 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**(12 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**(12 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**(12 Hrs)**

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

UNIT V ORAL COMMUNICATION**(12 Hrs)**

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

Text Books

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

Reference Books

1. Robert J.Dixon., 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.Dixon., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.
5. Sethi,J and Kamallesh Sadanand., A Practical Course in English Pronunciation, Prentice- Hall of India Pvt. Ltd, New Delhi, 2007

Web Resources

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-Dixon-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	PO1	PO1	PO1	PSO	PSO	PSO

										0	1	2	1	2	3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-

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

P104

PHYSICS LAB
(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** - 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, vernier 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** - 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

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. Avadhanulu M N, Engineering Physics, S. Chand & Co, 2009.
6. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi, 2011.
7. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008.

Web Resources

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

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

(Common to all Branches)

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

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

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

CO4 -To perform conductometric titration and its uses to analyze any sample. (K3)

CO5 -To perform experiments by using colorimeter From which concentration of a sample can be determined from absorbance value. (K3)

List of Experiments (Any 10 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.
11. Estimation of calcium by permanganometry
12. Estimation of iron by colorimetry

Demonstration Experiments (Any two of the following)

1. Determination of COD of water sample.
2. Determination of lead by conductometry
3. Percentage composition of sugar solution by viscometry

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, Veeraswamy. 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 Chemistry, A R Kulandaivelu , V Venkateswaran & R Veeraswamy, Chand Publications, 2001.

Web Resources

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

Web Resources

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

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

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	-	-

P107

NSS / NCC
(Common to all Branches)

L	T	P	C	Hrs
0	0	0	-	-

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

SEMESTER III



U19CST31	NUMERICAL METHODS (Common to CSE, IT & BME)	L 2	T 2	P 0	C 3	Hrs 60
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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 Numerical techniques to solve algebraic and transcendental equations. **(K2)**

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

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

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

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

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS

(12Hrs)

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

UNIT II LINEAR SIMULTANEOUS EQUATIONS

(12 Hrs)

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

UNIT III INTERPOLATION

(12 Hrs)

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

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

(12 Hrs)

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

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

(12 Hrs)

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

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 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., 7th Edition, 2019.



Reference Books

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

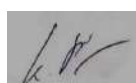
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CST32**DATA STRUCTURES**

(Common to CSE, IT,
ECE, ICE, CIVIL, BME, MECHATRONICS)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

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

Course 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**(9Hrs)**

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

UNIT II STACK AND QUEUE OPERATIONS**(9Hrs)**

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

UNIT III LINKED LIST OPERATIONS**(9Hrs)**

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

UNIT IV TREES**(9Hrs)**

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**(9Hrs)**

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

Text Books

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



Reference Books

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

Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CST33	DIGITAL DESIGN AND MICROPROCESSORS	L	T	P	C	Hrs
	(Common to CSE and IT)	3	0	0	3	45

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 -Design and understand the various sequential circuits. **(K2)**

CO3 - Explain the basic architecture of 8085 microprocessors. **(K3)**

CO4 - Gain the knowledge of the architecture and instruction sets of 8086. **(K3)**

CO5 - Acquire the interfacing the various peripherals to various 8086. **(K3)**

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)

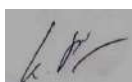
Introduction to 8086 Microprocessor - 8086 Architecture - Pin diagram –I/O & Memory Interfacing – Addressing Modes – Instruction Format – Instruction Set – Assembler Directives – Assembly Language Programming.

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. Douglas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH 2012.

Web Resources

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

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



U19CST34**AUTOMATA AND COMPILER DESIGN**

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

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

Course Outcomes

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

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

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

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

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

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

UNIT I FINITE AUTOMATA AND REGULAR EXPRESSIONS (12 Hrs)

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

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

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

UNIT III TURING MACHINES (12 Hrs)

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

UNIT IV LEXICAL ANALYSIS AND SYNTAX ANALYSIS (12 Hrs)

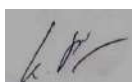
Compilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Specification of tokens – Recognition of tokens – A language for specifying lexical analyzers – Design of a lexical analyzer. Parser: Top Down Parser – Predictive Parser, Bottom up Parser – SLR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

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

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

Text Books

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



Reference Books

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

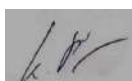
Web Resources

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

COs/POs/PSOs Mapping

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

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



	L	T	P	C	Hrs
U19CST35	3	0	0	3	45

OPERATING SYSTEMS**Course Objectives**

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

Course Outcomes

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

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

UNIT I INTRODUCTION AND PROCESS MANAGEMENT (9 Hrs)

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

UNIT II CPU SCHEDULING AND DEADLOCK (9 Hrs)

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

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT (9 Hrs)

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

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

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

UNIT V CASE STUDY (9 Hrs)

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

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons Ninth Edition, 2017.



2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd Edition, 2015.
3. Gary Nutt, "Operating Systems - A Modern Perspective", Pearson Education, Second Edition, 2013.

Reference Books

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

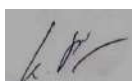
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CST36	DATA COMMUNICATIONS AND COMPUTER NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

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

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

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

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

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

UNIT I DATA COMMUNICATIONS

(9 Hrs)

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

UNIT II PHYSICAL LAYER AND MEDIA

(9 Hrs)

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

UNIT III DATA LINK LAYER AND NETWORK LAYER

(9 Hrs)

Data link layer design issues – Error Detection and Correction – Sliding window protocols – Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest path algorithm – Distance vector routing – Link state routing, Hierarchical routing – Broadcast, Multicast routing – The Network Layer in the Internet: IPv4 – IPv6.

UNIT IV TRANSPORT LAYER

(9 Hrs)

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

UNIT V APPLICATION LAYER AND NETWORK SECURITY

(9 Hrs)

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

Text Books

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



Reference Books

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

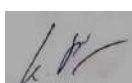
Web Resources

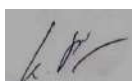
1. <https://nptel.ac.in/courses/106/105/106105183/>
2. <https://nptel.ac.in/courses/106/105/106105081/>
3. <https://www.geeksforgeeks.org/last-minute-notes-computer-network/>
4. <https://lecturenotes.in>
5. <https://www.cse.iitk.ac.in/users/dheeraj/cs425/>

COs/POs/PSOs Mapping

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

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





	NUMERICAL METHODS LABORATORY				
	(Common to CSE & IT)				
U19CSP31	L	T	P	C	Hrs
	0	0	2	1	30

Course Objectives

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

Course Outcomes

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

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 exercises

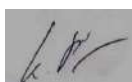
1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss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

Reference Books

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

Web Resources

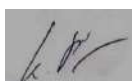
1. <http://nptel.ac.in/courses/111107063>
2. <http://nptel.ac.in/courses/122102009>
3. <http://nptel.ac.in/courses/111/107/111107105>
4. <http://www.math.iitb.ac.in/~baskar/book.pdf>
5. <https://www.math.ust.hk/~machas/numerical-methods.pdf>



COs/POs/PSOs Mapping

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

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



U19CSP32 DATA STRUCTURES LABORATORY(Common to CSE, ECE, IT, ICE,
CIVIL, BME, MECHTRONICS)

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

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

Course Outcomes**After completion of the course, the students will be able to****CO1** - Analyze the algorithm's / program's efficiency in terms of time and space complexity. **(K3)****CO2** - Solve the given problem by identifying the appropriate Data Structure. **(K3)****CO3** - Solve the problems of searching and sorting techniques. **(K3)****CO4** - Solve problems in linear Data Structures. **(K4)****CO5** - Solve problems in non-linear Data Structures. **(K4)****List of Exercises**

1. Write a C program to implement recursive and non-recursive i) Linear search ii) BinarySearch.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heapsort.
3. Write a C program to implement the following using an array. a) Stack ADT b) QueueADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list.
a) Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) QueueADT.
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 uses recursive functions to traverse the given binary tree in
a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

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

Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSP33**DIGITAL DESIGN AND MICROPROCESSORS
LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

(Common to CSE and IT)

Course Objectives

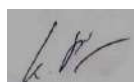
- ☐ To design and analyze a combinational circuits.
- ☐ To design and analyze a sequential circuits.
- ☐ To write assembly language programs using 8085 trainerkit.
- ☐ To be familiar with MASM-8086
- ☐ To apply the knowledge into interfacing and various applications 8085/8086.

Course Outcomes*After completion of the course, the students will be able to***CO1** - Understand the fundamental operations of Combinational Circuits. **(K1)****CO2** - Understand the fundamental operations of Sequential Circuits. **(K1)****CO3** - Develop simple programs and design interfacing circuits with 8085. **(K3)****CO4** - Learn assembly language program using MASM. **(K3)****CO5** - Gain the knowledge of interfacing and various applications of 8085/8086. **(K3)****List of Exercises**

1. Implementation of logic circuits using gates
 1. Full adder/fullSubtractor
 2. Implementation of logic functions using universal gatesonly
 3. Implementation of Boolean functions usingMUX
 4. Design of decoder, Demultiplexer.
 5. Design an Asynchronous and Synchronous counter.
2. Assembly language programming on8085.
 1. Addition
 2. Subtraction
 3. Multiplication
 4. Division
 5. Codeconversion
3. Assembly Language programming on8086.
 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. Douglas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH 2012.



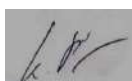
Web Resources

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

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



U19CSP34**LINUX INTERNALS LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

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

Course Outcomes

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

CO1 - Understand the basic commands for Linux. **(K2)**

CO2- Develop simple shell programs. **(K2)**

CO3- Implement different Scheduling Algorithms **(K5)**

CO4 - Apply the basic concepts of Deadlock Handling procedures. **(K4)**

CO5 - Simulate Critical Section problem using Semaphore **(K4)**

List of Exercises

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

Reference Books

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

Web Resources

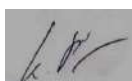
1. <https://www.geeksforgeeks.org>
2. <http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html>
3. <https://www.programming9.com/programs/c-programs/285-page-replacement-programs-in-c>



COs/POs/PSOs Mapping

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

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

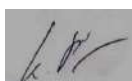


U19CSC3X CERTIFICATION COURSE - I

L	T	P	C	Hrs
0	0	4	-	50

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

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



	SKILL DEVELOPMENT COURSE 1	L	T	P	C	Hrs
U19CSS31	GENERAL PROFICIENCY-I (Common to all branches)	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**(6Hrs)**

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

UNIT II PERSONALITY DEVELOPMENT (6Hrs)

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

UNIT III INFERENTIAL LEARNING**(6Hrs)**

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

UNIT IV INTERPRETATION AND FUNCTIONAL WRITING**(6Hrs)**

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

UNIT V APTITUDE (6Hrs)

Language Enhancement: Articles, Preposition, Tenses

Verbal Ability Enhancement: Blood Relation, Completing Statements- Cloze test, Spotting Errors –Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(**GATE**)

Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2012.
2. Mn, Taylor, and Grant Taylor. "English Conversation Practice". Tata McGraw-Hill Education, 2004.
3. Bailey, Stephen. "Academic writing: A practical guide for students". Psychology Press, 2003.
4. Aggarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web Resources

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

COs/POs/PSOs Mapping

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

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

**COMPUTER ASSEMBLY AND
TROUBLESHOOTING****0 0 2 - 30****Course Objectives**

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

Course Outcomes

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

CO1 -Acquire knowledge to assemble PCs.(K3)

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

CO3 -Design a simple LAN network. (K3)

CO4 -Apply troubleshooting methods in printers. (K3)

CO5 -Apply troubleshooting approaches in PC. (K3)

List of Exercises

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

Reference Books

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

Web Resources

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



COs/POs/PSOs Mapping

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

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

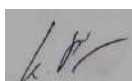


U19CSS32**SKILL DEVELOPMENT COURSE 2
APTITUDE - I**

L	T	P	C	Hrs
0	0	2	0	30

Course Contents

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

U19CSS32**SKILL DEVELOPMENT COURSE 2****L T P C Hrs**

B.Tech. Computer Science and Engineering

ELECTRONIC DEVICES AND CIRCUITS**0 0 2 0 30****Course Objectives**

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

Course Outcomes

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

- CO1** - Student should be able to understand the working of analog circuits like rectifiers, clippers, clampers etc. **(K3)**
- CO2** - Student should be able to design and implement circuits like RC coupled amplifier, tuned amplifier, Schmitt trigger etc. **(K3)**
- CO3** - Student should be able to design and demonstrate the functioning of regulators, oscillators and power amplifiers. **(K3)**
- CO4** - Students should be able to analyze and interpret the characteristics of diodes and transistors. **(K3)**
- CO5** - Students should be able to function effectively as an individual and in a team to accomplish the given task. **(K3)**

List of Exercises

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



Reference Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Eleventh Edition, 2015.
2. M. Morris Mano, "Digital Design", Pearson Education, 6th Edition, 2017.
3. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009
4. Thomas L. Floyd, "Digital Fundamentals", Tenth Edition, Pearson Education, New Delhi, 2009.
5. Varsha Agrawal Anil K. Maini, "Electronic Devices and Circuits", Wiley, 1st edition, 2019

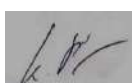
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSM31**PHYSICAL EDUCATION**

L	T	P	C	Hrs
0	0	2	-	30

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

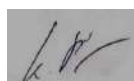


SEMESTER IV

U19CST41

**DISCRETE MATHEMATICS AND GRAPH
THEORY**

L	T	P	C	Hrs
2	2	0	3	60



B.Tech. Computer Science and Engineering

(Common to CSE & IT)

Course Objectives

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

Course Outcomes

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

CO1 – Construct mathematical arguments using logical connectives and truth tables. **(K3)**

CO2 – Apply propositional and predicate logic and quantifiers. **(K3)**

CO3 – Solve the problems using counting techniques in Lattices. **(K3)**

CO4 – Familiarize the different types of Graphs. **(K3)**

CO5 – Understand various types of trees and methods for algorithms. **(K2)**

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS (12Hrs)

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

UNIT II PREDICATE CALCULUS (12Hrs)

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

UNIT III LATTICES (12 Hrs)

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

UNIT IV GRAPH THEORY (12 Hrs)

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

UNIT V TREES (12 Hrs)

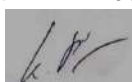
Trees – Properties of Trees – Pendant vertices in a Tree – Kruskal algorithm.

Text Books

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

Reference Books

1. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw - Hill Education Pvt. Ltd., 3rd Edition, 2008.



2. F. Harary, "Graph theory", Narosa publishing house, New Delhi, 1988.
3. Douglas B. West, "Introduction to Graph theory", Pearson Education, 2nd Edition, 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 Resources

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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4	3	2	1	1	-	-	-	-	-	-	-	1	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	1	3	1	1

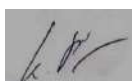
Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST42

PROGRAMMING IN JAVA

(Common to CSE, IT, ICE, CIVIL, BME)

L	T	P	C	Hrs
3	0	0	3	45



B.Tech. Computer Science and Engineering

Course Objectives

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

Course Outcomes

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

CO1 - Write a maintainable java program for a given algorithm and implement the same. **(K2)**

CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**

CO3 - Create java applications using exception handling, thread and generic programming. **(K3)**

CO4 - Build java distributed applications using Collections and IO streams. **(K3)**

CO5 - Exemplify simple graphical user interfaces using GUI components and database programs. **(K3)**

UNIT I INTRODUCTION TO JAVA PROGRAMMING (9 Hrs)

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

UNIT II INHERITANCE, PACKAGES AND INTERFACES (9 Hrs)

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

UNIT III EXCEPTION HANDLING, MULTITHREADING (9 Hrs)

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

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

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

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC (9 Hrs)

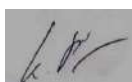
Events – Delegation event model – Event handling – Adapter classes. AWT: Concepts of components – Font class – Color class and Graphics. Introduction to Swing: Layout management - Swing Components. Java Database Connectivity. Develop real time applications.

Text Books

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

Reference Books

1. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017.



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

Web Resources

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

CO-POs/PSOs Mapping

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

U19CST43

DATABASE MANAGEMENT SYSTEMS

L	T	P	C	Hrs
3	0	0	3	45



B.Tech. Computer Science and Engineering

Course Objectives

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

Course Outcomes

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

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

UNIT I INTRODUCTION (9 Hrs)

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

UNIT II RELATIONAL MODEL (9 Hrs)

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

UNIT III RELATIONAL DATABASE DESIGN (9 Hrs)

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

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

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

UNIT V QUERY PROCESSING AND CONCURRENCY CONTROL (9 Hrs)

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

Text Books

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

Reference Books

1. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.
2. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.



3. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
5. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.

Web Resources

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

COs/POs/PSOs Mapping

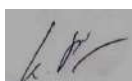
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3	3	3	3	3	2	2	2	-	2	1	2	2	3	2	3
4	3	2	3	3	1	2	2	-	2	1	2	3	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	3	3	3	3

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

U19CST44

DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C	Hrs
2	2	0	3	60



B.Tech. Computer Science and Engineering

Course Objectives

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

Course Outcomes

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

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

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

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

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

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

UNIT I INTRODUCTION TO ALGORITHM AND NOTATIONS

(12 Hrs)

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

UNIT II DIVIDE AND CONQUER, GREEDY METHOD

(12 Hrs)

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

UNIT III DYNAMIC PROGRAMMING

(12 Hrs)

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

UNIT IV BACKTRACKING METHOD

(12 Hrs)

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

UNIT V BRANCH AND BOUND, NP-HARD PROBLEMS

(12 Hrs)

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

Text Books



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

Reference Books

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

Web Resources

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

COs/POs/PSOs Mapping

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

Correlation Level:

1 - Low, 2 - Medium, 3 - High



U19CSP41 PROGRAMMING IN JAVA LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

(Common to CSE, IT, ICE, CIVIL, BME)

Course Objectives

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

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

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

Reference Books

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

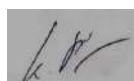
Web Resources

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

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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



U19CSP42**DATABASE MANAGEMENT SYSTEMS
LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

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

Course Outcomes

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

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

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

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

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

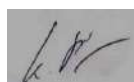
CO5 - Develop GUI applications in their known platform. **(K3)**

List of Exercises

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

Reference Books

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



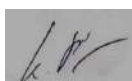
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSP43	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course objectives

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

Course Outcomes

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

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

List of Exercises

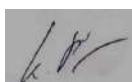
1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
3. Implementation of Knapsack using Greedy technique.
4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy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

Text Books

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

References Books

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



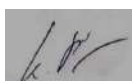
Web Resources

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

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

COs/POs/PSOs Mapping

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

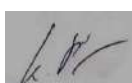


U19CSC4X CERTIFICATION COURSE - II

L	T	P	C	Hrs
0	0	4	-	50

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

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



U19CSS41	SKILL DEVELOPMENT COURSE 3				
	GENERAL PROFICIENCY-II				
	(Common to all branches)				
	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

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

UNIT I CAREER SKILLS**(6Hrs)**

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

UNIT II CORPORATE SKILLS**(6Hrs)**

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

UNIT III FUNCTIONAL SKILLS**(6Hrs)**

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

UNIT IV TRANSFERABLE SKILLS**(6Hrs)**

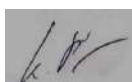
Listening: Listening Documentaries and making notes – **Speaking:** Conversation practice at formal & informal context **Reading:** Read and transform- report, memo, notice and advertisement, **Writing:** Euphemism, Redundancy, and Intensifiers **Vocabulary:** Refinement of vocabulary (IELTS).

UNIT V APTITUDE**(6 Hrs)**

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

Reference Books

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



5. Ramesh, Gopalaswamy. "The art of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.

Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSS42	SKILL DEVELOPMENT COURSE 4 EXPLORING PHOTOSHOP	L	T	P	C	Hrs
		0	0	2	0	30

Course Objectives

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

Course Outcomes

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

CO1 - Identify elements of the Photoshop user interface and demonstrate knowledge of their functions.

CO2 - Demonstrate knowledge of layers and images

CO3 - Apply painted masks, selection-based masks, gradient masks, and blend modes to create sophisticated image effects.

CO4 - Create adjustment layers for editable, non-destructive changes to image coloration and exposure.

CO5 - Apply special effects to Zooming using masks, paths, and layer styles.

List of Exercises

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

Reference Books

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

Web Resources

1. https://nptel.ac.in/content/storage2/courses/112101002/downloads/Lec_41-42.pdf
2. <https://nptel.ac.in/courses/106/106/106106177/>
3. http://www.nptelvideos.com/adobe/adobe_photoshop_tutorials.php



4. <https://www.adobe.com/products/captivateprime/content-catalog/creative-cloud/photoshop-cc.html>

COs/POs/PSOs Mapping

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

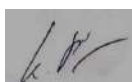
Correlation Level: 1 - Low, 2 - Medium, 3 - High



U19CSS42	SKILL DEVELOPMENT COURSE 4				L	T	P	C	Hrs
	APTITUDE – II				0	0	2	0	30

Course Contents

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



U19CSS42

SKILL DEVELOPMENT COURSE 4 OFFICE AUTOMATION

L	T	P	C	Hrs
0	0	2	0	30

MS OFFICE

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

TABLES AND DRAWING TOOLS

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

MS POWERPOINT

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

MS EXCEL

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

MS ACCESS

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



References Books

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

Web Resources

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



U19CSM41**INDIAN CONSTITUTION**

L	T	P	C	Hrs
2	0	0	0	30

Course Objectives

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties

Course Outcomes

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

CO1 - Understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration

CO2 - Understand knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

UNIT I INDIAN CONSTITUTION

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties

UNIT II PARLIAMENTARY SYSTEM

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker

UNIT III THE JUDICIARY

Organization and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

UNIT IV STATE GOVERNMENTS

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature

UNIT V LOCAL GOVERNMENTS

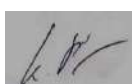
73rd and 74th Constitutional Amendments – Federalism - Center – State Relations

Text Books

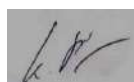
1. Basu D.D., "Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C., "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

Reference Books

1. Pylee M.V., "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S., "Our Constitution", National Book Trust, New Delhi, 2010



PROFESSIONAL ELECTIVES



U19CSE41	DATABASE ADMINISTRATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - Install Oracle software and create the Oracle Database. **(K2)**

CO2 - Build queries using the SQL commands. **(K2)**

CO3 - Define and manage user access and security. **(K2)**

CO4 - Manage the storage structures. **(K3)**

CO5 - Design Database backup and recovery procedures. **(K3)**

UNIT I INTRODUCTION TO SQL *PLUS (9 Hrs)

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

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

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

UNIT III USER ACCESS AND SECURITY (9 Hrs)

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

UNIT IV MANAGING ORACLE (9 Hrs)

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

UNIT V INTRODUCTION TO NETWORK ADMINISTRATION (9 Hrs)

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

Text Books

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



Reference Books

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

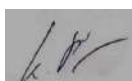
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSE42**E - BUSINESS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

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

Course Outcomes

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

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

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

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

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

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

UNIT I ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES (9 Hrs)

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

UNIT II APPROACHES TO SAFE ELECTRONIC COMMERCE (9 Hrs)

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

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

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

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

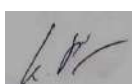
Introduction – Business requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of email. MIME: Multipurpose Internet Mail Extensions. S/MIME: Secure Multipurpose Internet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

UNIT V INTERNET AND WEBSITE ESTABLISHMENT (9 Hrs)

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

Text Books

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



Reference Books

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

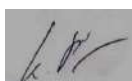
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSE43	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - Analyze, design and document the requirements through use case driven approach. **(K4)**

CO2 - Categorize the different object oriented methodologies. **(K3)**

CO3 - Develop and Explore the Classes and Its Relationships. **(K4)**

CO4 - Apply the concepts of architectural design for view layer and access layer. **(K3)**

CO5 - Test for the software quality using different testing strategies. **(K4)**

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

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

UNIT II OBJECT ORIENTED METHODOLOGIES (9 Hrs)

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

UNIT III OBJECT ORIENTED ANALYSIS (9 Hrs)

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

UNIT IV OBJECT ORIENTED DESIGN (9 Hrs)

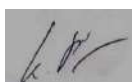
Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Object constraint language – Process of designing class – Class visibility – Refining attributes – Access Layer: Object store and Persistence – Database management system – Logical and Physical database-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

UNIT V SOFTWARE QUALITY (9 Hrs)

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

Text Books

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



Reference Books

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

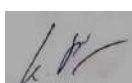
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSE44**SCRIPTING LANGUAGES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - Illustrate the basic concepts of Linux Administration. **(K2)**

CO2 - Explore the concepts of Perl **(K5)**

CO3 - Explore the concepts of TCL **(K5)**

CO4 - Understand the basic fundamentals of TK **(K2)**

CO5 - Working with programming concepts of Python **(K1)**

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

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

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

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

UNIT III TCL FUNDAMENTALS**(9 Hrs)**

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

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

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

UNIT V PYTHON PROGRAMMING**(9 Hrs)**

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

Text Books

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

Reference Books

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



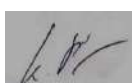
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSE45**FUNDAMENTALS OF
PROGRAMMING LANGUAGES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 - To understand various programming and data types **(k2)**

CO2 - Apply various sequence control techniques of programming languages. **(k2)**

CO3 - To understand the object oriented programming. **(k2)**

CO4 - To analyse logical and functional programming. **(k3)**

CO5 - To understand about concurrent programming. **(k2)**

UNIT I INTRODUCTION(9 Hrs)

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

UNIT II SEQUENCE CONTROL**(9****Hrs)**

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

UNIT III OBJECT ORIENTED PROGRAMMING**(9 Hrs)**

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

UNIT IV LOGICAL AND FUNCTIONAL PROGRAMMING**(9 Hrs)**

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

UNIT V CONCURRENT PROGRAMMING**(9 Hrs)**

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



Text Books

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

Reference Books

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

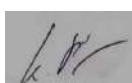
Web Resources

1. [www.nptel.ac.in/Fundamentals of Programming Language](http://www.nptel.ac.in/Fundamentals%20of%20Programming%20Language).
2. <https://www.edx.org/learn/computer-programming>.
3. <https://www.classcentral.com/course/programming1-385>.
4. [www.greeksforgreeks.org/Fundamentals of Programming Language](http://www.greeksforgreeks.org/Fundamentals%20of%20Programming%20Language).

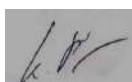
COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	3	3	2	1	2	2	2	-	-	3	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	-	-	3	3	3	2
3	3	3	3	2	3	2	2	-	-	2	-	3	3	3	3
4	2	2	2	2	2	2	2	-	-	2	-	2	2	2	2
5	3	3	2	2	2	2	2	-	2	3	3	3	2	3	2

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



OPEN ELECTIVES



U19EE042	ELECTRICAL SAFETY (Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT)	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)**

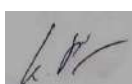
Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects 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 Resources

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

COs/POs/PSOs Mapping

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

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



	CONSUMER ELECTRONICS	L	T	P	C	Hrs
U19ECO42	(Common to EEE, ICE, CSE MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)	3	0	0	3	45

Course Objectives

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

Course Outcomes

After completion of the course, students will be able to

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

UNIT I AUDIO FUNDAMENTALS AND DEVICES (9Hrs)

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

UNIT II AUDIO SYSTEMS (9Hrs)

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

UNIT III TELEVISION SYSTEMS (9Hrs)

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

UNIT IV TELEVISION RECEIVERS AND VIDEO STANDARDS (9Hrs)

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

UNIT V HOME AND OFFICE APPLIANCES (9Hrs)

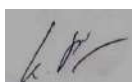
Microwave Oven: Types, technical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

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

Reference Books

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



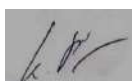
Web Resources

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

COs Mapping with POs and PSOs

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

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



	WEB DEVELOPMENT	L	T	P	C	Hrs
U19CSO41	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

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

Course Outcomes

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

CO1 -Develop basic web applications. **(K5)**

CO2 - Design the web applications using CSS. **(K5)**

CO3 -Validate the web pages using javascripts functions. **(K5)**

CO4 - Demonstrate the web 2.0 application to advance scripts. **(K3)**

CO5 - Update the knowledge of XML Data. **(K4)**

UNIT I INTRODUCTION TO WWW & HTML**(9 Hrs)**

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

UNIT II STYLE SHEETS**(9 Hrs)**

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

UNIT III JAVASCRIPTS**(9 Hrs)**

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

UNIT IV ADVANCE SCRIPT**(9 Hrs)**

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

UNIT V XML (9 Hrs)

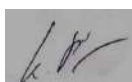
Introduction to XML – Uses of XML – Simple XML – XML key components – DTD and Schemas – Well-formed XML document – Applications of XML – XSL and XSLT.

Text Books

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

Reference Books

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



Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSO42	ANALYSIS OF ALGORITHMS	L	T	P	C	Hrs
	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

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

Course Outcomes

Upon completion of the course, students shall have ability to

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

CO2 - Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyze them. **(K3)**

CO3 - Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO4 - Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO5 - Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. **(K2)**

UNIT I INTRODUCTION(9 Hrs)

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

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD (9 Hrs)

Divide and Conquer method: Applications – Binary search, Merge sort, Quick sort. Greedy method: General method, applications – Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING(9 Hrs)

Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING(9 Hrs)

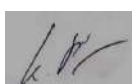
Backtracking: General method, Applications – N-queen problem, Sum of subsets problem, Graph Coloring – Hamiltonian Cycles.

UNIT V BRANCH AND BOUND(9 Hrs)

Branch and Bound: General method, Applications – Traveling sales person problem, 0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Text Books

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



Reference Books

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

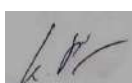
Web Resources

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

COs/POs/PSOs Mapping

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

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



U19CSO43**PROGRAMMING IN JAVA**

L	T	P	C	Hrs
3	0	0	3	45

(Common to ECE, MECH,
Mechatronics)**Course Objectives**

- ☐ To gain and explore the knowledge of Java programming.
- ☐ To know the principles of inheritance and packages.
- ☐ To learn about the usage of interfaces in Java.
- ☐ To gain and explore the event handling in Java.
- ☐ To get familiarized to the interfaces generic programming, multithreading concepts.

Course Outcomes*After completion of the course, the students will be able to***CO1** – Write a maintainable java Program for a given algorithm and implement the same. **(K2)****CO2** – Demonstrate the use of inheritance and package in relevant applications. **(K3)****CO3** – Construct Java programs using interfaces. **(K3)****CO4** – Build Java applications using Event Handling. **(K3)****CO5** – Create Java applications using multithreading and generic programming. **(K3)****UNIT I INTRODUCTION TO JAVAPROGRAMMING****(9Hrs)**

The History and Evolution of Java - Byte code - Java buzzwords - Data types – Variables – Arrays – Operators - Control statements - Type conversion and casting – Objects and classes in Java – Defining classes – Methods - Access specifiers – Static members – Constructors – Finalize method.

UNIT II INHERITANCE AND PACKAGES**(9Hrs)**

Arrays – Strings - Packages – Java-Doc comments – Inheritance – Class hierarchy – Polymorphism – Dynamic binding – Final keyword – Abstract classes

UNIT III INTERFACES**(9Hrs)**

The Object class – Reflection – Interfaces – Object cloning – Inner classes – Proxies - I/O Streams - Graphics programming – Frame – Components – Working with 2D shapes.

UNIT IV EVENT HANDLING**(9Hrs)**

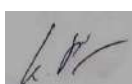
Basics of event handling – Event handlers – Adapter classes – Actions – Mouse events – AWT event hierarchy – Introduction to Swing – Model-View-Controller design pattern – Buttons – Layout Management – Swing Components – Exception handling – Exception hierarchy – Throwing And catching exceptions.

UNIT V GENERIC PROGRAMMING AND MULTITHREADING**(9 Hrs)**

Motivation for generic programming – Generic classes – Generic methods – Generic code and virtual machine – Inheritance and generics – Reflection and generics - Multi-threaded programming – Interrupting threads – Thread States – Thread properties – Thread synchronization – Executors – Synchronizers. Enumeration – Autoboxing – Generics.

Text Books

1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
3. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Sun Microsystems Press, Eighth Edition, 2008.
4. Herbert Schildt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.



Reference Books

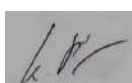
6. Cay S. Horstmann, Gary Cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
7. H.M. Dietel and P.J. Dietel, "Java How to Program", Pearson Education/PHI, 11th Edition, 2017.
8. Cay S. Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, 8th Edition, 2008.
9. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:
10. Programming in Java, S. Malhotra and S. Choudary, Oxford Univ. Press.

Web Resources

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

CO-POs/PSOs Mapping

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



	SENSORS AND TRANSDUCERS	L	T	P	C	Hrs
U19ICO41	(Computer Science Engineering)	3	0	0	3	45

Course Objectives

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers
- To introduce about advancements in sensor technology.

Course Outcomes

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

CO1 - Understand the concepts of classification of Transducers. **(K2)**

CO2 - Familiar with the working of resistance Transducer. **(K3)**

CO3 - Familiar with the principle and working of various Inductive and Capacitive transducer. **(K1)**

CO4 - Able to design signal conditioning circuit for various transducers. **(K3)**

CO5 - Able to identify or choose a transducer for a specific measurement application. **(K4)**

UNIT I CLASSIFICATION OF TRANSDUCERS (9 Hrs)

General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system, Statistical analysis of measurement data.

UNIT II RESISTANCE TRANSDUCERS (9 Hrs)

Resistive transducers: Potentiometers, metal and semiconductor strain gauges and signal conditioning circuits, strain gauge applications: Load and torque measurement, Digital displacement sensors.

UNIT III INDUCTIVE AND CAPACITIVE TRANSDUCERS (9 Hrs)

Transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT IV OTHER TRANSDUCERS (9 Hrs)

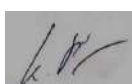
Piezoelectric transducers and their signal conditioning, Seismic transducer and its dynamic response, photoelectric transducers, Hall effect sensors, Magnetostrictive transducers. Eddy current transducers. Hall effect transducers – Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors

UNIT V SMART TRANSDUCER (9 Hrs)

Introduction to semiconductor sensor, materials, scaling issues and basics of micro fabrication. Smart sensors, Intelligent sensor, Mems Sensor, Nano-sensors, SQUID Sensors- Environmental Monitoring sensors

Text Books

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design Clarendon, Oxford 2nd edition Jacob Fraden - 2010
4. Doebelin E.O. "Measurement System Applications and Design", TMH, 5th Edition, 2004.



Reference Books

1. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol.1 ISA/CRC Press, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th edition, Vol.2 ASME PTC, 2018
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.

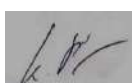
Web Resources

1. www.electrical4u.com
2. <https://nptel.ac.in/courses/108108147/>
3. <https://www.youtube.com/watch?v=1uPTyixZzyo>

COs/POs/PSOs 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		L	T	P	C	Hrs
	(Computer Science Engineering)		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

UNIT III 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 Engineering, 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 Systems, Prentice Hall India Pvt. Ltd, Ninth Edition, 2015
3. Smarajith Ghosh, —Control Systems Theory and Applications, Pearson Education, Singapore, Sixth Edition, 2015
4. Richard C. Dorf, Robert H Bishop, —Modern Control Systems, Pearson Education, Twelfth Edition, 2017



Web Resources

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

(Common to EEE, ECE, CSE, IT, ICE, CCE, MECH,
Mechatronics, AI&DS)

3 0 0 3 45

Course Objectives

- To gain knowledge about the various physiological parameters measurements
- To understand the various biochemical and nonelectrical sensors
- To study about the assist devices
- To gain knowledge on surgical equipments and telemetry in healthcare
- To understand the concepts of recent advancements in healthcare

Course Outcomes

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

CO1 - Explain the electro- physiological parameters and bio-potentials recording **(K2)**

CO2 - Measure the biochemical and non-electrical physiological parameters **(K2)**

CO3 - Interpret the various assist devices used in the hospitals **(K3)**

CO4 - Identify physical medicine methods and biotelemetry **(K3)**

CO5 - Analyse recent trends in medical instrumentation **(K3)**

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9 Hrs)

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9 Hrs)

pH, PO₂, PCO₂, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES (9 Hrs)

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters, Heart-Lung Machine.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY (9 Hrs)

Diathermies - Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry - Single Channel and Multiple Channel.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9 Hrs)

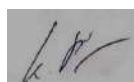
Telemedicine, Insulin Pumps, Radio pill, Endo-microscopy, Brain machine interface, Lab on a chip, Cryogenic Technique.

Text Books

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2011.
2. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2017.
3. John G.Webster, "Medical Instrumentation Application and Design", Third Edition, Wiley India , 2012.

Reference Books

1. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2011.
2. R.Anandanatarajan, "Biomedical Instrumentation and Measurements", Second Edition, PHI Learning, 2016.
3. Mandeep singh, "Introduction to Biomedical Instrumentation", Second Edition, Prentice Hall of India, New Delhi, 2014
4. Shakti Chatterjee, Aubert Miller, "Biomedical Instrumentation Systems", Cengage Learning, 2012
5. C.Raja Rao, Sujoy K.Guha, " Principles of Medical Electronics and Biomedical Instrumentation", Universities Press, 2010.



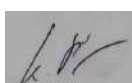
Web Resources

1. <https://www.nap.edu/read/21794/chapter/7>
2. <https://www.embs.org/about-biomedical-engineering/our-areas-of-research/diagnostic-therapeutic-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

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

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



U19BMO42	TELEMEDICINE (Common to EEE, ECE, CSE, IT, ICE, CCE, AI&DS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives:

- To understand the classification of telemetry.
- To gain knowledge about biotelemetry principles
- To know about the applications of telemetry in various fields
- To provide the idea about the value of telemedicine
- To know the various applications in telemedicine.

Course Outcomes:

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

CO1- Categorize the telemetry systems **(K2)**

CO2- Understand the principles of biotelemetry in transmission of biological signals **(K3)**

CO3 - Apply the various Biotelemetry applications for diagnostics **(K3)**

CO4- Acquire clear idea about the fundamentals of telemedicine **(K2)**

CO5 - Know about various applications of telemedicine **(K3)**

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

Basic system, Classification, Non electrical telemetry systems, Mechanical and Pneumatic type, Voltage and Current telemetry systems, Local transmitters and Converters, Frequency telemetry system, Power Line carrier communication (PLCC).

UNIT II BIOTELEMETRY**(9 Hrs)**

Radio Telemetry principles, FM, AM, PCM, Transmission of biological data through radio telemetry.

UNIT III APPLICATION OF BIOTELEMETRY**(9 Hrs)**

Wireless Telemetry - Single Channel and Multi-channel Telemetry systems, Multi Patient Telemetry, Implantable Telemetry Systems, Ambulatory patient monitoring.

UNIT IV FUNDAMENTALS OF TELEMEDICINE**(9 Hrs)**

History and advancements in telemedicine, Benefits of telemedicine, Functional Block of a telemedicine system, Use of computers in distance mode of healthcare delivery, Familiarizing with technology of telemedicine, scanner, electro stethoscope, data reception equipment, Scope for telemedicine, Limitations of telemedicine.

UNIT V APPLICATIONS OF TELEMEDICINE**(9 Hrs)**

Telemedicine in Neuroscience, Telecardiology, Telepathology, Telepediatrics, Telepharmacy, Telepsychiatry and mental health, Veterinary.

Text Books

1. Marilyn J. Field , "A Guide to Assessing Telecommunications in Health Care", Fourth Edition, Academy Press, 2011.
2. Bashshur , R. L. , Sanders, J. H and Shannon, G, "Telemedicine: Theory and Practice", Eight Edition, Springer, 2014.
3. Olga (EDT), Ferre Roca, M. Sosa, "Handbook of Telemedicine", Third Edition, IOS press 2009.

Reference Books

1. Bommel, J.H. van, Musen, M.A. (Eds.), "Handbook of Medical Informatics", Second Edition, Springer, 2010.
2. Simpson, W, "Video over IP. A practical guide to technology and applications", Ninth Edition, Focal Press, Elsevier, 2009.
3. Ferrer-Roca, O., Sosa-Iudicissa, , "Handbook of Telemedicine", IOS Press, 2012
4. Norris, A.C, "Essentials of Telemedicine and Telecare", Eight Edition, Wiley, 2017
5. Wotton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine", Fifth Edition, Royal Society of Medicine Press Ltd., 2014.



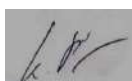
Web Resources

1. <https://en.wikipedia.org/wiki/Biotelemetry>
2. https://www.who.int/goe/publications/goe_telemedicine_2010.pdf
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5927731/>

COs/POs/PSOs Mapping

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

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



U19CCO42	INTRODUCTION TO COMMUNICATION SYSTEMS (Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	L	T	P	C	Hrs
		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)

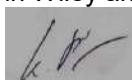
Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

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.



Web Resources

1. www.allaboutcircuits.com
2. <https://nptel.ac.in/courses/108/102/108102096/>
3. <http://www.electronics-tutorials.ws>
4. www.tutorialspoint.com
5. <https://nptel.ac.in/courses/108/104/108104091/>

COs/POs/PSOs Mapping

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

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



SEMESTER V



PROBABILITY AND STATISTICS

(Common to CSE & IT)

U19CST51

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***CO 1** - Apply the concept of probability in random variables. **(K3)****CO 2** - Apply the basic rules of continuous random variables. **(K3)****CO 3** - Understand the basic concepts of Statistics. **(K2)****CO 4** - Derive the inference for various problems using testing of hypothesis in large samples **(K3)****CO 5** - Solve the problems related to testing of hypothesis in small samples **(K3)****UNIT I DISCRETE RANDOM VARIABLES****(12Hrs)**

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

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

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

UNIT III STATISTICS**(12 Hrs)**

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

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

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

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

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

Text Books

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

Reference Books

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

Web Resources

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

COs/POs/PSOs Mapping

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

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

U19CST52

HANDHELD COMPUTING: DESIGN AND APPLICATION DEVELOPMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To about the system requirements for mobile applications.
- To learn the intricacies of UI required by mobile applications.
- To understand the App functionality beyond UI
- To explore the design using specific mobile development frameworks.
- To know the latest technologies available in mobile applications.

Course Outcomes

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

- CO1** - Describe the requirements for mobile applications. **(K2)**
CO2 - Explain the challenges in mobile application design and development. **(K3)**
CO3 - Create the states and lifecycle to create App functionality beyond UI. **(K3)**
CO4 - Develop the design for software development using Android SDK. **(K4)**
CO5 - Design software using iOS SDK. **(K4)**

UNIT I INTRODUCTION

(9 Hrs)

Mobility Landscape-Mobile Platforms- Mobile Apps Development -Overview of Android Platform-Setting up the Mobile App Development Environment along with an Emulator-A case study on Mobile App Development.

UNIT II USER INTERFACE

(9 Hrs)

App User Interface Designing - Mobile UI Resources (Layout, Ulements, Draw-able and Menu) -Activity- States and Life Cycle-Interaction amongst Activities- App Functionality beyond User Interface.

UNIT III APP FUNCTIONALITY BEYOND UI (9 Hrs)

Threads - AsyncTask- Services - States and Lifecycle-Notifications-Broadcast Receivers-Telephony and SMS APIs- Native Data Handling - On-device File I/O- Shared Preferences-SQLite and Enterprise Data Access

UNIT IV ANDROID SOFTWARE DEVELOPMENT (9 Hrs)

Android toolkit - Java for android - components of an Android Application. Kotlin Concepts and Terminology - Kotlin Environment Setup – Kotlin Architecture – Kotlin Views and Perspective - Kotlin and Android - Effective java for Android Building a View - Fragments and Multiplatform Support – Drawing - Handling and Persisting Data.

UNIT V OTHER MOBILE FRAMEWORKS (9 Hrs)

IOS - Objective C Basics - a simple App in IOS - Windows Phone basics - Simple Application in Windows Phone - Blackberry basics - Simple Application in Blackberry - Introduction to Cross-platform Mobile Application development.

Text Books

1. Anubhav Pradhan, Anil V. Deshpande, "Composing Mobile Apps: Learn, Explore, Apply Using Android", 1st Edition Wiley publication, 2014.
2. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", Wiley India Private Limited, 2012.
3. DavidMark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Beginning iOS Development: Exploring the iOS SDK, Apress, 2013.



Reference Books

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "Programming Android", O'Reilly, 2nd Edition, 2012.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
3. JamesDovey and Ash Furrow, Beginning Objective C, Apress, 2012
4. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C, Wrox Wiley, 2010.
5. "App Programming Guide for iOS-Apple developer" - 2014 Apple Inc.

Web Resources

1. <https://www.theserverside.com/tutorial/Mobile-application-development-tutorial>
2. <https://www.toptal.com/android/developing-mobile-web-apps-when-why-and-how>
3. <http://developer.android.com/develop/index.html>
4. <https://www.tutorialspoint.com/ios/index.htm>

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

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

U19CST53

WEB APPLICATION DEVELOPMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the Core concepts of PHP.
- To understand and program with the object oriented concepts in PHP.
- To learn about Framework and Cake PHP.
- To define a models for database.
- To understand about WordPress and CMS concepts.

Course Outcomes

After completion of the course, the students should be able to:

CO 1 - Explain and program with core concepts of PHP. **(K2)**

CO 2 - Explain the oops concepts in PHP. **(K2)**

CO 3 - Design and build database. **(K4)**

CO 4 - Design a micro project. **(K4)**

CO 5 - Understand JSON, XML, AJAX. **(K2)**

UNIT I CORE PHP**(9 Hrs)**

PHP Foundation: Installation - Syntax - Variables - Echo / Print - Data Types - Strings - Numbers - Math –Constants. Operators: Arithmetic - Comparison - Logical - String - Arrays - If...Else...Elseif - Switch - Loops - Functions - Arrays – Superglobals – RegEx.

UNIT II FORMS**(9 Hrs)**

PHP Form: Form Handling - GET/POST - Using Bootstarp - Form Validation - Form Required - Form Submission. Data: Date and Time - File Upload - Cookies - Sessions - Include - Exceptions. OOPS: Classes/Objects - Constructor - Destructor - Access Modifiers – Inheritance.

UNIT III DATABASE**(9 Hrs)**

Database: Data Definition Language (DDL) Commands – Data Manipulation Language (DML) Commands.

UNIT IV MICRO PROJECT – CASE STUDY**(9 Hrs)**

Design and build a Login form - Design and build an event registration form. Micro Project: Case Study - DB Design, Page Navigation Design, Web front end.

UNIT V JSON, XML, Netbeans, Eclipse**(9 Hrs)**

JSON - XML: XML File - XML Read - XML Write. Netbeans: Managing IDE windows – Eclipse – Javascript.

Text books

- 1.Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback,2016.
2. SemmyPurewal, "Learning Web App Development", O'Reilly Media, 2014.
3. Leon Atkinson, "Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Reference Books

- 1.Richard Blum,"PHP, MySQL & JavaScript All-in-One", John Wiley & Sons,2018.
2. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise WebDevelopment",O'Reilly Media, 2014.
3. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley&Sons, 2013.
4. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.
5. Laura Thomson, Luke Welling, "PHP and MySQLWeb Development",QUEpublications, 2001.

Web Resources

1. https://www.tutorialspoint.com/php/php_introduction.html
2. https://www.w3schools.com/php/php_intro.asp
3. <https://www.guru99.com/cakephp-tutorial.html>
4. <https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business>
5. https://www.tutorialspoint.com/netbeans_online_training/index.asp

COs/POs/PSOs Mapping

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

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

U19CST54	SOFTWARE ENGINEERING AND TESTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To familiarize the concepts of Software Engineering.
- To understand Software Design concepts.
- To learn about Software testing.
- To understand the Software testing techniques.
- To understand the levels of testing.

Course Outcomes

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

CO1– Perform Software engineering processes. **(K2)**

CO2–Make use of software design. **(K3)**

CO3– Apply different software testing strategies. **(K3)**

CO4–Illustratedifferent testing techniques. **(K2)**

CO5–Make use of different levels of testing in their software. **(K3)**

UNIT I SOFTWARE ENGINEERING PROCESSES(9 Hrs)

Software engineering concepts – Development activities – Software development lifecycle models – Softwareproject management – Project planning – Estimation – Scheduling – Risk management – Software configuration management –Project Planning – Empirical Estimation Techniques – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Software Requirements specification.

UNIT II SOFTWARE DESIGN(9 Hrs)

Characteristics of a Good Software Design – Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Detailed Design – Object oriented concepts – UML Diagrams – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – state chart diagrams – Object Oriented Analysis and Design methodology – Characteristics of a good User Interface – Types – A User Interface Design methodology.

UNIT III SOFTWARE TESTING (9 Hrs)

Introduction to Software testing – Psychology of Testing – Principles of Software Testing – Defects – Defect Prevention Strategies – Role of a tester – Software Testing Life Cycle.

UNIT IV TESTING TECHNIQUESAND TESTING TOOLS(9 Hrs)

Testing Techniques – Verification vs Validation – Software Testing Methodologies – White Box, Black Box and Grey Box – Static and Dynamic Techniques – Informal Reviews, Walkthroughs, Technical Reviews, Inspection – Structural Techniques, Black Box Techniques, Experienced Based Techniques. Testing Tools: Selenium – Jmeter

UNIT V LEVELS OF TESTING(9 Hrs)

Levels of Testing – Test Case Design – Building Test Cases – Test data mining – Test execution – Test reporting – Functional Testing – Unit, Integration, System, Acceptance, Regression, Retest – Non Functional Testing – Performance, Memory, Scalability, Compatibility, Security, Cookie, Session, Recovery, Adhoc, Risk Based Testing.

Text Books

1. Glenford J Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing", Wiley, 3rd Edition 2015.
2. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 3rd Edition, 2013.
3. Ian Sommerville, "Software Engineering", Pearson Education, 8th Edition, 2008.

Reference Books

1. Rahul Shende "Software Automation Testing Tools for Beginners", Arizona BusinessAlliance,2012
2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, 7th Edition, 2009.
3. S. L. Pfleeger and J.M. Atlee, "Software Engineering Theory and Practice", Pearson Education, 3rd Edition, 2008.
4. Lee Copeland "A Practitioner's Guide to Software Test Design", Artech House Publishers, 2003
5. Cem Kaner "Lessons Learned in Software Testing: A Context-Driven Approach", Wiley; 1st Edition, 2002.

Web Resources

1. <https://nptel.ac.in/courses/106/105/106105150/>
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. <https://www.coursera.org/lecture/introduction-software-testing/stages-of-software-testing-process-UMOpe>

COs/POs/PSOs Mapping

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

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

U19CSP51

HANDHELD COMPUTING LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To understand the basics of mobile application development
- To work with mobile app development platforms.
- To develop applications using components of android framework.
- To develop android applications including files and databases

Course Outcomes

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

CO1 - Describe the basic requirements of mobile applications. **(K3)**

CO2 - Analysis the challenges in mobile application design and development. **(K4)**

CO3 - Create the designs for software development using Android SDK. **(K4)**

CO4 - Design software applications with files and database connectivity. **(K4)**

List of Exercises

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.
12. Micro Project

Reference Books

1. "App Programming Guide for iOS-Apple developer" - 2014 Apple Inc.
2. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development paperback", Wiley India Private Limited, 2012.
3. JamesDovey and Ash Furrow, "Beginning Objective C",Apress, 2012
4. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
5. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C, Wrox Wiley, 2010.

Web Resources

1. <http://developer.android.com/develop/index.html>
2. <https://www.theserverside.com/tutorial/Mobile-application-development-tutorial>
3. <https://www.tutorialspoint.com/android/index.htm>
4. <https://www.programiz.com/kotlin-programming>

COs/POs/PSOs Mapping

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

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

U19CSP52

**WEB APPLICATION DEVELOPMENT
LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To understand the basic concepts of PHP
- To understand string concepts in PHP.
- To learn about file handling concepts in PHP
- To understand the concepts of form.
- To develop a form and link the form with data base using PHP.

Course Outcomes

After completion of the course, the students should be able to:

CO1 - Explain and program with basic concepts of PHP.(K4)

CO2 - Design a form and work with form.(K4)

CO3 - Understanding POST/GET, Session. (K2)

CO4 - Understanding cookies. (K2)

CO5 - Understanding PHP and Database connectivity. (K3)

List of Exercises

1. Write a program in PHP to handle numbers, strings.
2. Write a program in using if else, else if statements, loops.
3. Write a simple program in PHP to manipulate array values.
4. Write a function in PHP to generate random password.
5. Write a program in PHP for processing a simple form (use controls like checkbox, radio buttons and options).
6. Write a program in PHP for a simple POST and GET functions.
7. Write a program in PHP for setting and retrieving a Session.
8. Write a program in PHP for setting and retrieving a Cookie.
9. Design a login form using cookies, bootstrap, PHP, Database.
10. Design an event registration form using bootstrap, PHP, Database.
11. Design a student form with add, update, delete, display all and search option using student database.

Reference Books

1. Keith Wald, Jason Lengstorf, "Pro PHP and jQuery", Paperback, 2016.
2. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
3. Leon Atkinson, "Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Web Resources

1. <https://www.w3schools.com/php/DEFAULT.asp>
2. <https://www.tutorialspoint.com/php/index.html>
3. <https://www.phptpoint.com/php-tutorial/>
4. <https://www.javatpoint.com/php-tutorial>

COs/POs/PSOs Mapping

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

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

A handwritten signature in black ink, appearing to be 'K. P.' followed by a flourish.

U19CSP53

SOFTWARE TESTING LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To familiarize the concept of Software Testing.
- To apply and understand testing techniques.
- To build test reports.

Course Outcomes

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

CO1–Apply and practice test on websites using Selenium. **(K3)**

CO2 –Apply and practice different tests on websites using JMeter. **(K3)**

CO3– Build test reports using BeautifulSoup. **(K4)**

CO4 – Apply Unit testing on software module. **(K3)**

CO5– Apply Integration testing on software modules. **(K4)**

List of Exercises

1. Introducing Selenium Browser Automation Tool, environmental setup and web page navigation on browser..
2. Use Selenium to Check Functionality of Web Page's User Login and Registration
3. Use Selenium to Check Any Functionality of Web Page and Generate a Report Document.
4. Select a Website to write test plans for the website and to design Test cases using Selenium.
5. Test and Provide test reports for the given website using Selenium.
6. Select any 5 options in the website and test them using Selenium.
7. Introduction to JMeter and Setup JMeter Environment for Testing.
8. Use JMeter to perform Load Testing.
9. Use JMeter to perform Stress Testing.
10. Introduction to Timers in JMeter and Generate a Load using Timers.
11. Introduction to JMeter Response Assertion and Assert Response from Web Page.
12. Test and provide test reports for the given website using BeautifulSoup
13. Introduction to Unit Testing Framework and Unit Testing.
14. Manipulate Unit tests and Integration Tests.

Reference Books

1. Glenford J Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing", Wiley, Third edition, 2015.
2. Rahul Shende "Software Automation Testing Tools for Beginners", Arizona BusinessAlliance, 2012
3. Elfriede Dustin, Thom Garrett, and Bernie Gauf, "Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality", Addison-Wesley Professional, 1st Edition, 2009.
4. Lisa Crispin, Janet Gregory "Agile Testing: A Practice Guide for Testers and Agile Teams", Addison-Wesley Professional, 1st Edition, 2008.
5. Lee Copeland, "A practitioner's guide to Software Test Design", Artech House Publishers, 2003

Web Resources

1. <https://www.youtube.com/watch?v=5FUdrBq-WFo>
2. <https://intellipaat.com/blog/tutorial/selenium-tutorial/>
3. <https://www.youtube.com/watch?v=mXGcBvWYI-U>
4. <https://octoperf.com/blog/2018/03/29/jmeter-tutorial/>
5. <https://www.youtube.com/watch?v=87Gx3U0BDIo>
6. <https://www.guru99.com/unit-testing-guide.html>
7. https://www.youtube.com/watch?v=4_lk8eb2ln0

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3
4	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3
5	3	3	3	2	3	-	-	-	3	-	-	1	3	2	3

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

U19CSC5X**CERTIFICATION COURSES-III**

L	T	P	C	Hrs
0	0	4	-	50

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

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



SKILL DEVELOPMENT COURSE 5**U19CSS51** (Foreign Language / IELTS – I/ Career and Professional Skill development Program -I)

L	T	P	C	Hrs
0	0	2	-	30

1. BASIC APTITUDE & MATHEMATICAL SKILLS:

- Number System – Basics
- Number System – Advanced
- Surds & Indices
- Ratio & Proportion
- Problem On Ages & Partnership

2. APPLIED APTITUDE & MATHEMATICAL SKILLS:

- Average
- Alligations & Mixtures
- Profit & Loss, Discounts
- Percentage
- Time, Speed & Distance
- Problem On Trains
- Boats & Streams
- Time & Work
- Chain Rule
- Pipes & Cisterns
- Calendars

3. ENGINEERING APTITUDE SKILLS:

- Simple & Compound Interest
- Probability
- Permutation & Combination
- Mensuration
- Data Interpretation

U19CSS52SKILL DEVELOPMENT COURSE 6

(Presentation Skills using ICT)

L	T	P	C	Hrs
0	0	2	-	30

The methodology used is “learning by doing”, a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

ICT skills

- Understand ICT workflow in cloud computing.
- Manage multitasking.
- Deal with main issues using technology in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study and have to prepare a report, running to 15 or 20 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee for a total of 100 marks. The marks attained for this course is not considered for CGPA calculation.

U19CSM51	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

The course will introduce the students to

- To get a knowledge in Indian Culture
- To Know Indian Languages and Literature and the fine arts in India
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

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

- CO1 – Understand philosophy of Indian culture. (K2)
 CO2 – Distinguish the Indian languages and literature. (K3)
 CO3 – Learn the philosophy of ancient, medieval and modern India. (K1)
 CO4 – Acquire the information about the fine arts in India. (K3)
 CO5 – Know the contribution of scientists of different eras. (K2)

UNIT – I INTRODUCTION TO CULTURE

Culture, Civilization, Culture and Heritage, General Characteristics of Culture, Importance of Culture in Human Literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT – II INDIAN LANGUAGES, CULTURE AND LITERATURE

Indian Languages and Literature-I: The role of Sanskrit, Significance of Scriptures to Current Society, Indian Philosophies, Other Sanskrit Literature, Literature of South India Indian Languages and Literature-II: Northern Indian languages & Literature.

UNIT – III RELIGION AND PHILOSOPHY

Religion and Philosophy in Ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING)

Indian Painting, Indian handicrafts, Music, Divisions of Indian Classic Music, Modern Indian Music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, Development of Science in Ancient, Medieval and Modern India.

UNIT – V EDUCATION SYSTEM IN INDIA

Education in Ancient, Medieval and Modern India, Aims of Education, Subjects, Languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Reference Books

1. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, 2014.
2. Science in Sanskrit, "Sanskrita Bharti Publisher", 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", 2006.
4. Kapil Kapoor, "Text and Interpretation: The India Tradition", 2005.
5. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993.
6. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.

PROFESSIONAL ELECTIVES



U19CSE51**ENTERPRISE SOLUTIONS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the architecture of ERP and its technologies
- To gain knowledge about SAP.
- To Learn the concepts of oracle suite.
- To understand about people soft
- To study about Siebel Enterprise Applications

Course Outcomes

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

CO1–Analyse the fundamentals of ERP and its technologies(**K2**)

CO2–Summarize the concepts of SAP(**K3**)

CO3 –Demonstrate the SQL/PLSQL(**K3**)

CO4 –Examine people soft and its functionalities(**K2**)

CO5 –Know the Siebel Enterprise Applications and its tools.(**K1**)

UNIT I INTRODUCTION TO ENTERPRISE RESOURCE PLANNING (9 Hrs)

Introduction: ERP – Definition– Concept –Fundamentals – Need for ERP – Advantagesof ERP – Implementation of ERP – Key issues and Characteristics of ERP – TypicalArchitecture Components of ERP – ERP system Architecture.

UNIT II ERP AND RELATED TECHNOLOGIES(9 Hrs)

Business Process RE-engineering – Management Information System – Decision Support System – Executive Support System –On-Line Analytical Processing, Supply Chain Management, CustomerRelationship Management.

UNIT III SAP R/3 (9 Hrs)

SAP: History – SAP R/2 – SAP R/3 – Characteristics of SAP R/3 – Architecture of SAP R/3 – SAP Modules, NetWeaver, Customer Relationship Management, Business Warehouse, Advanced Planner and Optimiser. ABAP/4: Workbench – WorkbenchTools – ABAP/4Data Dictionary – ABAP/4 Repository Information – Structure of ABAP/4 program – ABAP/4 syntax – Data types – Constants and Variables. Statements: DATA, PARAMETERS, TABLE, MOVE, MOVE-CORRESPONDING, CLEAR, WRITE, CHECK, FORMAT, LOOP STRUCTURES, Sample program

UNIT IV ORACLE ERP (9 Hrs)

Oracle Suite: Oracle Apps 11i – Application Framework – FileSystem – WorkflowAnalysis – SQL/ PLSQL fundamentals – CreatingForms – OracleReports. Oracle Electronic Data Interchange – functions of EDI – Data File Structure – OracleData, Oracle Database – DWvs OLTP – DWConnectors.

UNIT V PEOPLESOFT (9 Hrs)

PeopleSoft:Basic PeopleSoft Functionality – Opening Multiple Windows – Database structure – Understanding People Soft Data Mover – Records – Pages vs. Forms. PeopleSoft HRMS: Introduction to PeopleSoft HRMS database – PeopleSoftproducts – FunctionalPeopleSoft - Financial Management System – PeopleSoftEnterprise HRMS.

Text Books

- 1.SAP ABAP/4, Black Book, DreamTech Press, 2012.
2. Jim J. Marion, PeopleSoftPeopleTools: Tips and Techniques, Oracle Press, 2010.
3. Oracle EDI Gateway User guide, Oracle Corporation.
4. V.K. Garg and N.K. Venkatkrishnan, ERP Concepts and Planning, PHI, 2004.

Reference Books

1. Paula Dean and Jim J. Marion, PeopleSoft People Tools: Data Management and Upgrade Handbook, Oracle Press, 2013.
2. Kogent, SAP ABAP / 4 (Covers SAP ECC 6.0) Black Book Paperback , Learning Solutions Inc, 2009
3. Chrispopher Allen, Oracle Database PL/SQL, TMH, 2004.

Web Resources

1. <https://www.tutorialspoint.com/sap/index.htm>
2. <https://peoplesofttutorial.com/>
3. <https://www.oracletutorial.com/plsql-tutorial/>

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	2	3	2	3	2	2	2	2	3	3	2	2	2	2
4	2	2	2	3	3	1	2	2	3	1	3	3	3	2	2
5	2	3	3	2	2	2	2	2	3	3	3	3	3	2	2

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

	L	T	P	C	Hrs
U19CSE52					
GAME DEVELOPMENT USING UNITY	3	0	0	3	45

Course Objectives

- To discuss and define the terms and principles of game design and development.
- To select and evaluate programming and scripting languages to develop particular games.
- To define the structure and duties of the game development team.
- To practice animation production development with interfaces.
- To choose an optimal solution and design the game development.

Course Outcomes

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

CO1 – Explain all game development stages. **(K1)**

CO2 – Explain story creation in different dimensions. **(K2)**

CO3 – Analyze the required mathematical and physical analysis. **(K3)**

CO4 – Create and design menus and interfaces. **(K3)**

CO5 – Organize and select the appropriate optimization technique for game development **(K3)**

UNIT I SETTING UP UNITY DEVELOPMENT ENVIRONMENT

(9 Hrs)

Welcome screen – The Unity interface – Menus – Toolbar – Hierarchy – Inspector – Project browser – Scene view – Game view – File formats – 3D Formats – 2D Formats – Importing Assets – Importing from inside Unity – Importing premade assets from the file browser – Creating new assets – Importing Packages – Unity Packages – Custom Packages.

UNIT II GAME OBJECTS and COMPONENTS (9 Hrs)

Game objects – Our first Game Objects – Creating a Game Objects – Components – Creating a component – Assign a Component – Prefabs. Creating 2D sprites: Working in 2D – 2D behaviours – 2D Workspace. Building our sprites: Import Settings – Pixels to units – Sprite editor – Sprite Packing – Packing tag – Sprite packer – Additional sprite packing resources. Setting the scene – Creating a roadmap – Adding details – Getting around Our Scene – Scene Gizmo – Perspective vs Isometric – Camera controls – Manipulating Objects in Unity – Transform tools.

UNIT III BUILDING THE GAME WORLD

(9 Hrs)

The three languages: Choosing the “Right” Language – Making the Player Go – Different ways of Handling Movement – Creating and hooking up Player Controller – Setting up a basic Follow-cam. Introducing the input manager: Error handling and debugging – Handling exceptions – Try-Catch-Finally – Gracefully Handling exceptions – Breakpoints. Rules for animation: Animation principles – 2D versus 3D Animation – Transform versus Frame Animation – Scripted Animations.

UNIT IV SETTING UP PLAYER PHYSICS AND COLLIDERS

(9 Hrs)

Understanding Physics: Physics – Mass – Gravity – Force – 2D versus 3D – 6DoF – Z-Depth – Rotations – Physics 2D Settings – General Physics Settings – Layer Collision Matrix – Rigidbodies – Colliders – Circle Collider – Box Collider – Edge Collider – Polygon Collider – Physics Materials – Constraints – Trigger Volumes in Unity – Trigger 2D Functions – Adding Trigger Components to Game Objects – Creating Checkpoints – Scripting the Checkpoint Component – Sizing and Placing Our Checkpoint Trigger .

UNIT V CREATING THE MENUS AND INTERFACE ELEMENTS (9 Hrs)

UI Design – Diegetic – Non-diegetic – Meta – Spatial – Unity native GUI – GUI style – GUI skin – GUI controls – Compound controls – GUI class – GUI layouts – GUI text – GUI texture – Creating a splash screen – Title screen – Game Over screen – HUD – Creating the visuals – Creating the Visuals – Creating the Scripts – Introducing the Shuriken Particle System – Creating a Particle System – Modules and Properties of a Particle System – Base Particle System Properties – Other Particle System Modules.

Text Books

1. Nicolas Alejandro Borromeo, "Hands-On Unity 2020 Game Development", Packt, 2020.
2. Franz Lanzinger, "2D Game Development with Unity", CRC Press, 1st Edition, 2020.
3. Mike Geig, "Unity Game Development in 24 Hours", sams, 3rd Edition, 2020.

Reference Books

1. Penny de Byl, Holistic "Game Development with Unity", CRC Press, 3rd Edition, 2019
2. Paris Buttfield-addis, Jonathon Manning, Tim Nugent, "Unity Game Development Cookbook, Essentials for Every Game", O'reilly, 2019.
3. Matthew Johnson, James A. Henley, "Learning 2D Game Development with Unity", Pearson Education, 2014.
4. Michelle Menard, "Game Development with Unity", Course Technology, 2012.
5. Michelle Menard, "Game Development with Unity", Course technology PTR Stacy L Hiquist, 2011.

Web Resources

1. <https://www.udemy.com>
2. <https://nptel.ac.in/courses/110/104/110104063/>
3. <https://www.capterra.com/game-development-software/>
4. <https://www.gamedesigning.org/gaming/game-development-tools/>
5. https://en.wikipedia.org/wiki/Game_development_tool

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	2	2	2	3	3	2	2	2	2	3	3	2	3	2	3
4	2	2	3	1	3	2	2	2	3	1	3	3	3	3	2
5	2	2	3	3	3	2	2	2	3	3	3	3	3	3	2

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

U19CSE53	FUNCTIONAL PROGRAMMING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Understand the fundamentals of functional programming
- To learn the programming in Haskell
- To write functional programs using recursion and higher order functions
- Combine functional programming with classes and objects
- To learn Haskell proofs on program equivalence and Monads

Course Outcomes

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

CO1 – List and define the fundamental concepts of functional programming (**K1**)

CO2 – Utilize the polymorphism and higher-order functions on Haskell (**K1**)

CO3 – Describe the required data types and construct the features of the Haskell (**K2**)

CO4 – Write functional programming using classes and objects of the system (**K2**)

CO5 – Apply the reasoning and proofs on programs in functional programming (**K3**)

UNIT I (9 Hrs)

Introduction to Functional Programming – Expressions and Values, Evaluations, Functions, Recursion, Types.

UNIT II (9 Hrs)

Introduction to Haskell - Tuples, Polymorphism, Higher Order Functions, Strings & Characters.

UNIT III (9 Hrs)

Data Types – Data Type Declarations, Data and Type Constructors, Defining Functions Over Data Types using Pattern, Abstract Data Types, Polymorphism, Polymorphic Functions, Polymorphic Data Types, Type Constructors to Define Polymorphic Constructor Functions, Recursive Data Types, Higher Order Functions.

UNIT IV (9 Hrs)

The Haskell Class System – Classes as Predicates on Types, Instance Declarations, Inheritance and Dependent Classes, Derived Instances, The Show Class, The Eq class.

UNIT V (9 Hrs)

Programs and Proofs - Equational Reasoning, Proofs on Program Equivalence. Monads-IO Monad, List Monad, Maybe Monad, State Monad.

Text Books

1. Simon Thompson, Haskell - The Craft of Functional Programming, Pearson Education, 2015
2. Richard Bird, Introduction to Functional Programming using Haskell, Prentice-Hall International, 2nd Edition, 2010.
3. Benjamin C. Pierce, Types and Programming Languages, The MIT Press, 2002

Reference Books

1. Graham Hutton, Programming in Haskell, 2nd Edition, Cambridge University Press, 2016.
2. Miran Lipovaca, Learn You a Haskell for Great Good, No Starch Press, 1st Edition, 2011.
3. Richard Bird, Introduction to Functional Programming using Haskell, Prentice-Hall International, 2nd Edition, 2010.
4. Simon Peyton Jones, Haskell 98 language and libraries - The Revised Report, Cambridge University Press, 2003
5. Paul Hudak, The Haskell School of Expression: Learning Functional Programming through Multimedia, Cambridge University Press, 2000.

Web Resources

1. https://nptel.ac.in/courses/Functional_Programming/
2. https://en.wikipedia.org/wiki/Game_development_too
3. <https://www.coursera.org/learn/progfun1>

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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4	2	1	3	3	3	2	2	2	3	1	3	3	3	2	2
5	2	3	3	3	3	2	2	2	3	3	3	3	3	2	2

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

U19CSE54**ROBOTIC PROCESS AUTOMATION**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the fundamental concepts of Robotics
- To outline types of workflows
- To design of Data Manipulations.
- To understand the applications and plugins.
- To Deploy and maintain the BOT.

Course Outcomes

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

CO1 – Explain the robotic kinematic and dynamic analysis **(K2)**

CO2 – Explain types of work flows **(K2)**

CO3 – Explain Data Manipulations **(K2)**

CO4 – Make use of various applications and plugins **(K3)**

CO5 – Deploy and maintain BOT **(K4)**

UNIT I INTRODUCTION TO ROBOTICS (9 Hrs)

Robotic Process Automation: What is RPA: Benefits of RPA – Components of RPA – Recorder – Development Studio – Extensions and Plugins – Bot Runner – Control Center. RPA Platforms: Automation Anywhere – UiPath – Blue Prism – Work Fusion. UiPath: UiPath Robot – UiPath Orchestrator.

UNIT II TYPES OF WORKFLOWS (9 Hrs)

Sequences – Flowcharts – State Machines. Variables: Managing Variables – Naming Best Practices. The Variables Panel: Types of Variables. Arguments: Managing Arguments – Naming Best Practices, The Arguments Panel – Using Arguments. Control Flow: Control Flow Activities – The Assign Activity – The Delay Activity – The While Activity – The Do while Activity – The For each Activity – The If Activity. Task Recorder: Advanced UI interactions – Input Methods – Output Methods.

UNIT III DATA MANIPULATION (9Hrs) Variables and scope: Collections – Arguments – Purpose and Use – DataTable Usage – Building a Data Table. File operation: Read Cell – Write Cell – Read Range – Write Range – Append Range. Taking Control: Finding the Control – Anchor Base – Element Exists – Element Scope – Find Relative Element – Mouse Activities – Send Hotkey. Working with UiExplorer: Handling Events – Element Triggering Events – Hotkey Trigger. Revisit Recorder: Basic Recording – Desktop Recording.

UNIT IV APPLICATION WITH PLUGINS (9 Hrs)

Terminal plugin: SAP automation – How SAP Automation affects data. Examples where SAP automation. Java plugin: JAVA plugin with UiPath Studio. Citrix automation: Citrix environment work – Mail Plugin – PDF Plugin – Web Integration – Word Plugins – Excel Plugin – Word Plugin – Credential Management. Events and Assistant Bots: What are Assistant Bots – Event Triggers – Hotkey Trigger – Mouse Trigger – System Trigger.

UNIT V DEPLOYING AND MAINTAINING THE BOT (9 Hrs)

Publishing using publish utility: workflow in UiPath, Orchestration Server: Queues – Assets – Process – Deploying a process. Server to Control Bots: Robot Statuses – Editing the Robot – Deleting the Robot – Displaying logs for a Robot. Server to deploy bots: Connecting a Robot to Orchestrator – Deploy the Robot to Orchestrator. License management: Activating and uploading a license to Orchestrator. Publishing and Managing Updates: Packages – Managing Packages.

Text Books

1. Tom Taulli , The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, 2020.
2. Nandan Mullakara, Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere, 2020.
3. Gerardus Blokdyk, "RPA robotic process automation", second Edition, Paper Back, 2018.
4. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009.
5. Mark W. Spong, Sdeth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005.

Reference Books

1. Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi. 2007.
2. Ghosal, A, "Robotics", Oxford Press, New Delhi, 2006.
3. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGrawHill, 2003.
4. Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003.
5. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.

Web Resources

1. <https://www.laserfiche.com/ecmblog/what-is-robotic-process-automation-rpa/>
2. <https://piazza.com/class/j641h48teqh6ba>
3. https://developer.mozilla.org/en-US/docs/Plugins/Guide/Plug-in_Basics
4. <https://www.edx.org/>

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

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

U19CSE55

SOFTWARE PROJECT MANAGEMENT

L	T	P	C	Hrs
3	0	0	3	45

B.Tech Computer Science and Engineering

Course Objective

- To understand what and why of Block chain.
- To explore the major components of Block chain
- To Learn about Hyper ledger Composer and Explorer
- To understand about Bitcoin, Cryptocurrency, Ethereum
- To create own Block chain network application

Course Outcome

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

CO 1 – Understand Project Management and planning strategies **(K1)**

CO 2 – Obtain adequate knowledge about software process models and software effort estimation techniques **(K1)**

CO 3 – Estimate the risks involved in various project activities **(K2)**

CO 4 – Understand project monitoring and control strategies **(K2)**

CO 5 – Staff selection process and the issues related to people management **(K2)**

UNIT I PROJECT EVALUATION AND PLANNING**(9 Hrs)**

Software Project Management – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION**(9 Hrs)**

Project Life Cycle – Software Process and Process Models – Rapid Application Development – Agile Methods – Dynamic System Development Method – Extreme Programming – Managing Interactive Processes – Basics of Software Estimation – Effort and Cost Estimation Techniques – COSMIC Full Function points – COCOMO II – A Parametric Productivity Model.

UNIT III ACTIVITY PLANNING, SCHEDULING AND RISK MANAGEMENT**(9 Hrs)**

Objectives of Activity planning – Project Schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo Simulation – Resource Allocation – Creation of Critical Patterns – Cost Schedules.

UNIT IV MONITORING AND CONTROL**(9 Hrs)**

Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – The ISO 12207 Approach – Supply Process – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLES AND ORGANIZING TEAMS**(9 Hrs)**

Staffing in Software Projects – Managing People – Organizational Behavior – Best methods of Staff Selection – Motivation – The Oldham – Hackman Job Characteristic Model – Stress – Health and Safety – Ethical and Professional Concerns – Working in Teams – Decision Making – Organizational Structures – Dispersed and Virtual Teams – Communications Genres – Communication Plans – Leadership.

Text Books

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2017.

2. Maneesh Dutt, Mind Maps for Effective Project Management, 1st edition, Notion Press, 2015.

3. Kalpesh Ashar, Project Management Essentials You Always Wanted To Know, Vibrant Publishers, 2020.

Reference Books

1. Meredith, Mantel, Shafer, Project Management, ISV: A Managerial Approach, Wiley, 2017.
2. Stanley E. Portny, Project Management For Dummies, Fifth edition, Wiley, 2017.
3. Gopalaswamy Ramesh, Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.
4. Robert K. Wysocki Effective Software Project Management – Wiley Publication, 2011.
5. Walker Royce: Software Project Management- Addison-Wesley, 1998.

Web Resources

1. <https://www.pmi.org/learning/library/strategic-program-management-office-structure-4613>
2. <https://www.simplilearn.com/project-estimation-techniques-article>
3. https://www.tutorialspoint.com/software_engineering/software_project_management.html
4. <https://www.javatpoint.com/software-project-management>
5. <https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/>

COs/POs/PSOs Mapping

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

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

OPEN ELECTIVES



U19ECO53**ELECTRONIC PRODUCT DESIGN AND PACKAGING**

L	T	P	C	Hrs
3	0	0	3	45

(Common to EEE, CSE, IT, ICE, MECH
BME and Mechatronics)

Course Objectives

- To provide basic knowledge about Electronic Product and Packaging
- To introduce and discuss various issues related to the system packaging
- To get clear idea about design of packages which can withstand higher temperature, vibrations and shock
- To Design of PCBs which minimize the EMI and operate at higher frequency
- To acquire depth knowledge about the concepts of Testing and testing methods

Course Outcomes

After completion of the course, students are able to

CO1-Explain the basics of Electronic Product and Packaging.(K2)

CO2-Infer various issues related to the system packaging.(K2)

CO3-Summarize the clear idea about design of packages which can with stand higher temperature, vibrations and shock (K2)

CO4 - Describe the design of PCBs which minimize the EMI and operate at higher frequency (K2)

CO5- Explain the various testing methods (K2)

UNIT I OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING**(9Hrs)**

Definition of a system and history of semiconductors, Products and levels of packaging, Packaging aspects 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**(9Hrs)**

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**(9Hrs)**

Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution, Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digital and RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance and Inductance fundamentals; Packaging roadmaps – Hybrid circuits – Resistive, Capacitive and Inductive parasitics.

UNIT IV CHIP PACKAGES**(9Hrs)**

IC Assembly – Purpose, Requirements, Technologies, Wire bonding, Tape Automated Bonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Single chip packaging: functions, types, materials processes, properties, characteristics, trends. Multi-chip packaging: types, design, comparison, trends. System-in-package (SIP); Passives: discrete, integrated, and embedded

UNIT V TESTING**(9 Hrs)**

Testing Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue – failures - thermo mechanically induced - electrically induced – chemically induced. Electrical Testing: System level electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability

Text Books

1. Tummala,RaoR.,Fundamentals of Micro systems Packaging, McGrawHill,2001
2. R.G.Kaduskar and V.B.Baru,Electronic Product design,Wiley India, 2011
3. Tummala,RaoR.,Microelectronics packaging handbook,McGrawHill,2008.

Reference Books

1. Blackwell(Ed),“The electronic packaging handbook”,CRCPress,2000.
2. R.S.Khandpur,“Printed Circuit Board”,TataMcGrawHill,2005
3. R.K.Ulrich,“Recent literature in Electronic Packaging”,2005
4. MichaelL.Bushnell and Vishwani D.Agrawal, “Essentials of ElectronicTesting for Digital, Memory and Mixed signal VLSICircuits”,Kluwer Academic Publishers.2000.
5. M.Abramovici,M.A.Breuer,andA.D.Friedman,“DigitalSystemTestingandTestableDesign”,ComputerScience Press,

Web Resources

1. <http://www.logopeople.in/blog/awesome-packaging-design-of-electronic-products-for-inspiration/>
2. <https://www.pinterest.com/PackagingTPI/electronic-packaging/>
3. <https://www.einfochips.com/blog/semiconductor-and-electronic-design-networks-and-profiles-to-follow-in-2018/>
4. https://en.wikipedia.org/wiki/Electronic_packaging
5. <https://nptel.ac.in/courses/108/108/108108031/>

COs/POs/PSOs Mapping

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

CorrelationLevel:1-Low,2-Medium,3-High

U19IC053**FUZZY LOGIC AND NEURAL NETWORKS**

(Common to CSE, IT, CIVIL and 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. McCulloch 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 – Nonlinear Fuzzy control – Fuzzy neuron.

Text Books

1. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA .2015.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International Editions,2010.
3. LaureneFausett, "Fundamentals of Neural Networks", Pearson Education, 2008.

Reference Books

1. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2019.
2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Pearson Education 2007.
3. Rajasekaran. S, Pai. G.A.V. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice-Hall of India, 2003.
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.

Web Resources

1. <https://lecturenotes.in/subject/922>.
2. <https://www.ifi.uzh.ch/dam/jcr:000000000-2826-155d-0000-00005e4763e3/fuzzylogicscript.pdf>.
3. <https://nptel.ac.in/courses/106/105/106105173/>.

COs/POs/PSOs Mapping

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

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

U19CEO53	DISASTER MANAGEMENT	L	T	P	C	Hrs
	(Common to EEE,ECE, CSE, IT, ICE, MECH and BME)	3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basic conceptual understanding of disasters
- Understand approaches of Disaster Management
- Build skills to respond to disaster
- Understand the safety precaution
- Understand the basic planning and policy act of the disaster

Course Outcomes

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

CO1 - Understanding Disasters, man-made Hazards and Vulnerabilities **(K2)**

CO2 – Understanding the flood management studies **(K2)**

CO3 - Understanding disaster mitigation and management mechanism **(K1)**

CO4 - Understanding the disaster safety precaution **(K2)**

CO5 – Understanding the disaster plan and act **(K3)**

UNIT I DEFINITION AND TYPES

(9 Hrs)

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunamis, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

UNIT II STUDY OF IMPORTANT DISASTERS

(9 Hrs)

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) Earthquakes, Landside). Social Economics and Environmental impact of disasters.

UNIT III MITIGATION AND MANAGEMENT

(9 Hrs)

Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief.

UNIT IV SAFETY PROCESS

(9 Hrs)

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.



UNIT V PLANNING AND ACT**(9 Hrs)**

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans.

Text Books

1. Dr. 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.

Web Resources

1. <http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf>
2. <http://nidm.gov.in/pdf/guidelines/new/sdmp.pdf>
3. http://sdmassam.nic.in/pdf/publication/undp/disaster_management_in_india.pdf

COs/POs/PSOs Mapping

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

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

U19CE054	AIR POLLUTION AND SOLID WASTE MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Provide general understanding of air pollution, air pollutants, their sources and their effects
- Provide knowledge about meteorological parameters, air sampling and measurement of pollutants.
- Provide knowledge of air pollution controlling technologies, air pollution due to automobiles and general idea of noise pollution.
- Study the importance of solid waste management by processing, treatment, disposal and reuse of solid waste.
- Study about the equipment used for waste collection and transportation of solids waste.

Course Outcome

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

CO1 - understand the type, sources & effect of air pollutants (**K2**)

CO2 – know the parameters affecting air pollution and various methods of measurement and estimation of pollutants (**K3**)

CO3 - gain knowledge of basics of noise pollution (**K2**)

CO4 - understand various air pollution control equipment's & pollution caused due to automobile exhaust (**K4**)

CO5 - understand the concepts of solid waste management (**K2**)

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO AIR POLLUTION

(8 Hrs)

Introduction to air pollution: Air pollution episodes, Atmosphere and its zones, classification and sources of air pollutants, effects of air pollutants on man, plants animal & materials

UNIT II METEOROLOGICAL ASPECTS

(8Hrs)

Meteorological Aspects: Atmospheric stability, plume behavior, Ambient air sampling and stack sampling, collection of particulates and gaseous pollutants, methods of estimation.

UNIT III AIR POLLUTION CONTROL METHODS

(9 Hrs)

Air pollution control methods and equipment: Principle of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters cyclones, wet scrubbers, automobile exhaust: Pollution due to diesel and petrol engines, exhaust treatment and abatement, noise Pollution: Sources, ill effects, control measures.

UNIT IV SOLID WASTE MANAGEMENT

(8Hrs)

Introduction to solid waste management, sources, quantification and characterisation, classification and components, sampling and analysis, Method of collection

UNIT VEQUIPMENT

(12 Hrs)

Equipment used for collection and transportation, transfer stations, solid waste processing and management. Treatment and disposal methods: composting, sanitary landfills, Incineration – concept, components and applications, leachate management.

Text Books

1. M.N. Rao & H.V.N. Rao, 1988, Air Pollution, Tata McGraw Hill Publishing Co. Ltd.
2. C.S. RAO, 2007, Environmental Pollution Control Engineering, New Age International, Wiley Estern Ltd. New Delhi.
3. Stern A. C., 1973, Air pollution, Academic Press.
4. A.D. Bhide & Sunderesan B.B., 1983, Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tohobanoglous, 1993, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd.

Reference books

1. P. Aarne Vesilind, William Worrell & Debra Reinhart, 2002, Solid Waste Engineering, Cengage Learning India pvt. Ltd.
2. Dr. Y Anjaneyulu, 2002, Air Pollution and Control Technologies, Allied Publisher pvt. Ltd.
3. Waste Management: A Reference Handbook. Contributors: Jacqueline Vaughn - Author. Publisher: ABC-Clio
4. K. V. S. G. Murlikrishna, 1995, Air Pollution, Kaushal & Company.

Web Resources

1. <https://nptel.ac.in/courses/120108005/>
2. <http://cpheeo.gov.in/upload/uploadfiles/files/Part1>
3. <https://nptel.ac.in/content/storage2/courses/104103022>

COs/POs/PSOs Mapping

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

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

U19BMO53**BIOMETRIC SYSTEMS**

(Common to EEE,ECE,CSE, IT,ICE,MECH AND MECHATRONICS)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives:

- To understand the basics of Biometric systems
- To gain knowledge in different fingerprint technologies
- To understand the classification of face recognition methods.
- To understand multimodal Biometrics and its performance evaluation.
- To know personal privacy and security implications of biometrics systems.

Course Outcomes:*After completion of the course, the students will be able to***CO1** - Explain the fundamentals of biometric systems(**K2**)**CO2**- Describe the various fingerprint technologies(**K3**)**CO3** - Distinguish different face recognition and hand geometry pattern(**K3**)**CO4** - Analyze the multimodal biometrics and performance evaluation of biometrics (**K4**)**CO5**- Recognize various Biometric authentication methods (**K3**)**UNIT I INTRODUCTION TO BIOMETRICS****(9 Hrs)**

Introduction– biometric technologies – passive biometrics – active biometrics - Biometric systems – Enrolment – templates – algorithm – verification – Authentication technologies –Need for strong authentication - Protecting privacy and biometrics policy – Biometric applications – biometric characteristics.

UNIT II FINGERPRINT TECHNOLOGY**(9 Hrs)**

History of fingerprint pattern recognition - General description of fingerprints - Finger print feature processing techniques - fingerprint sensors using RF imaging techniques – fingerprint quality assessment – computer enhancement and modelling of fingerprint images – fingerprint enhancement – Feature extraction – fingerprint classification – fingerprint matching

UNIT III FACE RECOGNITION AND HAND GEOMETRY**(9 Hrs)**

Introduction to face recognition - face recognition from correspondence maps - Hand geometry- scanning - feature extraction - Adaptive Classifiers - Visual Based feature extraction and Pattern Classification -types of algorithm - Biometric fusion.

UNIT IV MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION**(9 Hrs)**

Voice scan - Physiological biometrics –Behavioural biometrics - Introduction to multimodal biometric system- Integration strategies - Architecture -level of fusion - combination strategy – training and adaptability - examples of multimodal biometric systems - Performance evaluation - Statistical Measures of Biometrics- FAR - FRR - FTE - EER -Memory requirement and allocation.

UNIT V BIOMETRIC AUTHENTICATION**(9 Hrs)**

Introduction - Biometric Authentication Methods - Biometric authentication by fingerprint - Biometric Authentication by Face Recognition. Expectation-Maximization theory - Support Vector Machines- Biometric authentication by hand geometry- Securing and trusting a biometric transaction – matching location – local host - authentication server – match on card (MOC) – Multibiometrics and Two-Factor Authentication.

Text Books

1. Anil K. Jain, Arun Ross, and 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

Web Resources

1. <http://www.findbiometrics.com/Pages/glossary.html>
2. <http://www.biometrics.gov/Documents/privacy.pdf>
3. http://zing.ncsl.nist.gov/biiousa/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

U19BMO54**MEDICAL ROBOTICS**

(Common to CSE, IT, MECH, MECHATRONICS)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the basics of Robotics
- To gain knowledge in Kinematics
- To know about the robot vision
- To describe various motion planning solutions
- To explain various applications of Robots in Medicine

Course Outcomes

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

CO1 - Understand the basics of robotic systems. **(K2)**

CO2-Explore workspace and related motion of the Robots **(K3)**

CO3- Analyse and extract information from the image using Robots **(K3)**

CO4 - Design of task planning and simulating the task. **(K4)**

CO5-Construct Robots for Medical applications **(K4)**.

UNIT I INTRODUCTION**(9 Hrs)**

Introduction- Automation and Robots – Classification - Applications- Specifications – Direct Kinematics Dot and cross products – Coordinate frames – Rotations – Homogeneous coordinates Link coordination arm equation – Four-axis robot -Five-axis robot - Six-axis robot.

UNIT II KINEMATICS**(9 Hrs)**

Inverse Kinematics – General properties of solutions tool configuration – Workspace analysis and trajectory planning work envelope - examples- workspace fixtures – Pick and place operations – Continuous path motion – Interpolated motion – Straight-line motion.

UNIT III ROBOT VISION**(9 Hrs)**

Robot Vision- Image representation – Template matching – Polyhedral objects – Shape analysis – Segmentation – Thresholding – region labelling – Shrink operators – Swell operators – Euler numbers – Perspective transformation – Structured illumination – Camera calibration.

UNIT IV PLANNING**(9 Hrs)**

Task Planning – Task level programming – Uncertainty – Configuration – Space, Gross motion – Planning – Grasp Planning – Fine-motion planning – Simulation of planar motion – Source and Goal scenes – Task Planner simulation.

UNIT V MEDICAL APPLICATIONS**(9 Hrs)**

Applications in Biomedical Engineering – Biologically Inspired Robots – Application in Rehabilitation – Interactive Therapy – Bionic Arm – Clinical and Surgical – Gynaecology – Orthopaedics – Neurosurgery.

Text Books

1. Robert Schilling, "Fundamentals of Robotics-Analysis and control", Prentice Hall, 2003.
2. Paula Gomes, "Biomedical Instrument and Robotic Surgery System: Design and Development for Biomedical Applications", Woodhead Publishing, 2012.
3. Klafter, Chmielewski and Negin, "Robotic Engineering - An Integrated approach", PHI, 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.

Web Resources

1. <https://nptel.ac.in/courses/112/105/112105249/>
2. https://www.intechopen.com/books/medical_robotics/motion_tracking_for_minimally_invasive_robotic_surgery
3. https://www.intechopen.com/books/medical_robotics/robotic_applications_in_neurosurgery
4. https://www.intechopen.com/books/medical_robotics/medical_robotics_in_cardiac_surgery
5. <https://www.worldscientific.com/worldscinet/jmrr>

COs/POs/PSOs Mapping

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

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



U19ADO51	PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE)	3	0	0	3	45

Course Objectives

- To understand basic principles of Artificial Intelligence
- To learn and design Knowledge representation
- To understand the concept of reasoning
- To master the fundamentals of machine learning, mathematical framework and learning algorithms
- To understand the reinforcement and statistical learning.

Course Outcomes

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

CO1 - Understand foundational principles of artificial intelligence. **(K2)**

CO2 - Understand formal methods of knowledge representation. **(K2)**

CO3 - Understand the fundamental issues and challenges of Reasoning. **(K2)**

CO4 - Analyze the underlying mathematical relationships with Machine Learning algorithms. **(K3)**

CO5 - Apply various models for Artificial Intelligence programming techniques. **(K4)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to Artificial Intelligence - Artificial Intelligence Problems - Timelines of Artificial Intelligence - Production Systems - State Space Representation - Branches of Artificial Intelligence - Application of Artificial Intelligence.

UNIT II KNOWLEDGE REPRESENTATION**(9 Hrs)**

Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge representation - Issues in Knowledge representation - Knowledge base. First order Logic – Frames – Conceptual Dependency.

UNIT III REASONING**(9 Hrs)**

Types of reasoning - reasoning with Fuzzy Logic - Rule based Reasoning - Diagnosis Reasoning.

UNIT IV LEARNING**(9 Hrs)**

Types of Learning - Machine Learning - Intelligent agents - Association Learning: Apriori Algorithm - Case Study: Customer Sequence and SCADA Application – k-Means Clustering - Fuzzy Clustering - Cluster Similarity

UNIT V REINFORCEMENT AND STATISTICAL LEARNING**(9 Hrs)**

Markov Decision Problem - Hidden Markov Model - Linear Classifier - decision Trees: Random forest - Bayesian Network – ANN - ANN Learning process - Types of Network – Perceptron - RBF Network - Case studies: Character recognition.

Text Books

1. Anand Hareendran S., Anand Hareendran, And Vinod Chandra S.S. "Artificial Intelligence and Machine Learning" PHI Publication, 2014.
2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Science, 1997.
3. Peter Harrington, "Machine Learning in action", Manning Publication, 2012.

Reference Books

1. Charu C. Aggarwal "Data Classification Algorithms and Applications", Chapman & Hall/CRC Data Mining and Knowledge Discovery Series.
2. Andreas C. Mueller and Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, Inc. First Edition, 2016.
3. Eremy Watt, Reza Borhani, and Aggelos K. Katsaggelos "Machine Learning Refined Foundations, Algorithms, and Applications", Cambridge University Press, 2016.
4. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

Web Resources

1. <https://www.coursera.org/learn/machine-learning>
2. https://ml-cheatsheet.readthedocs.io/en/latest/regression_algos.html
3. <https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms>

COs/POs/PSOs Mapping

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

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



U19ADO52	DATA SCIENCE APPLICATION OF VISION	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To understand the capability of a machine to get and analyze visual information and make decisions
- To learn methods and algorithms for Vision
- To learn how to use deep learning for Vision tasks
- To understand the neural network concepts
- To study the real world applications using computer vision

Course Outcomes

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

CO1 - Understand the methods and algorithms for image processing. **(K2)**

CO2 - Apply object detection and segmentation concepts for image processing. **(K4)**

CO3 - Apply scalable algorithms for large datasets in vision. **(K4)**

CO4 - Analyze deep learning and neural network architectures for image and video processing. **(K3)**

CO5 - Apply vision-based solutions for specific real-world applications. **(K4)**

UNIT I IMAGE FUNDAMENTALS**(9 Hrs)**

Pixels - The Building Blocks of Images - The Image Coordinate System - RGB and BGR Ordering - Scaling and Aspect Ratios. Image filters - Gaussian blur - Median filter - Dilation and erosion - Custom filters - Image thresholding - Edge detection - Sobel edge detector - Canny edge detector.

UNIT II OBJECT DETECTION AND SEGMENTATION**(9 Hrs)**

Image Features - Harris corner detection - Local Binary Patterns - Image stitching - Segmentation: Contour detection - The Watershed algorithm - Super pixels - Normalized graph cut.

UNIT III MACHINE LEARNING WITH COMPUTER VISION**(9 Hrs)**

Data pre-processing - Image translation through random cropping - Image rotation and scaling - Applications of machine learning for computer vision - Logistic regression - Support vector machines - K-means clustering.

UNIT IV IMAGE CLASSIFICATION USING NEURAL NETWORKS**(9 Hrs)**

Image Classification Basics Types of Learning - The Deep Learning Classification Pipeline - Introduction to Neural Networks - The Perceptron Algorithm - Backpropagation and Multi-layer Networks - The Four Ingredients in a Neural Network Recipe - Weight Initialization - Constant Initialization - Uniform and Normal Distributions - LeCun Uniform and Normal - Understanding Convolutions - CNN Building Blocks - Common Architectures and Training Patterns.

UNIT V COMPUTER VISION AS A SERVICE**(9 Hrs)**

Computer vision as a service – architecture - Developing a server-client model - Computer vision engine.

Text Books

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Cengage Learning, 2007.
3. Gary Bradski, "Learning OpenCV", First Edition, 2008.

Reference Books

1. Alok Kumar Singh Kushwaha, Rajeev Srivastava, "Recognition of Humans and Their Activities for Video Surveillance", IGI Global, 2014.
2. Ying-li Tian, Arun Hampapur, Lisa Brown, Rogerio Feris, Max Lu, Andrew Senior, "Event Detection, Query, and Retrieval for Video Surveillance", IGI Global, 2009.
3. Matthew Turk, Gang Hua, "Vision-based Interaction", First Edition, Morgan Claypool, 2013.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", MIT Press, 2017.
5. Fan Jiang, "Anomalous Event Detection from Surveillance Video", ProQuest, 2012.

Web Resources

1. <https://www.kaggle.com/learn/computer-vision>
2. <https://machinelearningmastery.com/what-is-computer-vision/>
3. <https://www.udemy.com/course/pythoncv/>
4. <https://www.analyticsvidhya.com/blog/2019/03/opencv-functions-computer-vision-python/>
5. https://www.youtube.com/watch?v=N81PCpADwKQ&ab_channel=ProgrammingKnowledge

COs/POs/PSOs Mapping

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

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

Open Elective Courses offered to other Department students

U19CSO54	PLATFORM TECHNOLOGY	L	T	P	C	Hrs
	(Common to EEE, ECE, ICE, MECH, CIVIL and BME)	3	0	0	3	45

Course Objectives

- To understand the fundamentals of developing modular application by using object oriented concepts.
- To utilize the C# and .NET framework to build distributed enterprise applications.
- To develop Console Application, Windows Application and Web Applications.
- To connect to multiple data sources and managing them effectively.
- To develop the Enterprise kind of applications

Course Outcomes

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

CO1 -Understand the concept of .NET Framework. **(K2)**

CO2 -Develop, implement and creating Applications with C#. **(K4)**

CO3 -Evaluate various graphics and window forms. **(K5)**

CO4 - Integrating front end applications with Database connectivity. **(K3)**

CO5- Classifying various Enterprise applications into real world problems. **(K3)**

UNIT I INTRODUCTION TO .NET FRAMEWORK (9 Hrs)

.NET Framework – Common Language Runtime (CLR) – Common Type System (CTS) – Common Language Specification (CLS) – Compilation Process – Assemblies – Namespaces – Command Line Compiler.

UNIT II C# FUNDAMENTALS (9 Hrs)

C# Class – Object – StringFormatting – Types – Scope – Constants – C# Iteration – Control Flow – Operators – Array – String – Enumerations – Structures- Custom Namespaces. Programming Constructs – Value Types and Reference Types – Object Oriented Concepts – Encapsulation – Inheritance – Polymorphism – Interfaces – Collections – Multithreading.

UNIT III GRAPHICS AND WINDOWS FORMS (9 Hrs)

Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run time – Graphics Programming GDI+.

UNIT IV DATABASE PROGRAMMING(9 Hrs)

Data Access with ADO.NET – Architecture – Data Reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML based Data Sets.

UNIT V J2EE (9 Hrs)

Enterprise Edition Overview – Multi-Tier Architecture – Best Practices – Comparison between J2EE and .NET.

Text Books

1. Herbert Schildt, "C# 3.0 The Complete Reference", McGraw-Hill Professional, 3rd Edition, 2008.
2. Keogh, "J2EE The Complete Reference", Tata McGraw-Hill, 2008.
3. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2002.

Reference Books

1. Joh Skeet, "C# in depth, Manning publications", 3rd Edition, 2014.
2. Adrew Stellman and Jennifer Greene, "Head First C#", 3rd Edition, O'Reilly, 2013.
3. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Sixth edition, A Press, 2012.
4. Michael Schmalz, "C# Database Basics", O'Reilly Media, January 2012.
5. Rod Johnson, "J2EE Design and Development", Wrox, 2002

Web Resources

1. <https://www.nptel.ac.in/>
2. <https://www.c-sharpcorner.com/csharp-tutorials>
3. <https://www.guru99.com/c-sharp-tutorial.html>

COs/POs/PSOs Mapping

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

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

U19CSO55	GRAPHICS DESIGNING	L	T	P	C	Hrs
(Common to EEE, ECE, ICE, MECH, CIVIL and BME)		3	0	0	3	45

Course Objectives

- To develop basic skills using graphics and theory used in design process.
- Create computer-based projects using Adobe Photoshop.
- Understand, develop and employ visual hierarchy using images and text
- Use a computer to create and manipulate images and layers for use in various print and digital mediums.
- To acquire the knowledge of Animation

Course Outcomes

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

CO1 – Develop the basic design elements of graphics. **(K3)**

CO2 – Apply the various photoshop tools. **(K3)**

CO3 – Modify the image size, selection and grids using tools. **(k3)**

CO4 – Create and Work with colored layers. **(K4)**

CO5 – Apply different methods for Animation & Panoramic Picture creation. **(K5)**

UNIT I BASIC CONCEPTS

(9 Hrs)

Basic Concepts of Designing – Design Principles – Basics of Design Elements – Typography – Color theory – Introduction to Graphics – Introduction to Photoshop – Bitmap and Vector Images - Understanding Image Size and Resolution.

UNIT II INTRODUCTION TO PHOTOSHOP

(9 Hrs)

Introduction to Tools – Environment – Layout of Photoshop – Design Layout Setup – Color – Resolution setting – Using Basic Marquee – Selection Tools Usage of Lasso Tools – Using Brushes – Using and Filling Colors – Layers Using Text Tool – Free Transform Tool – Exercise: Designing Greeting Card / Advertisement.

UNIT III IMAGE SIZE, SELECTION, GRID AND GUIDES

(9 Hrs)

Modifying Image Size – Resolution, Marquee – Lasso – Magic Wand – Selection Tools – Selecting – Saving – Crop tool – Copying Selection And Image - Grid and Guide Options – Masks – Channel – Painting and Editing – Working with Quick Masks – Painting (Brush, and its effects) – Blending Modes, Color Palettes – Editing – Background – Color – Touchup – Cleanup – Gradient Tools – Layer Blending Modes - All Types of Text Tools – Shape Tools Exercise : Designing Magazine Cover – Poster – Brochure

UNIT IV LAYERS

(9 Hrs)

The layer Palette - Changing and controlling layer order - Editing layers - Adjustment layers - Layer Effects Filters - Actions - Automation - Extract - Filter Gallery - Liquefy , Pattern making - Vanishing point - Built in Bitmap Filters - 3rd party Plug-ins - Using predefined Actions - Creating and Recording Actions - Using built in automation - Learning Filter effects - managing the files with layers and layer effects - plugins Manipulation tools - Image control options – HUE - Levels - brightness control Using image – modifying - changing color Exercise : Converting black and white photo to color - designing a photo album

UNIT V ANIMATION & PANORAMIC PICTURE CREATION

(9Hrs)

Creating Product Packaging Designs – CD Cover – Book and Magazine Front Cover – Envelope – Visiting card – Color Correction and Color Channel Management – Design Automation Theory and Practical's Samples and Demos – Guidelines for Freelance Work – Website Links – Resource Sharing – Preparing Image For Print and Web – Calculating Image Size and Resolution, Changing Image Dimensions – Layout Preview – Color Separation – Optimizing Images for Web – File Formats – Creating Webpages – Web Photo Galleries.

Text Books

1. Katherine A. Hughes, "Graphic Design", Learn It, Do It, CRC Press 2019.
2. Ken Pender, "Digital color in Graphics Design", CRC Press 2012.
3. Adobe Creative Team, "Adobe Photoshop – Classroom in a Book", Adobe system incorporation, Adobe Press, 2010.

Reference Books

1. Poppy Evans, Aaris Sherin, Irina Lee, "The Graphic Design", Rockport, 2013.
2. Peter Bauer, "Photoshop CC for Dummies", Wiley, 2013.
3. Mike Wooldridge, "Teach Yourself Visually Adobe Photoshop CS 5", Wiley Publishing, 2010.
4. Lesa Snider, "Photoshop the missing Manual", O'Reilly Media, Inc, 2010.
5. Scott Onstott, "Enhancing CAD Drawings with Photoshop", Wiley, 2006.

Web Resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/MIT6_831S11_lec18.pdf<http://www.moshplant.com/direct-or/bezier/>
2. <https://www.cs.montana.edu/courses/spring2004/352/lectures/CS351-GUIDesign.pdf>
3. <https://www.university.youth4work.com/study-material/graphic-design-lecture>
4. <https://kmayeunhia.wordpress.com/lecture-notes/>
5. <https://nptel.ac.in/courses/106/106/106106090/>

COs/POs/PSOs Mapping

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

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

SEMESTER VI



U19CST61	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To study the concepts and different problem solving techniques of AI.
- To understand the Knowledge representation and reasoning in the field of artificial intelligence dedicated to representing information about the world in a form that a computer system
- To adjust new inputs and perform human-like tasks.
- To make the student knowledgeable in the area planning, machine learning.
- To apply the AI Models.

Course Outcomes

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

CO1 – Understand and apply AI and Problem Solving with search techniques. **(K4)**

CO2 – Understand the logical thinking and knowledge representation. **(K4)**

CO3 – Evaluate various algorithms through Bayes rule. **(K4)**

CO4 – Understand Machine Learning and Deep learning. **(K3)**

CO5 – Explore Real-World problems where artificial intelligence technology can be applied. **(K4)**

UNIT I INTRODUCTION TO AI AND PROBLEM SOLVING

(12Hrs)

Introduction – Foundations of Artificial Intelligence – History of Artificial Intelligence – AI Agents and its Structure – Problem Solving by Searching – Uninformed Search Strategies – Breadth first search – Depth-First Search – Depth-Limited Search – Iterative Deepening Depth-First Search – Bidirectional Search, Informed (Heuristic) Search Strategies – Greedy Best-First Search – A* Search – Memory-Bounded Heuristic Search.

UNIT II REPRESENTATION OF KNOWLEDGE, REASONING AND PLANNING

(12 Hrs)

Basic Concepts of Fuzzy Set Theory – Operations of Fuzzy Sets – Properties of Fuzzy Sets – Crisp Relations – Fuzzy Relational Equations – Operations on Fuzzy Relations – Fuzzy Systems – Logical Agents, Predicate Logic – First-Order Logic, Inference in First-Order Logic, Forward and Backward Chaining – Knowledge Representation, Classical Planning, Knowledge Representation.

UNIT III KNOWLEDGE INFERENCE (12 Hrs)

Basic Probability Notations – Bayes Rule and its Applications – Bayesian Networks – Hidden Markov Models – Kalman Filters, Dempster-Shafer Theory.

UNIT IV MACHINE LEARNING

(12 Hrs)

Introduction to Machine Learning – Overview of Different Forms of Learning – Supervised Machine Learning – Basic Models: Learning Decision Trees, Regression and Classification – Neural Networks and Deep Learning – Composite Models: Random Forests, Ensemble Learning.

UNIT V APPLICATIONS (12 Hrs)

Applications of AI – Language Models – Information Extraction – Natural Language Processing: Machine Translation, Database Access, Information Retrieval, Text Categorization, Extracting Data from Text. Speech Recognition – Robotics: Hardware – Perception – Planning – Moving.

Text Books

1. Bratko, I., Prolog Programming for Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
2. Stuart Russel, Peter Norvig “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education 2009.
3. Rajasekaran. S., Vijayalakshmi Pai. G.A. “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall of India Private Limited, 2003.

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009.
2. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
4. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc; 1 edition, 2008
5. Kevin Knight, Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill, 2008.

Web Resources

1. <https://nptel.ac.in/courses/106/105/106105077/>
2. <https://www.reddit.com/r/artificial/>
3. <https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/>
4. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm
5. <https://www.javatpoint.com/expert-systems-in-artificial-intelligence>

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

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

U19CST62	C# AND .NET PROGRAMMING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study and learn the MS.NET framework developed by Microsoft.
- To learn the fundamental concepts using C#.
- To understand the Programming Constructs using C#.
- To develop the Graphical User Interface using C#.
- To explore the Database Connectivity using ADO.NET.

Course Outcomes

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

CO1 – Learn about MS.NET framework developed by Microsoft. **(K1)**

CO2 – Learn the fundamental concepts using C#. **(K3)**

CO3 – Understand the Programming Constructs using C#. **(K4)**

CO4 – Develop the Graphical User Interface using C#. **(K2)**

CO5 – Explore the Database Connectivity using ADO.NET. **(K4)**

UNIT I INTRODUCTION**(9 Hrs)**

Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assemblies – Namespaces – Command line compiler.

UNIT II C# FUNDAMENTALS**(9 Hrs)**

C# Class – Object – String Formatting – Types – Scope – Constants – C# Iteration – Control Flow – Operators – Array – String – Enumerations – Structures – Custom Namespaces.

UNIT III PROGRAMMING CONSTRUCTS USING C#**(9 Hrs)**

Programming Constructs – Value Types and Reference Types – Object Oriented Concepts – Encapsulation – Inheritance – Polymorphism – Interfaces – Collections – Multithreading.

UNIT IV GRAPHICS & WINDOW FORMS IN C#**(9 Hrs)**

Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run Time – Graphics Programming GDI+.

UNIT V DATABASE PROGRAMMING WITH C#**(9 Hrs)**

Data Access with ADO.NET – Architecture – Data reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML Based Data Sets.

Text Books

1. Keogh, "J2EE The Complete Reference", Tata McGraw-Hill, 2015.
2. Herbert Schildt, "C# 3.0 The Complete Reference", McGraw-Hill Professional, Third Edition, 2009.
3. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2002.

Reference Books

1. Gabriel Baptista and Francesco Abbruzzese, "Hands-On Software Architecture with C# 8 and .NET Core 3: Architecting software solutions using microservices, DevOps, and design patterns for Azure Cloud", Packt Publications, 2019
2. Mark J. Price, "C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development", Packt Publications, 2019.
3. Joh Skeet, "C# in depth", Manning publications, Third Edition, 2014.
4. Adrew Stellman and Jennifer Greene, "Head First C#", Third Edition, O'Reilly, 2013.
5. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Sixth edition, A Press, 2012.

Web Resources

1. <https://www.c-sharpcorner.com/csharp-tutorials>
2. <https://www.guru99.com/c-sharp-tutorial.html>
3. <https://www.w3schools.com/cs/>
4. <https://www.javatpoint.com/c-sharp-tutorial>
5. <https://nptel.ac.in/courses/106/105/106105084/>

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

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

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To understand the cloud virtualization concepts and vm ware.
- To understand the Big Data Platform and its Use cases
- To provide an overview of Apache Hadoop, Provide HDFS Concepts and Interfacing with HDFS

Course Outcomes

After completion of the course, the students should be able to:

- CO1** – Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. **(K3)**
- CO2** – Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple data centers to build and deploy cloud applications that are resilient, elastic and cost-efficient. **(K2)**
- CO3** – Illustrate the fundamental concepts of cloud virtualization. **(K4)**
- CO4** – Identify Big Data and its Business Implications. **(K2)**
- CO5** – List the components of Hadoop and Hadoop Eco-System, Access and Process Data on Distributed File System. **(K3)**

UNIT I INTRODUCTION(9 Hrs)

Introduction to Cloud Computing – The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization – Web Services Delivered from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service. Federation in the Cloud - Presence in the Cloud – Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud – Common Standards in the Cloud – End-User Access to the Cloud Computing.

UNIT II CLOUD INFRASTRUCTURE(9 Hrs)

Introduction – Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities – Standards and Working Groups – Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management – Utility Computing Technology.

UNIT III CLOUD VIRTUALIZATION(9 Hrs)

Virtualization – Hyper Threading – Blade Servers – Automated Provisioning – Policy Based Automation – Application Management – Evaluating Utility Management Technology – Virtual Test and Development Environment - Data Center Challenges and Solutions - Automating the Data Center – Basics of VMWare, Advantages of VMware Virtualization, Using VMware Workstation, Creating Virtual Machines – understanding Virtual Machines.

UNIT IV INTRODUCTION TO BIG DATA AND HADOOP**(9 Hrs)**

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix Tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Info Sphere Big Insights and Big Sheets.

UNIT V HDFS(HADOOP DISTRIBUTED FILE SYSTEM) & MAP REDUCE**(9 Hrs)**

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop File System Interfaces, Data Flow, Data Ingest with Flume and Scoop and Hadoop Archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data Structures. Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Text Books

1. Ritting house, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

Reference Books

1. Garry Turkington, "Hadoop Beginner's Guide", 1st Edition, Packt Publishing Limited, 2013.
2. Pete Warden, "Big Data Glossary", O'Reily, 2011.
3. John W. Rittinghouse and James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
4. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
5. Bunker and Darren Thomson, "Delivering Utility Computing", 2006, John Wiley & Sons Ltd.

Web Resources

1. [www.coltdatacentres.net/Cloud Technology](http://www.coltdatacentres.net/Cloud%20Technology).
2. <https://www.zdnet.com/article/what-is-cloud-computing-everything-you-need-to-know-about-the-cloud/>
3. www.digitalocean.com/community/tutorials/an-introduction-to-big-data-concepts-and-terminology
4. https://www.tutorialspoint.com/hadoop/hadoop_introduction
5. <https://www.oracle.com/in/big-data/what-is-big-data.html>

COs/POs/PSOs Mapping

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

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

U19CST64	ANIMATION AND VISUAL EFFECTS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Evaluate teaching and learning processes using assistive technology for students with disabilities.
- Describe and demonstrate how people with disabilities can benefit from working on multidisciplinary team.
- Describe and demonstrate the use of technology devices for people with disabilities.
- Identify and evaluate technologies that maximize the potential of people with disabilities.
- Describe and demonstrate the use of assistive technology performance areas that facilitate inclusion in academic learning and work settings.

Course Outcomes

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

CO1 – Develop technology-enabled assessment and evaluation strategies. **(K3)**

CO2 – Demonstrate knowledge, attitudes and skills of assessment professionals working on multidisciplinary team. **(K4)**

CO3 – Facilitate instruction in the new technology devices that emerge within digital / interactive learning environments. **(K4)**

CO4 – Implement curriculum methods and strategies that use technology activities to maximize student learning. **(K3)**

CO5 – Identify and apply emerging technologies in learning and working environments. **(K4)**

UNIT I VFX & ANIMATION(9 Hrs)

VFX– Understanding VFX – Brief History of VFX - Need for Visual Effects–Future of Visual Effects–Pros & Cons of Visual Effects – Applications of VFX – Comparison between VFX and Animation. **Animation**– History of Animation – Applications of Animation – Career in Animation – Pros & Cons of Animation

UNIT II LEARNING AFTER EFFECTS**(9 Hrs)**

Usage of Platform – Tools used – Plugins & Types – Imports & Exports – Masking– Object Duplication – Motion Tracking – Rotoscoping – Color Play – Visual Effects – Render Tab & Advance Option – Exploring to Media Encoder

UNIT III LEARNING PREMIERE PRO**(9 Hrs)**

Usage of Platform– Difference between After Effects & Premiere Pro – Effects & Presets Tab – Audio Splitting & its work – LUTs & its Application – Working with Creative Curve – Render Tab & Advance Options.

UNIT IV INTRODUCTION TO BLENDER & TOOLS**(9 Hrs)**

Basics of Blender – Understanding Blender Interface & Tools – The Blender Scene - Project overview & Character Design – Using Other Design Methods

UNIT V BLENDER WORKS**(9 Hrs)**

Modeling & its Tools in Blender –Character Modelling –Unwrapping, Painting & Shaders – Character Rigging & Animation – The Render Page – Lighting & Composition

Text Books

1. Eran Dinur, "The Filmmaker's Guide to Visual Effects", 2nd Edition, Routledge, 2017
2. Patmore, "Complete Animation Course", 1st Edition, Barron's Educational Series, 2013
3. Andy Wyatt, "The Complete Digital Animation Course: Principles, Practices, and Techniques: a Practical Guide for Aspiring Animators", 1st Edition, B E S Pub Co, 2010

Reference Books

1. Peter Lord, "Cracking Animation: The Aardman Book of 3-D Animation", 1st Edition, Thames, 2015.
2. David Landau, "Lighting for Cinematography: A Practical Guide to the Art and Craft of Lighting for the Moving Image", 1st Edition, Continuum Publishing Corporation, 2014.
3. Ron Ganbar, "Nuke 101: Professional Compositing and Visual Effects (Digital Video & Audio Editing Courses)", 2nd Edition, Peachpit Press, 2014.
4. Richard Williams, "The Animator's Survival Kit", 2nd Edition, Faber, 2009.
5. Ron Brinkmann, "The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", 2nd Edition, Morgan Kaufmann, 2008.

Web Resources

1. <https://www.bloppanimation.com/animation-for-beginners/>
2. <https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/>
3. <https://www.premiumbeat.com/blog/text-effect-premiere-pro/>
4. <https://conceptartempire.com/blender-animation-tutorials/>
5. <https://www.visualeffectssociety.com/>

COs/POs/PSOs Mapping

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

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



U19CSP61	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course objectives

- To perform such intellectual tasks as decision making and planning.
- To implement searching algorithms
- To understand knowledge of reasoning and planning.
- To understand Bays Rule.
- To understand and apply various Machine Learning algorithms.

Course outcomes

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

CO1– Analyze a problem and identify and define the computing requirements appropriate to its solution. **(K4)**

CO2– Apply various AI search algorithms. **(K3)**

CO3– Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information. **(K3)**

CO4– Implement Bayesian classifier. **(K3)**

CO5– Apply Machine Learning algorithms. **(K3)**

List of Exercises

1. Graph coloring problem.
2. Blocks world problem.
3. Water Jug Problem using DFS, BFS.
4. Heuristic algorithms (A * Algorithm, best first search).
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
7. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Reference Books

1. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, Edition 2017.
2. Bratko, I., "Prolog Programming for Artificial Intelligence (International Computer Science Series)", Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
3. Stuart Russell, Peter Norvig "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education 2009.

Web Resources

1. <https://www.nptel.ac.in/>
2. <https://www.reddit.com/r/artificial/>

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	2	2	-	2	-	2	2	2	2	2	3
5	3	3	3	3	3	3	-	3	-	3	3	3	3	3	3

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

U19CSP62	C# AND .NET PROGRAMMING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the development .NET Programming.
- To study the objectoriented concepts through application development.
- To develop applications and establish connection with database.

Course Outcomes

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

CO1 – Explorein the Object Orientation using C#.Net. **(K5)**

CO2 – Understandthe Exception Handling, Operator Overloading and Multi-Threading in C# .Net.**(K2)**

CO3 – Developan application using C# with ADO.Net **(K4)**

List of Exercises

1. Develop an application to implement Inheritance concepts
2. Develop a console application that implements Classes and Objects concepts
3. Implement Polymorphism concepts with window form applications
4. Develop a window form application to implement an Interfaces
5. Implement an Operator Overloading concepts
6. Develop an application to brief about Delegates and Events
7. Write an application that elaborate any one of Exception Handling
8. Implement a concepts of Multi-Threading with starting of multiple threads
9. Develop an interactive application to connect database through ADO.NET
10. Develop an application to implement multiple tools for design graphical interfaces

Reference Books

1. Gabriel Baptista and Francesco Abbruzzese, “Hands-On Software Architecture with C# 8 and .NET Core 3: Architecting software solutions using microservices, DevOps, and design patterns for Azure Cloud”, Packt Publications, 2019.
2. Mark J. Price, “C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development”, Packt Publications, 2019.
3. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill, 2015.
4. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition, 2009.
5. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley, 2002.

Web Resources

1. <https://www.c-sharpcorner.com/csharp-tutorials>
2. <https://www.guru99.com/c-sharp-tutorial.html>
3. <https://www.guru99.com/c-sharp-tutorial.html>
4. <https://www.w3schools.com/cs/>
5. <https://www.javatpoint.com/c-sharp-tutorial>

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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2	2	2	2	3	2	1	1	-	-	1	1	1	2	2	2
3	3	2	3	2	2	2	1	-	-	2	1	2	3	3	3

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

U19CSP63**ANIMATION AND VISUAL EFFECTS LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To learn the effect of Animation.
- To understand Key frames of animation.
- To learn the Motion effects in video editing.
- To understand Bevel Tool, Knife Tool & Shading Concepts.
- To create 3D Environment.

Course Outcomes

After completion of the course, students will be able to

CO1 – Understand Layers, Panels, Frames, etc. **(K3)**

CO2 – Implement motion effects in video clips **(K4)**

CO3 – Implement new methods in animations **(K4)**

CO4 – Understand Bevel Tool, Knife Tool & Shading Concepts. **(K4)**

CO5 – Create 3D Environment. **(K5)**

List of Exercises**AFTEREFFECTS**

1. Understanding AFTEREFFECTS
 - a. What is AE?
 - b. Interface Introduction
 - c. Layers, Timeline Panels, Compositions, Links Panel
 - d. Animation Principles
 - e. Key frames
2. Simple Video Editing & Animation
3. Easing & Time Stretching & Imports\Exports\Footage Replacements
4. Presets & Masking & Text Animation
5. Working with Media Encoder
6. Vfx & Rendering

PREMIEREPRO

1. Basic start
 - a. Timeline & New Sequence
 - b. Selection & Track Selection tools
 - c. Rolling & Ripple Edit
 - d. Make Slow Motion
 - e. Split\Cut video clip
 - f. Transitions
2. Motion Effects control & Animation layers\ Chroma keys
3. Masking and Duplication \ Effects & Adjustments Layer
4. Colour Splash\ Imports & Exports

ANIMATION BLENDER

1. Introduction & fundamentals
2. Viewport Navigation & Transform & Add\Del
3. Modeling Instructions & Creating Meshes
4. Extrude & Loop cut
5. Bevel Tool & Knife Tool & Shading
6. Shading Editor & Texture
7. Rigging & parenting
8. Creating Landscapes & Environments
9. Rain effects & Abstract creation
10. 3D Environment

Reference Books

1. Peter Lord, "Cracking Animation: The Aardman Book of 3-D Animation", 1st Edition, Thames, 2015.
2. David Landau, "Lighting for Cinematography: A Practical Guide to the Art and Craft of Lighting for the Moving Image", 1st Edition, Continuum Publishing Corporation, 2014.
3. Ron Ganbar, "Nuke 101: Professional Compositing and Visual Effects (Digital Video & Audio Editing Courses)", 2nd Edition, Peachpit Press, 2014.
4. Richard Williams, "The Animator's Survival Kit", 2nd Edition, Faber, 2009.
5. Ron Brinkmann, "The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", 2nd Edition, Morgan Kaufmann, 2008.

Web Resources

1. <https://www.pdfdrive.com/3d-art-essentials-the-fundamentals-of-3d-modeling-texturing-and-animation-e157006123.html>
2. <https://www.pdfdrive.com/aim-awards-suite-of-games-animation-and-vfx-skills-qualifications-e50802091.html>
3. <https://www.blopanimation.com/animation-for-beginners/>
4. <https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/>
5. <https://www.premiumbeat.com/blog/text-effect-premiere-pro/>

COs/POs/PSOs Mapping

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

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

U19CSC6X	CERTIFICATION COURSE – IV	L	T	P	C	Hrs
		0	0	4	-	50

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

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



U19CSS61	SKILL DEVELOPMENT COURSE 7 (Foreign Language / IELTS – II/Career and Professional Skill development Program -II)	L	T	P	C	Hrs
		0	0	2	-	30

1. LOGICAL REASONING:

- Syllogism
- Coding Inequalities
- Coding & Decoding
- Blood Relationship
- Direction Sense
- Number Series
- Odd Man Out
- Ranking Test
- Logical Analogy

2. ANALYTICAL REASONING & CRITICAL REASONING:

- Analytical Thinking
- Seating Arrangement
- Selection Decision Table – Eligibility Test
- Numerical Puzzles
- Data Sufficiency
- Critical Reasoning

3. NON VERBAL REASONING:

- Cubes & Dices
- Sequence Oriented, Analogy Oriented, Coding Oriented
- Figure & Factual Analysis
- Water & Mirror Image
- Paper Cutting Problems

4. FUNCTIONAL GRAMMAR:

- Naming &Substituting Words - (Noun &Pronoun)
- Qualifying Words - (Adverb)
- Describing Words - (Adjectives)
- Action Words - (Verb)
- Positioning Words - (Preposition)
- Connecting / Linking Words - (Conjunction)
- Articles
- Tenses



U19CSS62	SKILL DEVELOPMENT COURSE 8 (Technical Seminar)	L	T	P	C	Hrs
		0	0	2	-	30

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

Course Outcomes

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

CO1 - Review, prepare and present technological developments.

CO2 - Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 20 minutes.
- In a session of three periods per week, 8 to 10 students are expected to present the seminar.
- Each student is expected to present atleast twice during the semester and the student is evaluated based on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.



U19CSS63	SKILL DEVELOPMENT COURSE 9 (NPTEL / MOOC - I)	L	T	P	C	Hrs
		0	0	0	-	-

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

U19CSM61	PROFESSIONAL ETHICS	L	T	P	C	Hrs
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B.Tech Computer Science and Engineering



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Course Objectives

- To enable the students to create an awareness on Engineering Ethics and Human Values,
- To instill Moral and Social Values and Loyalty and to appreciate the rights of others.
- To develop a firm ethical base.
- To make the students to realize the significance of ethics in professional environment.
- To acquaint students with latest intellectual property rights

Course Outcomes

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

CO1-Apply ethics in society. **(K3)**

CO2- Discuss the ethical issues related to engineering. **(K2)**

CO3- Act as a responsible Experimenter and to follow the codes of Ethics. **(K3)**

CO4- Realize the responsibilities and rights in the society. **(K2)**

CO5- Familiarize with the Multinational Corporations and its Social Responsibility. **(K3)**

UNIT I HUMAN VALUES

(6 Hrs)

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self- confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS

(6 Hrs)

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

(6 Hrs)

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS SAFETY

(6 Hrs)

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

UNIT V GLOBAL ISSUES

(6 Hrs)

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

Reference Books

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

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PROFESSIONALELEC TIVES



U19CSE61	AUGMENTED REALITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Understanding the System Architecture of Augmented Reality
- Learn the Hardware for Augmented Reality
- Learn the Software for Augmented Reality
- Understanding the Augmented Reality and Mixed Reality
- Understanding the AR Digital Entertainment

Course Outcomes

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

CO1 – Apply geometric concepts to understand Augmented Reality **(K3)**

CO2 – Utilize hardware components for Augmented Reality **(K4)**

CO3 – Make use of software components for Augmented Reality **(K3)**

CO4 – Apply AR with the Virtual Reality to provide Mixed Reality **(K4)**

CO5 – Apply AR in Digital Entertainment **(K4)**

UNIT I INTRODUCTION OF AUGMENTED REALITY (AR)**(9 Hrs)**

System Structure of Augmented Reality – Key Technology in AR – General Solution for Calculating Geometric – Illumination Consistency in the Augmented Environment.

UNIT II 3D USER INTERFACE INPUT HARDWARE**(9 Hrs)**

Input Device Characteristics – Desktop Input Devices – Tracking Devices – 3D Mice - Special Purpose Input Devices – Direct Human Input – Home-Brewed Input Devices - Choosing Input Devices for 3D Interfaces.

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

Database-World Space, World Coordinate, World Environment, Objects-Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and Other Attributes, VR Environment-VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction-Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits.

UNIT IV AUGMENTED AND MIXED REALITY**(9 Hrs)**

Taxonomy, Technology and Features of Augmented Reality, Difference between AR and VR, Challenges with AR, AR Systems and Functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Wireless Displays in Educational Augmented Reality Applications, Mobile Projection Interfaces, Marker-less Tracking for Augmented Reality, Enhancing Interactivity in AR Environments, Evaluating AR Systems.

UNIT V DEVELOPMENT TOOLS AND FRAMEWORKS IN AR**(9 Hrs)**

Frameworks of Software Development Tools in AR. X3D Standard; Vega, MultiGen, Virtools etc. Applications of AR in Digital Entertainment: AR Technology in Film & TV Production. AR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by AR.

Text Books

1. Peddie, Jon, "Augmented Reality Where We Will All Live", 1st Edition, 2017.
2. Dieter Schmalstieg and Tobias Hollerer, "Augmented Reality: Principles and Practice (Usability)", Addison-Wesley Educational Publishers, 1st Edition, 2016.
3. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann publishers, 2009.

Reference Books

1. Doug A Bowman, Ernest Kijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces: Theory and Practice, Addison Wesley, 2nd Edition, 2017.
2. Borko Furht, "Handbook of Augmented Reality", Springer, 2011.
3. Michael Haller, "Emerging Technologies of Augmented Reality: Interfaces and Design", Idea Group Publishing, 2007.
4. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, Springer, 2005.

Web Resources

1. <https://www.8thwall.com/>
2. <https://developers.google.com/web/updates/2018/06/ar-for-the-web>
3. <https://www.sitepen.com/blog/augmented-reality-on-the-web-in-2019/>
4. <https://hacks.mozilla.org/2019/01/augmented-reality-and-the-browser%E2%80%8A-%E2%80%8Aan-app-experiment/>

COs/POs/PSOs Mapping

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

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



U19CSE62	SERVICE ORIENTED ARCHITECTURE	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand Software Architecture and various Patterns used to construct.
- To understand the analysis and design of service oriented architecture business models.
- To understand SOA Governance and best practices.
- To understand XML and security framework involved in SOA.
- To understand Transaction Management in SOA.

Course Outcomes

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

CO1 - Identify type of architecture and its patterns. **(K1)**

CO2 - Identify Service oriented Analysis and Design activity. **(K1)**

CO3 - Identify the Governance strategy adopted and development of architecture. **(K1)**

CO4 - Know about Meta data management, security and issues **(K2)**

CO5 - Know about the Transaction Management using SOA **(K2)**

UNIT I ARCHITECTURE AND PATTERNS

(9 Hrs)

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – Patterns for SOA – Architectural Patterns – The Unified Process: Use Case Driven, Architecture Centric, Iterative, and Incremental – SOA Programming Models.

UNIT II SOA ANALYSIS AND DESIGN

(9 Hrs)

Service-oriented Analysis and Design – Design of Activity, Data, Client and Business Process Services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service Integration with ESB – Scenario – Business case for SOA – Stakeholder Objectives – Benefits of SPA – Cost Savings.

UNIT III SOA GOVERNANCE

(9 Hrs)

SOA Implementation and Governance – Strategy – SOA Development – SOA Governance – Trends in SOA – Event-Driven Architecture – Software as a Service – SOA Technologies – Proof-of-Concept – Process Orchestration – SOA Best Practices

UNIT IV SOA AND XML

(9 Hrs)

Meta Data Management – XML Security – XML Signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in Web Service Framework – Advanced Messaging.

UNIT V SOA TRANSACTION MANAGEMENT

(9 Hrs)

Transaction Processing – Paradigm – Protocols and Coordination – Transaction Specifications – SOA in Mobile – Research Issues.

Text Books

1. Shankar Kambhampaty, "Service –Oriented Architecture & Micro Services Architecture: For Enterprise, Cloud, Big Data and Mobile", Wiley India Pvt Ltd, 2018.
2. Frank Buschmann, "Pattern Oriented Software Architecture: A pattern language for distributed Computing", Wiley, 2017.
3. Mark O' Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2009.

Reference Books

1. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service-oriented Frameworks", Business Science Reference, 2014.
2. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2012.
3. Eric Newcomer and Greg Lomow, "Understanding SOA with Web Services", Pearson Education. 2006.
4. Eric Newcomer and Greg Lomow, "Understanding SOA with Web Services", Pearson Education. 2006.
5. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Pearson Publication, 2004.

Web Resources

1. <https://www.tutorialspoint.com/soa/index.htm>
2. <https://www.javatpoint.com/service-oriented-architecture>
3. <https://tekslate.com/oracle-soa-11g>
4. <https://www.ibm.com/developerworks/webservices/tutorials/ws-soa-ibmcertified/ws-soa-ibmcertified.html>
5. <https://tutorialseye.com/soa>

COs/POs/PSOs Mapping

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

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



U19CSE63**AGILE DEVELOPMENT**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To familiarize the concepts of Software Engineering.
- To understand Software Design concepts.
- To learn about Software testing.
- To understand the Software testing techniques.
- To understand the levels of testing.

Course Outcomes

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

CO1– Perform Software engineering processes(**K2**)

CO2–Make use of software design(**K2**)

CO3– Apply different software testing strategies(**K3**)

CO4–Illustratedifferent testing techniques.(**K3**)

CO5–Make use of different levels of testing in their software.(**K3**)

UNIT I AGILE METHODOLOGY(9 Hrs)

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT II AGILE PROCESSES(9 Hrs)

Lean Production – SCRUM, Crystal, Feature Driven Development – AdaptiveSoftware Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT (9 Hrs)

Agile Information Systems – Agile Decision Making – Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING (9 Hrs)

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE**(9 Hrs)**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

Text Books

1. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth Heinemann, 2007.
3. Craig Larman, "Agile and Iterative Development: A Managers Guide", Addison-Wesley, 2004.
4. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.

Reference Books

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley, 2008
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley, 2006
3. Mike Cohn, "User Stories Applied: For Agile Software", Addison Wesley, 2004.
4. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall, 2002
5. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", Pearson, 2001

Web Resources

1. <https://www.tvagile.com/category/scrum/>
2. <https://www.wiziq.com/tutorials/agile>

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

U19CSE64 EMBEDDED SYSTEMS**L T P CHrs**
3 00345**Course Objectives**

- To learn the architecture and process of embedded systems.
- To be familiar with the embedded computing platform design and analysis.
- To be exposed to the basic concepts and design models.
- To learn and understand the basic concepts of RTOS.
- To acquire the knowledge of design techniques and networks for embedded systems.

Course Outcomes

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

CO1 – Explain the basic architecture and programming of ARM Processors. **(K1)**

CO2 – Outline the concepts of embedded systems. **(K2)**

CO3 – Explain the various concepts of real time operating system design and system design techniques. **(K2)**

CO4 – Differentiate between the general purpose operating systems and the real time operating Systems. **(K3)**

CO5 – Explore the model real-time applications using embedded system concepts. **(K3)**

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS**(9 Hrs)**

Characteristics – Challenges of Embedded Systems – Design Process – Choice of Microcontroller – Building an Embedded Systems.

UNIT II EMBEDDED COMPUTING**(9 Hrs)**

The CPU Bus – Memory Devices and Systems – Designing with Computing Platforms – Consumer Electronics Architecture.

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

Platform-level Performance Analysis – Components for Embedded Programs – Models of Programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis – Software Performance Optimization – Program Level Energy and Power Analysis and Optimization – Analysis and Optimization of Program Size – Program Validation and Testing.

UNIT IV PROCESSES AND OPERATING SYSTEMS**(9 Hrs)**

Introduction – Multiple tasks and Multiple Processes – Multirate Systems – Preemptive real-time Operating Systems – Priority based Scheduling – Interprocess Communication Mechanisms – Evaluating Operating System Performance – Power Optimization Strategies for Processes – Example Real Time Operating Systems – POSIX – Windows CE.

UNIT V SYSTEM DESIGN TECHNIQUES AND NETWORKS**(9 Hrs)**

Design Methodologies – Design Flows – Requirement Analysis – Specifications – System Analysis and Architecture Design – Quality Assurance Techniques – Distributed Embedded Systems – MPSoCs and Shared Memory Multiprocessors.

Text Books

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Fourth Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2016.
2. Jonathan Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
3. Raj kamal, "Embedded Systems – Architecture, Programming and Design", Third Edition, McGraw Hill Education, 2017.

Reference Books

1. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2. Raymond J.A. Buhr, Donald L. Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1999.
3. Tammy Noergaard, "Embedded Systems Architecture", Second Edition, Newness Publications, 2010.
4. Elecia White, "Making Embedded Systems", Third Edition, O'REILLY, 2011.
5. K.V. Shibu, "Introduction to Embedded systems", Second Edition, Mc Graw Hill Publications, 2017.

Web Resources

1. <https://www.embedded.com>
2. <https://www.arm.com>
3. <https://www.edx.org/course/embedded-systems-shape-the-world-microcontroller-i>
4. <https://nptel.ac.in/courses/108/102/108102045/>
5. <https://www.codrey.com/embedded-systems/embedded-systems-introduction/>

COs/POs/PSOs Mapping

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



U19CSE65	ASSISTIVE TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Evaluate teaching and learning processes using assistive technology for students with disabilities.
- Describe and demonstrate how people with disabilities can benefit from working on multidisciplinary team.
- Describe and demonstrate the use of technology devices for people with disabilities.
- Identify and evaluate technologies that maximize the potential of people with disabilities.
- Describe and demonstrate the use of assistive technology performance areas that facilitate inclusion in academic learning and work settings.

Course Outcomes

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

CO1 –Develop technology-enabled assessment and evaluation strategies(K1)

CO2 –Demonstrate knowledge, attitudes and skills of assessment professionals working on Multidisciplinary team(K2)

CO3– Facilitate instruction in the new technology devices that emerge within digital / interactive learning environments.(K2)

CO4 – Implement curriculum methods and strategies that use technology activities to maximize student learning.(K3)

CO5 – Identify and apply emerging technologies in learning and working environments.(K3)

UNIT I ASSISTIVE TECHNOLOGY ASSESSMENT PROCESS MODEL (9 Hrs)

Introduction to Assistive Technology – Assessing Individual Functionality and Disability – Measuring Individual Functioning – Measuring the Assistive Technology MATCH – Assessment of the Environments of AT use: Accessibility, Universal Design and Sustainability – Measuring the impact of Assistive Technology on Family caregivers

UNIT II ASSISTIVE TECHNOLOGY DEVICES (9 Hrs)

The Systemic User Experience Assessment – Gesture, Signing and Tracking – Using Brain Computer Interfaces for Motor Rehabilitation – Graphic User Interface for communication – New Horizon of Robotic Assistance for Human Gait – Technology Developments in Music Therapy.

UNIT III ASSISTIVE TECHNOLOGY ACTIVITIES (9 Hrs)

Seating Systems as Extrinsic Enablers – Human/Assistive Technology Interface – Sensory Aids for Persons with Visual Impairment - Sensory Aids for Persons with Auditory Impairment.

UNIT IV PERFORMANCE AREAS AND APPLICATIONS (9 Hrs)

Assistive Technologies for Cognitive Augmentation – Technology that Enable Mobility – Technologies that aid Manipulation and Control of the Environment – Assistive Technologies in the Context of the Classroom - Assistive Technologies in the Context of the Work.

UNIT V APPLICATIONS OF ASSISTIVE TECHNOLOGY (9 Hrs)

Assistive Technology to Support Writing - Assistive Technology to Support Reading – Enhanced Communication - Computer Access - Computers and Math

Text Books

1. Cook and Hussey's, Assistive Technologies- E-Book: Principles and Practice, 3rd edition, Mosby 2007.
2. Pedro Encarnação Cook, Robotic Assistive technologies Principles and practices, CRC Press, 2017.
3. Stefano Federica, Marcia Scherer, Assistive Technology Assessment Handbook, 2nd edition, CRC Press, 2017.

Reference Books

1. Diane P. Bryant, Brian R. Bryant, Assistive Technology for People with Disabilities, 1 edition, Pearson, 2002.
2. Desleigh De Jonge, Marcia Joslyn Scherer, Sylvia Rodger, Assistive Technology in the Workplace, Mosby Elsevier, 2007.
3. Suzanne Robitaille, The Illustrated Guide to Assistive Technology & Devices, Demos Medical Publishing, 1st edition, 2009.
4. Albert, Janice Miller Polgar, "Assistive Technologies: Principles and Practice" – 30 January 2015.
5. Joan Green, Assistive Technology in Special Education, Sourcebooks, 2018.

Web Resources

1. https://www.researchgate.net/publication/321683103_Assistive_Technology_Assessment_Handbook
2. <https://www.atia.org/wp-content/uploads/2015/10/ATOBV1N1.pdf>.
3. <https://www.understood.org/en/school-learning/assistive-technology/assistive-technologies-basics/assistive-technology-what-it-is-and-how-it-works>
4. <https://webdesign.tutsplus.com/tutorials/introduction-to-assistive-technology--cms-26619>.
5. <https://www.atia.org/home/at-resources/what-is-at/>

COs/POs/PSOs Mapping

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

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



OPEN ELECTIVES



U19HSO61	PRODUCT DEVELOPMENT AND DESIGN (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	L	T	P	C	Hrs
		3	1	0	3	45

Course Objectives

- To provide the basic concepts of product design, product features and its architecture.
- To have a basic knowledge in the common features a product has and how to incorporate them suitably in product.
- To enhance team working skills.
- To design some products for the given set of applications.
- To compete with a set of tools and methods for product design and development.

Course Outcomes

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

CO1 -Apply the concept for new product development. **(K3)**

CO2 -Validate knowledge on the concepts of product specification. **(K5)**

CO3 - Describe the principles of industrial design and prototyping. **(K2)**

CO4 - Apply knowledge on product architecture. **(K3)**

CO5 - Review the concept of product development and customer needs. **(K5)**

UNIT I: INTRODUCTION TO PRODUCT DEVELOPMENT (9 Hrs)

Product development versus design, product development process, product cost analysis, cost models, reverse engineering and redesign product development process, new product development, tear down method.

UNIT II: PRODUCT SPECIFICATIONS**(9 Hrs)**

Establishing the product specifications– Target specifications – Refining specifications, concept generation- Clarify the problem – Search internally – Search externally – Explore systematically - Reflect on the Results and the Process.

UNIT III: PRODUCT CONCEPTS**(9 Hrs)**

A: Concept generation, product configuration, concept evaluation and selection, product embodiments.

B: Quality function deployment, product design specification, physical prototypes-types and technique, dimensional analysis, design of experiments.

UNIT IV: PRODUCT ARCHITECTURE**(9 Hrs)**

Concept selection- Screening – scoring, Product architecture – Implication of architecture - Establishing the architecture – Related system level design issues.

UNIT V: PROTOTYPING**(9 Hrs)**

Reliability, failure identification techniques, Poka-Yoke, Design for the environment, design for maintainability, product safety, liability and design, design for packaging.

Text Books

1. Kari T.Ulrich and Steven D.Eppinger, "Product Design and Development", McGraw-Hill International Edns.
2. Stephen Rosenthal, "Effective Product Design and Development", Business One Orwin, Homewood,
3. Otto, K. N. Product design: techniques in reverse engineering and new product development.

Reference Books

1. Ashby, M. F., & Johnson, K... *Materials and design: the art and science of material selection in product design*. Butterworth-Heinemann.
2. Kevin Otto and Kristin Wood, "Techniques in Reverse Engineering and New Product Development", Pearson Education, Chennai, Edition III.
3. Chitale A.V. and Gupta R.C., "Product Design and Manufacturing", 6th Edition, PHI.

4. Taurt Pugh, "Tool Design – Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New york, NY
5. Kumar, A., Jain, P. K., & Pathak, P. M. Reverse engineering in product manufacturing: an overview. DAAAM international scientific book,

Web Resources

1. <http://www.worldcat.org/title/product-design-and-development/oclc/904505863>
2. <https://www.pdfdrive.com/product-design-and-development-e38289913.html>
3. <https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/>
4. <https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/>
5. https://ocw.mit.edu/courses/sloan-school-of-management/15-783j-product-design-and-development-spring-2006/lecture-notes/clas1_int_crse_6.pdf
6. https://swayam.gov.in/nd1_noc20_de05/preview

COs/POs/PSOs Mapping

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

	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C	Hrs
U19HSO62	(Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	3	0	0	3	45

Course Objectives

- To introduce fundamental aspects of Intellectual Property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- Awareness about current trends in IPR and Government steps in fostering IPR

Course Outcomes

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

CO1: Complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works **(K2)**

CO2: Presenting useful insight on novelty of their idea from state-of-the art search during their project work period. **(K3)**

CO3: Posting Intellectual Property as a career option like R&D IP Counsel, Government Jobs – Patent Examiner, Private Jobs, Patent agent and/or Trademark agent and Entrepreneur **(K5)**

CO4: To disseminate knowledge on Design, Geographical Indication, Plant Variety and Layout Design Protection and their registration aspects **(K1)**

CO5: Organizing their idea or innovations and analyse ethical and professional issues which arise in the intellectual property law context. **(K4)**

UNIT I OVERVIEW OF INTELLECTUAL PROPERTY (9 Hrs)

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

UNIT II PATENTS (9 Hrs)

Patents - Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

UNIT III COPYRIGHTS (9 Hrs)

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

UNIT IV TRADEMARKS (9 Hrs)

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

UNIT V OTHER FORMS OF IP**(9 Hrs)**

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.

Text Books

1. Nithyananda, K V. Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited, 2019
2. Neeraj, P., & Khusdeep, D. Intellectual Property Rights. India, IN: PHI learning Private Limited. 2014

Reference Books

1. Ahuja, V K. Law relating to Intellectual Property Rights. India, IN: Lexis Nexis, 2017.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
4. Prabuddha Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
5. S.V. Satakar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
6. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012.

Web Resources

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>
2. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
3. Cell for IPR Promotion and Management (<http://cipam.gov.in/>)
4. World Intellectual Property Organisation (<https://www.wipo.int/about-ip/en/>)
5. Office of the Controller General of Patents, Designs & Trademarks (<http://www.ipindia.nic.in/>)
6. Journal of Intellectual Property Rights (JIPR): NISCAIR

COs/POs/PSOs 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	-	-	-

U19HSO63	MARKETING MANAGEMENT AND RESEARCH (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	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**(9Hrs)**

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**(9Hrs)**

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 Kotler & Keller, "Marketing Management", Prentice Hall of India, 14th edition, 2012.
2. Lilien, Gary I., and Arvind Rangaswamy. "Marketing managers make ongoing decisions about product features, prices, distribution options", The Handbook of Marketing Research: Uses, Misuses, and Future Advances (2006).

Reference Books

1. Chandrasekar. K.S., "Marketing Management Text and Cases", 1st Edition, Tata McGraw Hill - Vijaynicole, 2010.
2. Kothari, C. "Research Methodology Methods and Techniques", New Age International (P) Ltd., 2017
3. RajanSexena. Marketing Management: Text cases in Indian Context.(3rd edition) New Delhi, Tata McGraw hill, 2006
4. Moisander J, Valtonen A, "Qualitative marketing research: A cultural approach", Sage Publisher, 2006.
5. Malhotra NK, Satyabhushan Dash, "Marketing Research: An Applied Orientation", 7th ed, Pearson Education, 2019

Web Resources

1. https://swayam.gov.in/nd1_noc20_mg26/preview
2. https://swayam.gov.in/nd1_noc20_mg26/preview
3. <https://www.entrepreneur.com/encyclopedia/market-research>

COs/POs/PSOs 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	-	-	-

U19HSO64	PROJECT MANAGEMENT FOR ENGINEERS (Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	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 Resources

1. www.pmi.org
2. www.projectmanagement.com
3. <https://www.sciencedirect.com/journal/international-journal-of-project-management>
4. <https://nptel.ac.in/courses/110/107/110107081/>
5. <https://nptel.ac.in/courses/110/104/110104073/>

COs/POs/PSOs Mapping

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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	-	-	-

	FINANCE FOR ENGINEERS	L	T	P	C
U19HSO65	(Common to EEE, ECE, MECH, CSE, IT, ICE, CIVIL, BME and Mechatronics)	2	1	0	3

Course Objectives

- To develop a deeper understanding of the fundamentals of Accounting and Finance
- To learn how to apply mathematical principles in Finance and the concepts of Risk and Return
- To understand the need and procedure for conducting Financial Analysis for better decision-making
- To be familiar with the modes of generating funds for business and their implications
- To understand the scientific ways to determine deployment of funds in business

Course Outcomes

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

CO1: Understand basic concepts in accounting and finance and their importance for engineers **(K2)**

CO2: Demonstrate knowledge and understanding of the applications of mathematics in finance **(K3)**

CO3: Conduct Financial Analysis and use the outcome in making informed decisions in investing **(K4)**

CO4: Identify and Appreciate various sources of procurement of funds in business and their critical evaluation **(K2)**

CO5: Know how to scientifically determine the investing in long-term and short-term assets in business **(K3)**

UNIT I: UNDERSTANDING THE FUNDAMENTALS**(9 hrs)**

Assets – Need and Functions of Assets – Types of Assets – Factors determining Investments in Assets. Liabilities – Meaning and Functions of Liabilities – Types of Liabilities – Capital as a Liability: Why and How — Concept and Meaning of Finance – Distinction between Accounting and Finance – Significance of Accounting and Finance for Engineers.

UNIT II: MATHEMATICS OF FINANCE**(9 hrs)**

Time Value of Money – Computation of Present Value and Future Value – Implications of TVM in Financial Decisions – Concept of Risk and Return – Measuring Risk and Return – Concept of Required Rate of Return and its significance in Investment Decisions.

UNIT III: FINANCIAL ANALYSIS**(9 hrs)**

Meaning and Objectives of Financial Analysis – Annual Report As an Input for Analysis – Basic Understanding of Annual Reports - Tools of Financial Analysis – Horizontal Analysis – Vertical Analysis – Trend Analysis – Accounting Ratios – Significance of Ratio Analysis in Decision-making – Snap-shot of the Past to predict the Future – Computation of Key Ratios – Liquidity Ratios – Profitability Ratios – Performance Ratios – Ratios that are helpful for Potential Investors.

UNIT IV: FUNDS PROCUREMENT**(9 hrs)**

Meaning of Funds – Sources of Funds – Long-Term Sources – Short-Term Sources – Financing Decisions in Business – Capital Structure – Need and Importance of Capital Structure – Determining Optimum Capital Structure – Concept and Computation of Earnings Before Interest and Tax (EBIT), Earnings Before Tax (EBT), and Earnings After Tax (EAT)(Simple Problems) - Leverage in Finance – Types and Computation of Leverages – Operating Leverage, Financial Leverage, and Combined Leverage.

UNIT V: FUNDS DEPLOYMENT**(9 hrs)**

Investment Decisions – Types of Investment Decisions: Long-Term Investment Decisions. Significance – Methods: Pay-Back Period Method, Net Present Value Method and Benefit-Cost Ratio Method. Short-Term Investment Decisions – Concept of Working Capital – Need and Importance of Working Capital in Business –

Determinants of Working Capital in a Business. Components of Working Capital. Dividends: Concept and Meaning – Implications of Dividend Decisions on Liquidity Management.

Text Books

1. R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi. (2015 or later edition)
2. C. Paramasivan and T. Subramanian. Financial Management. New Age International, New Delhi. (2015 or later edition)

Reference Books

1. S.N. Maheswari, Sharad K. Maheswari & Suneel K. Maheswari. Accounting For Management. Vikas Publishing (2017 or later edition)
2. Varun Dawar & Narendar L. Ahuja. Financial Accounting and Analysis. Taxmann Publications. (2018 or later edition)
3. Athma. P. Financial Accounting and Analysis. Himalaya Publishing House. (2017 or later edition)
4. Prasanna Chandra. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
5. S.C. Kuchhal. Financial Management. Chaitanya Publishing House, Allahabad. (2014 or later edition)

Web Resources

1. <http://www.annualreports.com/>
2. <http://www.mmachennai.org/>
3. <https://finance.yahoo.com/>
4. <https://icmai.in/icmai/>
5. <https://nptel.ac.in/courses/110/107/110107144/>
6. https://web.utk.edu/~jwachowi/wacho_world.html
7. <https://www.icaai.org/indexbkip.html>
8. <https://www.icsi.edu/home/>
9. <https://www.investopedia.com/>
10. <https://www.moneycontrol.com/>
11. <https://www.rbi.org.in/>

COs/POs/PSOs Mapping

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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	-	-	-

SEMESTER -VII

U19CST71	IOT AND EDGE COMPUTING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To assess the vision and use of Devices in IoT Technology
- To Understand IoT Market perspective.
- To classify Real World IoT Design Constraints using Raspberry Pi.
- To learn about the introduction to Edge Computing
- To know about Physical Servers and Cloud Offerings

Course Outcomes

After completion of the course, students will be able to

CO1-Interpret the vision of IoT from a global context along with the uses of IOT devices.(K2)

CO2 -Determine the Market perspective of IoT.(K5)

CO3 -Design a portable IOT using Raspberry Pi.(K5)

CO4-Describe the importance of edge computing.(K1)

CO5- Illustrate the applications in Industrial Automation and identify Real World Design Constraints.(K2)

UNIT I INTRODUCTION & ENABLING TECHNOLOGIES (9 Hrs)

Definition & Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Communication Models, IoT Communication APIs, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, IoT System Management with NETCONF-YANG, Need for IoT Systems Management, Network Operator Requirements, NETCONF, YANG.

UNIT II IOT PROTOCOLS**(9 Hrs)**

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

UNIT III IOT PLATFORMS DESIGN METHODOLOGY(9 Hrs)

IoT Physical Devices and Endpoints– Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT IV COMPONENT OF EDGE COMPUTING AND CLOUD COMPUTING**(9 Hrs)**

Fog computing vs Edge computing- Need for edge computing - Benefits of Edge computing. Lightweight Container Middleware for Edge Cloud Architectures - Clusters for Lightweight Edge Clouds - Architecture Management – Storage and Orchestration - IoT Integration - Security Management for Edge Cloud Architectures.

UNIT V PHYSICAL SERVERS & CLOUD OFFERINGS (9 Hrs)

Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework,designing a RESTful web API.

Text Books

1. Rajkumar Buyya, Satish Narayana Srirama, "Fog and Edge Computing: Principles and Paradigms", 1st Edition, Wiley-Blackwell, 2019.
2. Matt Richardson & Shawn Wallace, O'Reilly (SPD), "Getting Started with Raspberry Pi", 3rd edition, 2016, ISBN: 9781680452457.
3. "Internet of Things – A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti", Universities Press, 2015, ISBN: 9788173719547.
4. Vijay Madisetti and Arshdeep Bahga, "Internet of Things: A Hands-On Approach", VPT edition1, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, —"The Internet of Things – Key applications and Protocols", Wiley, 2012 (for Unit 2).

Reference Books

1. Donald Norris, —"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", Mc.Graw Hill, 2015.
2. Jonathan Follett, "Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies", O'Reilly, 2014.
3. Jan Ho" Iler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Charalampos Doukas, —"Building Internet of Things with the Arduinoll, Create space", April 2012.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —"Architecting the Internet of Things", Springer, 2011.
6. Michael Margolis, "Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects", 2nd Edition, O'Reilly Media, 2011.

Web Resources

1. <https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot>
2. <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>
3. <https://www.geeksforgeeks.org/edge-computing/>
4. <https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/>

COs/POs/PSOs Mapping

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

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

U19CST72

**DATA SCIENCE AND DIGITAL MARKETING
ANALYTICS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To introduce data science and social media.
- To learn about connecting, capturing and cleaning the social data.
- To know about the branding of Facebook.
- To analyse about the sentiments in twitter.
- To Learn how Google Tools using for consumer's reactions

Course Outcomes

After completion of the course, students will be able to

CO1 – Understand the fundamentals of data science and social media. **(K2)**

CO2 – Interpret the connecting, capturing and cleaning the social data. **(K3)**

CO3 – Learn about the promoting of facebook. **(K2)**

CO4 – Analysis of sentiments in twitter. **(K3)**

CO5 – Learn how Google Tools using for consumer's reactions. **(K4)**

UNIT I INTRODUCTION TO DATA SCIENCE AND SOCIAL MEDIA (9 Hrs)

Introduction of Data science - Scope of Data Science – Data Science with other fields – Relationship between Data Science and Information Science. Data – Data Types – Data collection – Data pre-processing. Introduction to the Latest Social Media Landscape and Importance - Introducing social graph - Delving into social data - Understanding the process - Working environment - Collecting the data - Analyzing the data - Visualizing the data - Getting started with the toolset.

UNIT II HARNESSING SOCIAL DATA (9 Hrs)

APIs in a nutshell - Different types of API - Advantages and Limitations of social media APIs - Connecting principles of APIs - Introduction to authentication techniques - Parsing API outputs - Twitter - Facebook - GitHub - YouTube. Basic cleaning techniques- MongoDB to store and access social data - MongoDB using Python. Google Tools.

UNIT III UNCOVERING BRAND ACTIVITY, POPULARITY AND EMOTIONS ON FACEBOOK (9 Hrs)

Facebook brand page - The Facebook API - Project planning - Analysis - data extraction - data pull - feature extraction - content analysis - Keywords - Extracting verbatim for keywords - Noun phrases - Detecting trends in time series - Maximum shares - Maximum likes - Uncovering emotions - Extract emotions - Brands benefit from Emotions.

UNIT IV ANALYZING TWITTER USING SENTIMENT ANALYSIS AND ENTITY RECOGNITION (9 Hrs)

Scope and process - Getting the data - Getting Twitter API keys - Data extraction - REST API Search endpoint - Streaming API - Data pull - Data cleaning - Sentiment analysis - Customized sentiment analysis - Labeling the data - Creating the model - Model performance evaluation and cross-validation - K-fold cross-validation - Named entity recognition - Installing NER - Combining NER and sentiment analysis.

UNIT V CAMPAIGNS AND CONSUMER REACTION ANALYTICS AND GOOGLE TOOLS(9 Hrs)

Scope and process - Getting the data - Data pull - Data processing - Data analysis -Sentiment analysis in time - Comments in time - The Next Great Technology – Trends Mining on GitHub - Top technologies. Google Tools: Google Ad Manager - Google Ads - Google Marketing Platform. Digital Marketing Tools: Data Shorts - Test My Site - Grow My Store - Find My Audience - Market Finder - Google Trends..

Text Books

- 1.Chirag Shah “ A Hands-On Introduction to Data Science” Cambridge University Press, 2020.
- 2.Siddhartha Chatterjee, Michal Krystyanczuk “Python Social Media Analytics “, Packt Publishing, 2017.
- 3.Jesus Rogel-Salazar, "Data science and Analytics", CRC Press, 2017.

Reference Books

1. Chuck Hemann, Ken Burbary "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World", Que Publishing, 2013.
2. Wolfgang Jank, "Business Analytics for Managers", Springer, 2011.
3. Wes McKinney, "Python for Data Analysis", O'Reilly Press, 2nd Edition, 2017.
4. Phil Spector, "Data Manipulation with R", Springer, 2018.
5. Christian Ritz, Jens Carl Streibig, "Nonlinear Regression with R", Springer, 2015.

Web Resources

1. <https://www.analyticsinsight.net/data-science-in-digital-marketing/>
2. <https://www.simplilearn.com/pgp-data-science-certification-bootcamp-program?>
3. <https://emeritus.sdabocconi.it/big-data-ai-marketing?>
4. <https://www.thinkwithgoogle.com/intl/en-apac/?>
5. <https://www.upgrad.com/executive-management-in-digital-brand-advertise-mica/?>

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

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

U19CSP71 BUSINESS BASICS FOR ENTREPRENEUR

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To develop a clear understanding on Business Plans and their significance.
- To be familiar with various forms of business appropriate for an individual entrepreneur
- To understand various ways of judging a successful opportunity for an entrepreneur
- To know the ways to formulate a successful Operation Plan
- To be aware of things to know to prepare effective financial and marketing plans

Course Outcomes

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

CO1 - Understand the need and significance of Business Plan in the success of an Enterprise. **(K1)**

CO2 - Demonstrate a comprehensive and comparative understanding on various forms of businesses. **(K2)**

CO3 - Understand the ways to judge the economic and business viability of proposed venture. **(K1)**

CO4 - Explain various strategies to formulate an Operational Plan successfully. **(K3)**

CO5 - Show an understanding on key issues involved in Marketing and Financial Plans. **(K2)**

UNIT I THE BUSINESS PLAN

(6 Hrs)

What is a Business Plan? – Need and Significance of a Business Plan – Perils of Not Having a Business Plan – Survey on Enterprises with and without Business Plan at their start-up.

UNIT II THE BUSINESS FORMS

(6 Hrs)

Description of the Form of Enterprise – Sole Proprietor – One-man Company – Partnership – Private Limited Company – Comparative Pros and Cons of each of these forms of business – Interview findings from at least 3 of these business forms.

UNIT III JUDGING THE OPPORTUNITY

(6 Hrs)

Sensing the Business Opportunity – Measuring the Economic and Business Viability of the Entrepreneurial idea – Findings from Observations of various small firms and ascertaining the causes of their successes and failures with reference to “Business Fitness of the Purpose/Idea”.

UNIT IV STRATEGISING THE IDEA

(6 Hrs)

Study of the Industry and Market – Preparation of Strategy specific to the proposed enterprise – Identifying the Core Team to work with – Formulating an Operational Plan. Experience-sharing with Entrepreneurs and preparation of summary of their experiences and best practices.

UNIT V THE FINAL COUNT-DOWN

(6 Hrs)

Preparation of the Marketing and the Financial Plan – Seeking Funds for Investment – Options available – Exploring Commercial Banks and NBFCs for Loans – Knowing the jargons: Collateral, Security, Margin Money, Working Capital, Term Loan, Interest Rates, EMIs, Loan Tenure, etc. Getting to know the nitty-gritties of Bank Loan Documentation and Procedures through Seminars / Workshops from Practicing Bankers and Industrialists.

Text Books

1. Friend, G., & Zehle, S., “Guide to business planning”, Profile Books Limited, 2004.
2. Lasher, W., “The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business”, Broadway Books, 2010.

Reference Books

1. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
2. Arthur R. DeThomas – Writing a Convincing Business Plan.
3. Ben Horowitz – The Hard Thing about Hard Things.
4. Guy Kawasaki – The Art of Start 2.0
5. Hal Shelton – The Secrets to Writing a Successful Business Plan.

6. Jason Fried and David Hanson – Rework.
7. Jim Horan – The One Page Business Plan.
8. Linda Pinson – Anatomy of a Business Plan.
9. Rhonda Abrams – Successful Business Plan: Secrets & Strategies.

Web Resources

1. <https://www.waveapps.com/blog/entrepreneurship/importance-of-a-business-plan>
2. <https://www.entrepreneur.com/article/200516>
3. <https://smallbusinessbc.ca/article/how-to-use-viability-to-test-if-you-should-invest-in-your-business/>
4. <https://www.infoentrepreneurs.org/en/guides/strategic-planning/>
5. <http://www.marketingmo.com/strategic-planning/marketing-plans-budgets/>
6. <https://www.mbda.gov/page/loan-documentation>

COs/POs/PSOs Mapping

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

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

U19CSP72	IOT AND EDGE COMPUTING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- Learn to analyse the performance of IOT devices
- Design and program IoT devices
- Be exposed to tool kits for cloud environment.
- Transfer IoT data to the cloud and in between cloud providers
- Learn to run virtual machines of different configuration.

Course outcomes

After completion of the course, students will be able to

CO1 - Analyse the performances of IOT devices.(K2)

CO2 - Design IoT applications in different domain.(K6)

CO3 - Implement basic IoT applications on embedded platform.(K6)

CO4 - Use of the cloud tool kits.(K3)

CO5- Design and Implement applications on the Cloud.(K6)

List of Exercises

1. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run python programs on Pi
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Access an image through a Pi web cam
5. Implement an intruder system that sends an alert to the given email.
6. Get the status of a bulb at a remote place (on the LAN) through web.
7. Show the virtual machine migration based on the certain condition from one node to the other.
8. Find procedure to install storage controller and interact with it.
9. Install Google App Engine. Create hello world app and other simple web applications using python/java.
10. Find a procedure to transfer the files from one virtual machine to another virtual machine.
11. Find a procedure to launch virtual machine using trystack
12. Install Hadoop single node cluster and run simple applications like wordcount.

Reference Books

1. Jonathan Follett, "Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies", O'Reilly, 2014.
2. Charalampos Doukas, —"Building Internet of Things with the Arduino", Create space, April 2012.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —"Architecting the Internet of Things", Springer, 2011.
4. Michael Margolis, "Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects", 2nd Edition, O'Reilly Media, 2011.

Web Resources

1. <https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot>
2. <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>
3. <https://www.geeksforgeeks.org/edge-computing/>
4. <https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/>

COs/POs/PSOs Mapping

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

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

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

U19CSP73

**DATA SCIENCE AND DIGITAL MARKETING
ANALYTICS LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To describe common Python functionality and features used for data science.
- To learn the Query Data Frame structures for cleaning and processing.

B.Tech Computer Science and Engineering

- To configure your programming environment to analysis Facebook.
- To analyse about the sentiments in twitter.
- To learn how YouTube promotions and analysis of consumer's reactions are made.

Course Outcomes

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

- CO1** –Design programs using Python functionality and features.(K3)
CO2 –Developing Query Data Frame structures for cleaning and processing.(K4)
CO3 –Construct programming environment to analysis Facebook.(K4)
CO4 – Analyse about the sentiments in twitter.(K4)
CO5 – Learn how Google Tools using for consumer's reactions. (K5)

List of Exercises

1. Demonstrate Aggregation.
2. Demonstrate Indexing and Sorting.
3. Demonstrate handling of missing data.
4. Demonstrate hierarchical indexing.
5. Demonstrate usage of Pivot table.
6. Demonstrate use of eval () and query ().
7. Demonstrate Scatter Plot and 3D plotting.
8. Implement an analytic application for facebook to demonstrate the number of likes, emotions.
9. Implement an analytic application for twitter to demonstrate Sentiment Analysis and Entity Recognition.
10. Implement an analytic application for Google Tools such as Find My Audience - Market Finder - Google Trends.

Reference Books

1. Chirag Shah " A Hands-On Introduction to Data Science" Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystianczuk "Python Social Media Analytics ", Packt Publishing, 2017.
3. Jesus Rogel-Salazar, "Data science and Analytics", CRC Press, 2017.

Web Resources

1. <https://www.searchlaboratory.com/analytics-data-science/>
2. <https://www.analyticsinsight.net/data-science-in-digital-marketing/>
3. <https://www.simplilearn.com/pgp-data-science-certification-bootcamp-program?>
4. <https://emeritus.sdabocconi.it/big-data-ai-marketing?>

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

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

U19CSP74

COMPREHENSIVE VIVA-VOCE

L	T	P	C	Hrs
0	0	2	1	30

The student will be tested for his understanding of basic principles of the core Computer Science and Engineering subjects. The objective of comprehensive viva-voce is to assess the overall knowledge of the

B.Tech Computer Science and Engineering

student in the relevant field of Engineering acquired over 4 years of study in the undergraduate program.

U19CSW71

PROJECT PHASE - I

L	T	P	C	Hrs
0	0	4	2	30

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.



- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - State the problem definition clearly. **(K3)**

CO2 - Prepare SRS for projects. **(K3)**

CO3 - Prepare SDS for projects. **(K3)**

CO4 - Develop presentation skills. **(K3)**

CO5 - Develop project management skills. **(K3)**

Exercises

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

- Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

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

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

U19CSW72

INTERNSHIP/ INPLANT TRAINING

L	T	P	C	Hrs
0	0	0	2	0

Inplant training is a short duration training course for students to develop their skills and get industrial knowledge which will help you to understand what is actually happens in industry. Inplant training is important

B.Tech Computer Science and Engineering

for Engineering students as it gives industry exposure to them while studying. Inplant training adds credits to the students during their placements. They provide inplant training and internships for the students of engineering and arts. Its usefulness varies depending on which branch you are, and which company you did an InPlant Training.



PROFESSIONAL ELECTIVES

U19CSE71

NETWORK SECURITY

L	T	P	C	Hrs
3	0	0	3	45



Course Objectives

- To understand the web security architecture and basics of cyber security.
- To describe Authentication application, IP security.
- To understand about web security model and network protocols.
- To understand the network security and network security defense tools.
- To describe Symmetric Ciphers techniques and Standards and design principles.

Course Outcomes

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

CO1 – Analyse various security attacks and select appropriate security mechanisms for designing various security services and classical encryption techniques. **(K3)**

CO2 – Describe Authentication application, IP security. **(K1)**

CO3 – Acquire knowledge about web security model and network protocols. **(K3)**

CO4 – Acquire knowledge about Network Security protocols and defence tools. **(K3)**

CO5 – Acquire knowledge in symmetric and public key cryptography. **(K3)**

UNIT I INTRODUCTION**(9 Hrs)**

The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

UNIT II AUTHENTICATION APPLICATIONS AND IP SECURITY**(9 Hrs)**

Symmetric Key Cryptography: Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm- Security of RSA-Key management.

UNIT III WEB SECURITY**(9 Hrs)**

Basic web security model, Web application security, Content Security Policies (CSP), Web workers, and extensions, Session management and user authentication, HTTPS: goals and pitfalls, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT IV NETWORK SECURITY AND DEFENSE TOOLS**(9 Hrs)**

Security issues in Internet protocols: TCP, DNS, and routing Firewalls: Firewall Design Principles, Trusted Systems. Intruders: Intruders, Intrusion Detection, Password Management. Unwanted traffic: denial of service attacks.

UNIT V SYMMETRIC AND ASYMMETRIC KEY TECHNIQUES**(9 Hrs)**

Cyber Resilience cyber-attack – Symmetric Key Cryptography - Asymmetric Key Cryptography – Cryptographic algorithms – Authentication & identification – Renowned information security – Diffie – Hellman Key exchange – Security of both key.

Text Books

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education; Seventh edition, 2017.
2. Roberta Bragg, "Network Security: The Complete Reference", McGraw Hill Education, 1st edition, 2017.
3. William Stallings, "Network Security Essentials: Applications and Standards", Pearson Education India; 4th edition, 2011.

Reference Books

1. Atul Kahate, "Cryptography and Network Security", McGraw-Hill; Fourth edition, 2019.
2. Manoj Kumar, "Cryptography and Network Security", Krishan Prakashan, 2014.
3. Prakash C. Gupta, "Cryptography and Network Security", PHI Learning Pvt. Ltd, 2014.
4. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill, Second Edition, 2013.
5. Charlie Kaufman, "Network Security: Private Communication in Public World", 2nd Edition. Prentice Hall of India, New Delhi, 2004.

Web Resources

1. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html
2. <https://phoenixnap.com/blog/best-network-security-tools>
3. <https://developer.mozilla.org/en-US/docs/Web/Security>
4. <https://sucuri.net/guides/website-security/>
5. <https://nptel.ac.in/courses/106/105/106105162/>

COs/POs/PSOs Mapping

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

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

U19CSE72	DATA MINING AND WAREHOUSING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the Fundamental Concept of Data mining.
- To describe the OLAP technology.
- To understand the Classification Techniques.
- To understand the Cluster Analysis.
- To develop Data Mining Object.

Course Outcomes

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

CO1 - Understand the Data mining and Data warehousing fundamentals. **(K1)**

CO2 - Describe the OLAP technology for Data Mining. **(K3)**

CO3 - Understand the Classification Techniques. **(K1)**

CO4 - Understand the Cluster Analysis. **(K1)**

CO5 - Develop Data Mining Object. **(K3)**

UNIT I INTRODUCTION**(9 Hrs)**

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Pre-processing: Need for Pre-processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II DATA WAREHOUSING AND OLAP TECHNOLOGY**(9 Hrs)**

Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT III CLASSIFICATION AND PREDICTION**(9 Hrs)**

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

UNIT IV CLUSTER ANALYSIS**(9 Hrs)**

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT V SPATIAL, MULTIMEDIA, TEXT AND WEB MINING**(9 Hrs)**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web. Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

Text Books

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Second Edition, Pearson education, 2016.
3. Jared Dean, "Big Data Mining, and Machine Learning: value Creation for Business Leaders and Practitioners", Second Edition, Wiley, 2019.

Reference Books

1. Arun K Pujari, "Data Mining Techniques", Second Edition, Universities Press, 2010.
2. Sam Aanhory and Dennis Murray, "Data Warehousing in the Real World", Second Edition, Pearson Edn Asia, 1997.
3. K.P.Soman, S.Diwakar and V.Ajay, "Insight into Data Mining", Second Edition, PHI, 2008.
4. PaulrajPonnaiah, "Data Warehousing Fundamentals" Third Edition, Wiley student Edition, 2017.
5. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Third Edition, Prentice Hall of India, 2006.

Web Resources

1. <https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/>
2. <https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing>
3. <https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining>
4. <https://nptel.ac.in/courses/106/105/106105174/>
5. <https://www.guru99.com/data-warehousing-tutorial.html>

COs/POs/PSOs Mapping

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

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

U19CSE73**VIRTUAL REALITY**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the concept of Virtual Reality.
- To develop Geometry for Virtual Reality.
- To develop Physiology of Human models using VR.
- To create visual perception and rendering with Virtual World.
- To test the audio.

Course Outcomes

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

CO1 - Understand the concept of Virtual Reality. **(K2)**

CO2 - Develop Geometry for Virtual Reality. **(K3)**

CO3 - Develop Physiology of Human models using VR. **(K3)**

CO4 - Create visual perception and rendering with Virtual World. **(K3)**

CO5 - Test the audio. **(K4)**

UNIT I INTRODUCTION**(9 Hrs)**

Virtual Reality: What is Virtual Reality - Modern VR Experiences - History Repeats. Bird's-Eye View: Hardware - Software - Human Physiology and Perception.

UNIT II GEOMETRY AND LIGHT AND OPTICS**(9 Hrs)**

Geometric Models - Changing Position and Orientation - Axis-Angle Representation of Rotation - Viewing Transformations - Chaining the Transformations.

Light and Optics: Basic Behavior - Lenses - Optical Aberrations - The Human Eye - Cameras – Displays.

UNIT III PHYSIOLOGY OF HUMAN VISION**(9 Hrs)**

From the Cornea to Photoreceptors - From Photoreceptors to the Visual Cortex - Eye Movements - Implications for VR.

UNIT IV VISUAL PERCEPTION, VISUAL RENDERING AND MOTION IN REAL AND VIRTUAL WORLD**(9 Hrs)**

Perception: Depth - Motion - Color - Combined sources of Information. Rendering: Ray Tracing and Shading Models - Rasterization - Correcting Optical Distortions. Motion: Velocities and Accelerations - The Vestibular System - Physics in the Virtual World - Mismatched Motion and Vection.

UNIT V TRACKING, INTERACTION AND AUDIO**(9 Hrs)**

Tracking: Tracking 2D Orientation - Tracking 3D Orientation - Tracking Position and Orientation - 3D Scanning of Environments. Interaction: Motor Programs and Remapping - Locomotion - Social Interaction.

Audio: The Physics of Sound - The Physiology of Human Hearing - Auditory Perception - Auditory Rendering - Perceptual Training - Recommendations for Developers.

Text Books

1. Stevan M. LaValle, "Virtual Reality", Cambridge University Press, 2020.
2. Burdea, "Virtual Reality Technology", Wiley India, 2nd edition, 2008.
3. John Vince, "Virtual Reality Systems", Pearson Edition, 2012.

Reference Books

1. Jonathan Linowes, "Unity Virtual Reality Projects", Packt publications, Second Edition, 2016.
2. Woodrow Barfield, Marc J. Blitz, "Research Handbook on the Law of Virtual Reality and Augmented Reality", Edward Elgar Publishing, 2020.
3. Jeff W Murray, "Building Virtual Reality with Unity and SteamVR", CRC Press, 2nd edition, 2020.
4. Erin Pangilinan, Steve Lukas, Vasanth Mohan, "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", O'Reilly Media, 1st edition, 2019.
5. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", Morgan & Claypool Publishers, 2015.

Web Resources

1. <https://www.investopedia.com/terms/v/virtual-reality.asp>
2. <https://www.iberdrola.com/innovation/virtual-reality>
3. <https://www.marxentlabs.com/what-is-virtual-reality>
4. <https://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html>
5. <https://arvr.google.com/vr>

COs/POs/PSOs Mapping

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

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

U19CSE74**ROBOTICS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the fundamental concepts of Robotics
- To outline sensors and vision system
- To design of controlling in robotics
- To extend the robot Actuation systems
- To design and control hardware & interfacing in robot

Course Outcomes

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

CO1 - Explain the robotic kinematic and dynamic analysis. **(K2)**

CO2 - Discover various sensors and vision system. **(K1)**

CO3 - Apply linear and non-linear controls of robotics. **(K3)**

CO4 - Make use of various actuators. **(K2)**

CO5 - Develop robotics using embedded systems and AI. **(K4)**

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

Types and components of a robot, Classification of robots, Kinematics systems; Definition of mechanisms and manipulators, Degrees of Freedom.

Robot Kinematics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics

UNIT II ROBOT DYNAMICS, SENSORS AND VISION SYSTEM (9 Hrs)

Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.

UNIT III ROBOT CONTROL (9 Hrs)

Basics of control: open loop- closed loop, Transfer functions, Control laws: P, PD, PID, Linear and Non-linear controls

UNIT IV ROBOT ACTUATION SYSTEMS**(9 Hrs)**

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

UNIT V CONTROL HARDWARE AND INTERFACING**(9 Hrs)**

Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming for robot applications. AI in Robotics: Applications in unmanned systems, defense, medical, industries, etc.

Text Books

1. Craig, J.J., "Introduction to Robotics: Mechanics and Control", 4th Edition, Pearson, 2017.
2. Spong, Vidyasagar, "Robot Dynamics and Control", 2nd Edition, Wiley India Pvt. Ltd, 2009.
3. R. Klatfater, "Robotics Engineering", 3rd edition, PHI, 2012.
4. Saha, S.K., "Introduction to Robotics". 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
5. M. P. Groover, Ashish Dutta, "Industrial Robotics", 2nd edition, McGraw Hill, 2013.

Reference Books

1. Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003
2. NikuSaeed B., "Introduction to Robotics: Analysis, Systems, Applications", 3rd edition, PHI, New Delhi, 2008
3. Mittal R.K. and Nagrath I.J., "Robotics and Control", 2nd edition, Tata McGrawHill, 2011
4. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.
5. Mark W. Spong, Sdeth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005.

Web Resources

1. <http://www.cs.cornell.edu/courses/cs4750>
2. <https://www.coursera.org/specializations/robotics>
3. <https://cmsx.cs.cornell.edu>
4. <https://www.edx.org/>
5. <https://builtin.com/robotics>

COs/POs/PSOs Mapping

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

U19CSE75**HAPTIC COMPUTING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the basics of Haptics Principles and Applications
- To learn the concept of Human Haptic Perception and Machine Haptics
- To study the Computer Haptics
- To learn the Multimedia Haptics
- To understand the designing purpose of Haptics System

Course Outcomes

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

CO1 – Analyze the basic Principles and Applications of Haptics.(K3)

CO2 –Understand the Human Haptic Perception and Machine Haptics.(K1)

CO3 –Analyze the concept of Computer Haptics.(K3)

CO4 – Make use of the Multimedia Haptics.(K2)

CO5 – Ability to design the Haptic Systems.(K2)

UNIT I HAPTICS: GENERAL PRINCIPLES AND APPLICATIONS (9Hrs)

Introduction - Human Senses - Haptics Exploration - Concepts and Terminology - Roadmap to Multimedia Haptics.- Haptic-Audio-Visual Multimedia System. Haptic Evolution: From Psychophysics to Multimedia - Haptics for Medical Applications - Tele-Robotics and Tele-Operation – Media - Mobile Haptics - Haptics and Virtual reality - Education and Learning - Haptics for Security.

UNIT II HUMAN HAPTIC PERCEPTION AND MACHINE HAPTICS (9Hrs)

Introduction - Touch and Cognition - Human Haptic System - Concept of Illusion. Haptic Interfaces - HAVE Sensors - HAVE Actuators - Performance Specifications - State-of-the-Art Haptic Interfaces.

UNIT III COMPUTER HAPTICS (9Hrs)

Haptic Rendering Subsystem - Polygon-Based Representation and Scene Graph - Collision Detection Techniques and Bounding Volumes - Penetration Depth and Collision Response - Haptic Rendering of Surface Properties - Control Methods for Haptic Systems - Benchmarking Haptic Rendering Systems - Haptic Software Frameworks.

UNIT IV MULTIMEDIA HAPTICS (9Hrs)

Haptics as a New Media - HAVE Content Creation - HAVE Content Representation - Haptic Media Transmission - Architectures for C-HAVE - Communication Frameworks for C-HAVE Systems - Quality of Experience in Multimedia Haptics – Haptics Watermarking.

UNIT V DESIGNING HAPTIC SYSTEMS (9Hrs)

Kinematic Design: Basics - Serial Mechanisms - Parallel Mechanisms. Actuator Design: General Facts about Actuator Design - Electrodynamics Actuators - Electromagnetic Actuators - Piezoelectric Actuators – Electrostatic Actuators. Sensor Design: Constraints - Sensing Principles.

Text Books

1. Abdulmotaleb El Saddik, Mauricio Orozco, Mohamad Eid, Jongeun Cha, "Haptics Technologies: Bringing Touch to Multimedia, Springer-Verlag Berlin Heidelberg", 1st Edition, 2011.
2. Natalia Roberts," Haptic Technology and Applications Hardcover – Import", 12 March 2015.
3. Robert Jütte, "Martin Grunwald (eds.), Human Haptic Perception: Basics and Applications", Birkhäuser Base, 1st Edition, 2008.

Reference Books

1. Troy McDaniel and Sethuraman Panchanathan, "Haptic Interfaces for Accessibility, Health, and Enhanced Quality of Life" springer, 2020.
2. Natalia Roberts, "Haptic Technology and Applications Hardcover – Import", 12 March 2015.
3. Robert Jütte, "Martin Grunwald (eds.), Human Haptic Perception: Basics and Applications", Birkhäuser Base, 1st Edition, 2008.
4. Haptic Rendering: Foundations, Algorithms, and Applications Hardcover – Import, 25 July 2008 by Ming C. Lin, Miguel Otaduy
5. Human Haptic Perception Basics And Applications by Martin Grunwald, Birkhauser Verlag AG, Publisher Birkhauser Verlag AG, December 2008.

Web Resources

1. <https://www.azosensors.com/article.aspx?ArticleID=1435>
2. <https://www.sciencedirect.com/topics/neuroscience/haptic-perception>
3. <https://electronics.howstuffworks.com/everyday-tech/haptic-technology.htm>
4. <https://www.rfwireless-world.com/Terminology/haptic-sensor.html>
5. https://www.architectmagazine.com/technology/the-role-of-haptics-in-design_o

COs/POs/PSOs Mapping

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

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

Open Elective Courses offered to other Department students



U19CS076	ARTIFICIAL INTELLIGENCE	L	T	P	C	Hrs
	(Common to EEE, ICE, CIVIL, CCE, MECH, FT)	3	0	0	3	45

Course Objectives

- To cover fundamentals of Artificial Intelligence,
- To understand various knowledge representation techniques.
- To provide knowledge of AI systems and its variants
- To understand the planning and different learning.
- To understand the communication process of language translator.

course outcomes

On successful completion of this course students will be able to

CO1 - Understand the basics of Artificial Intelligence. **(K1)**

CO2 - Apply AI problem solving techniques, knowledge representation, and reasoning methods in

Knowledge based systems **(K3)**

CO3 - Develop simple intelligent / expert system using available tools and techniques of AI to analyze and interpret domain knowledge. **(K3)**

CO4 - Become familiar with planning and different learning methods. **(K3)**

CO5 - Understanding the human language to Machine language and Robotics. **(K1)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction - Foundations of AI – History of AI –Structure of AI agents, Problem solving - Informed and uninformed search techniques.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING**(9 Hrs)**

Logical Agents –Propositional logic - First-Order Logic - Forward and backward chaining - Knowledge Representation

UNIT III UNCERTAIN KNOWLEDGE AND REASONING**(9 Hrs)**

Basic probability notations - Bayes rule – Wumpus world revisited - Bayesian network.

UNIT IV PLANNING AND LEARNING**(9 Hrs)**

Introduction to planning, Planning in situational calculus - Representation for planning – Partial order planning algorithm- Learning from examples- Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning.

UNIT V COMMUNICATING, PERCEIVING AND ACTING**(9 Hrs)**

Natural Language Processing – Natural Language for communication – Perception - Robotics.

Text Books

1. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
2. Kevin Night, Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill 2008.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Books Third edition, 2000.

Reference Books

1. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Books Third edition, 2000.
2. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
3. George F Luger, Artificial Intelligence, Pearson Education, 6th edition, 2009.
4. EngeneCharniak and Drew Mc Dermott, "Introduction to Artificial intelligence, Addison Wesley 2000.
5. Nils J. Nilsson, "Principles of Artificial Intelligence", Narosa Publishing House, 2000.

Web Resources

- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- <https://www.javatpoint.com/artificial-intelligence-tutorial>
- <https://www.w3schools.com/ai/>
- <https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/>
- <https://nptel.ac.in/courses/112/103/112103280/>

COs/POs/PSOs Mapping

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

	CLOUD TECHNOLOGY AND ITS APPLICATIONS	L	T	P	C	Hrs
U19CS077	(Common to EEE, ICE, MECH, CIVIL, BME, CCE, Mechatronics)	3	0	0	3	45

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To Relate cloud storage technologies and relevant distributed file systems.
- To Explain the Cloud Applications.
- To Define the Future of Cloud.

Course Outcomes

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

CO1 - Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. **(K1)**

CO2 - Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacentres to build and deploy cloud applications that are resilient, elastic and cost-efficient. **(K3)**

CO3 - Illustrate the fundamental concepts of Cloud Applications. **(K4)**

CO4 - Explain the Applications of cloud. **(K3)**

CO5 - Advancing towards a Cloud. **(K3)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network.

UNIT II CLOUD INFORMATION SYSTEMS**(9 Hrs)**

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing.

UNIT III CLOUD INFRASTRUCTURE**(9 Hrs)**

Introduction– Evolving IT infrastructure – Evolving Software Applications –Service Oriented Architecture – Interoperability Standards for Data Center Management - Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment.

UNIT IV CLOUD APPLICATIONS**(9 Hrs)**

Software Utility Application Architecture - Characteristics of a SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework - Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture - Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT V FUTURE OF CLOUD**(9 Hrs)**

Other Design Considerations - Design of a Web Services Metering Interface - Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

Text Books

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press; First edition, 2017..
2. Erl, 'Cloud Computing: Concepts, Technology & Architecture', Pearson Education India, 1st edition (1 January 2014).
3. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

Reference Books

1. Sanjiva Shankar Dubey, 'Cloud Computing and Beyond', Dreamtech Press 2 edition, 2019.
2. John W. Rittinghouse and James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
3. George Reese, "Cloud Application Architectures", O'reilly Publications, 2009.
4. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
5. Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd. 2006.

Web Resources

1. [www.coltdatacentres.net/Cloud Technology](http://www.coltdatacentres.net/Cloud%20Technology).
2. www.zdnet.com.
3. <https://www.cloudbakers.com/blog/what-is-a-cloud-application>
4. <https://www.cloudbakers.com/blog/what-is-a-cloud-application>
5. <https://blog.servermania.com/what-is-a-cloud-application/>

COs/POs/PSOs Mapping

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

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

OPEN ELECTIVES



	IOT AND ITS APPLICATIONS	L	T	P	C	Hrs
U19ECO75	(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE and FT)	3	0	0	3	45

Course Objectives

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

Course Outcomes

After completion of the course, students will be able to

CO1-Understand internet of Things and its hardware and software components. **(K2)**

CO2-Demonstrate the Interfacing of I/O devices, sensors & communication modules. **(K3)**

CO3-Understand the concepts of remotely monitor data and control devices. **(K2)**

CO4-Build and deploy an various architecture with their elements. **(K3)**

CO5-Can develop real time IoT based projects. **(K3)**

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

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

UNIT II ARCHITECTURE OF IoT**(9 Hrs)**

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT III ELEMENTS OF IoT**(9 Hrs)**

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

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

UNIT IV IoT APPLICATION DEVELOPMENT**(9 Hrs)**

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

UNIT V IoT APPLICATIONS**(9 Hrs)**

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Text Books

1. Vijay Madiseti, 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 Resources

1. <https://www.i-scoop.eu/internet-of-things-guide/>
2. <https://www.theinternetofthings.eu/>
3. <https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>
4. <https://www.coursera.org/learn/iot>
5. https://onlinecourses.nptel.ac.in/noc21_ee85/preview

COs/POs/PSOs Mapping

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

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

U19EC076	SENSORS FOR INDUSTRIAL APPLICATIONS	L	T	P	C	Hrs
	(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME and Mechatronics)	3	0	0	3	45

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 student's understanding of 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 force 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, Inclino meters.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS (9 Hrs)

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement. Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V APPLICATIONS OF SENSORS (9 Hrs)

Applications of Sensors for Industry Automation - Design of smart Industry using Temperature, Humidity and Pressure sensors - Applications of Flow sensors in Industries - Applications of Gyro sensor. Applications of Position sensors.

Text Books

1. PatranabisD., "SensorandActuators", PrenticeHallofIndia(Pvt)Ltd., secondedition2005(revised).
2. RenganathanS., "TransducerEngineering", AlliedPublishers(P)Ltd., 2005(revised).
3. ErnestO.Doebelin, "MeasurementsystemsApplicationandDesign", InternationalStudentEdition, VIEdition, TataMcGraw-HillBookCompany, 2012.

Reference Books

1. Kr.Iniewski, "Smart Sensors for Industrial Applications", CRC Press, 2017
2. BoltonW, "Mechatronics", ThomsonPress, thirdedition, 2004.
3. IanRSinclair, —SensorsandTransducersI, ThirdEdition, Newnespublishers, 2001.
4. RobertB.Northrop, "IntroductiontoInstrumentationandMeasurement", 3rdEdition", CRC—Press—TaylorandFrancis Group, 2005
5. CurtisD.Johnson, "ProcessControlInstrumentationTechnology", PrenticeHallInternationalEdition, 2015.

Web Resources

1. <https://www.first-sensor.com/en/applications/industrial/>
2. <https://www.finoit.com/blog/top-15-sensor-types-used-iot/>
3. <https://www.iaasiaonline.com/smart-sensors-for-industrial-applications-2/>
4. <https://www.plantautomation-technology.com/articles/types-of-sensors-used-in-industrial-automation>
5. <https://www.thomasnet.com/articles/instruments-controls/sensors/>

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

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

U19IT076	AUTOMATION TECHNIQUES & TOOLS - DEVOPS	L 3	T 0	P 0	C 3	Hrs 45
	(Common toEEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME and Mechatronics)					

Course Objectives

- The Background and mindset of Devops
- To enable students appreciate the agile led development environment.
- To give the students a perspective to grasp the need for Minimum viable product led development using Sprints.
- To enable students acquire fundamental knowledge of CI/CD and CAMS.
- To enable learners realize various aspects of DevOps Ecosystem.

Course Outcomes

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

CO1 - Explain traditional software development methodologies like waterfall.

CO2 - Apply the Agile Methodology and comparing various other software development models with agile.

CO3 - Explain implementing Continuous Integration and Continuous Delivery.

CO4 - Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing).

CO5 - Create quick MVP prototypes for modules and functionalities.

UNIT I TRADITIONAL SOFTWARE DEVELOPMENT(9 Hrs)

The Advent of Software Engineering - Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation - Developers vs IT Operations conflict.

UNIT II RISE OF AGILE METHODOLOGIES**(9 Hrs)**

Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan

UNIT III INTRODUCTION DEVOPS (9 Hrs)

Introduction to DevOps - Version control - Automated testing - Continuous integration - Continuous delivery - Deployment pipeline - Infrastructure management – Databases

UNIT IV PURPOSE OF DEVOPS**(9 Hrs)**

Minimum Viable Product- Application Deployment- Continuous Integration- Continuous Delivery.

UNIT V CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING)**(9 Hrs)**

CAMS – Culture, CAMS – Automation, CAMS – Measurement, CAMS – Sharing, Test-Driven Development, Configuration Management-Infrastructure Automation- Root Cause Analysis- Blamelessness- Organizational Learning

Text Books

1. Dev Ops – Volume 1 , Pearson and Xebia Press
2. Grig Gheorghiu, Alfredo Deza, Kennedy Behrman, Noah Gift, Python for DevOps,2019

Reference Books

1. The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
2. What is DevOps? - by Mike Loukides
3. Joakim Verona, Practical DevOps, 2016.

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	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

U19ITO77	AUGMENTED AND VIRTUAL REALITY	L	T	P	C	Hrs
	(Common to EEE, ICE, MECH, CIVIL, CCE and BME)	3	0	0	3	45

Course Objectives

- To learn basics of VR and AR systems
- To know about basic Augment reality functions
- To know about basic Virtual reality functions
- To know about Virtual reality environment and steps to work on it
- To learn various application on AR and VR

Course Outcomes

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

CO1 - Understand the concepts of VR

CO2 - Work on different VR modelling Process

CO3- Learn applications of virtual reality environment

CO4- Understand and work on Augmented Reality environment

CO5 - Work on applications related to VR and AR

UNIT I VIRTUAL REALITY AND 3D COMPUTER GRAPHICS (9Hrs)

Introduction - Benefits of virtual reality - The Virtual world space – Positioning the virtual observer – Stereo perspective projection – 3D clipping – Color Theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms

UNIT II VR MODELLING PROCESS (9Hrs)

Geometric modeling – kinematics modeling- physical modeling – behaviour modeling – model Management.

UNIT III CONTENT CREATION CONSIDERATIONS FOR VR (9Hrs)

Methodology and terminology - user performance studies - VR health and safety issues – Usability of virtual reality system - cyber sickness -side effects of exposures to virtual reality environment

UNIT IV AUGMENTED REALITY (AR) (9Hrs)

Introduction – Benefits of AR – Key players of AR technology - Understanding Augmented reality - Working with AR and System structure

UNIT -V APPLICATIONS ON VR (9Hrs)

Medical applications- robotics applications- Advanced Real time Tracking-other applications- games, movies, simulations

Text Books

1. Kelly S. Hale , Kay M. Stanney," Handbook of Virtual Environments: Design, Implementation, and Applications", Human Factors and Ergonomics ,Second Edition , 2014.
2. C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Gregory, John Wiley and Sons, Inc., Second Edition, 2008.
3. Jason Jerald, "The VR Book: Human-Centred Design for Virtual Reality". Association for Computing Machinery and Morgan and Claypool, New York, 2015.

Reference Books

1. Dieter Schmalstieg and Tobias Hollerer, "Augmented Reality: Principles and Practice (Usability)", Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability)", Addison-Wesley Professional; 1 edition, 2016.
3. Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", O'Reilly Media, 1st edition, 2015.
4. Tony Parisi, "Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages", O'Reilly Media, 1st edition, 2014.

Web References

1. <https://www.coursera.org/courses?query=augmented%20reality>
2. <https://nptel.ac.in/courses/106/106/106106138/>
3. <http://www.vrmedia.it/en/xvr.html>
4. <http://www.hitl.washington.edu/artoolkit/>

COs/POs/PSOs Mapping

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

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

U19IC075**INDUSTRIAL AUTOMATION**

L	T	P	C	Hrs
3	0	0	3	45

(Common toEEE, ECE, CSE, MECH, IT,
CIVIL, CCE, BME and Mechatronics)

Course Objectives

- To know about the design of a system using PLC.
- To study about PLC Programming
- To study knowledge on application of PLC
- To have an exposure SCADA architecture
- To know about the fundamentals of DCS.

Course Outcomes

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

CO1- Know the fundamentals of data networks and Understand working of PLC,I/O modules of PLC, automation and applications in industry.

CO2- Know about the design of systems using PLC and PLC programming.

CO3- Acquire knowledge on application of PLC

CO4- Know about the SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software.

CO5- Know the fundamentals of DCS.

UNIT I PLC ARCHITECTURE**(9 Hrs)**

Introduction and overview of Industrial automation – Block diagram of PLC – different types of PLC – Type of input and output – Introduction to relay logic- Application of PLC.

UNIT II PLC PROGRAMMING**(9**

Hrs) Introduction to Ladder logic programming – Basic instructions – Timer and Counter instruction Arithmetic and logical instruction – MCR, PID controller and other essential instruction sets - Case studies and examples for each instruction set.

UNIT III APPLICATION OF PLC**(9 Hrs)**

Introduction to high level PLC language – Programming of PLC using simulation software – Real time interface and control of process rig/switches using PLC.

UNIT IV INTRODUCTION OF SCADA**(9 Hrs)**

Introduction to DCS and SCADA - Block diagram – function of each component – Security objective – Operation and engineering station interface – Communication requirements.

UNIT V DISTRIBUTED CONTROL SYSTEM**(9 Hrs)**

Development of different control block using DCS simulation software – Real time control of test rigs using DCS. Introduction to HART, Field bus and PROFIBUS – Application and case studies of large scale process control using DCS.

Text Books

1. John W. Webb and Ronald A Reis, Programmable Logic Controllers - Principles and Applications, Prentice Hall Inc., New Jersey, 5th Edition, 2002.
2. Lukcas M.P, Distributed Control Systems, Van Nostrand Reinhold Co., New York, 1986.
3. Frank D. Petruzella, Programmable Logic Controllers, McGraw Hill, New York, 4th Edition, 2010.

Reference Books

1. Deshpande P.B and Ash R.H, Elements of Process Control Applications, ISA Press, New York, 1995.
2. Curtis D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi, 8th Edition, 2005.
3. Krishna Kant, Computer-based Industrial Control, Prentice Hall, New Delhi, 2 nd Edition, 2011.

Web Resources

1. <https://nptel.ac.in/courses/108105063/>
2. <https://www.google.com/amp/s/controlstation.com/what-is-a-distributed-control-system/amp/>
3. <https://nptel.ac.in/courses/108/105/108105088/>
4. https://onlinecourses.nptel.ac.in/noc20_me39/preview
5. https://nptel.ac.in/content/syllabus_pdf/108105088.pdf.

COs/POs/PSOs Mapping

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

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

U19CEO76	GLOBAL WARMING AND CLIMATE CHANGE (Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS and FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basics and importance of global warming.
- Gain adequate knowledge about the characteristic of atmosphere components.
- Gain knowledge about impact of climate change.
- Gain knowledge about the Changes in Climate and Environment
- Impart knowledge about the mitigation measures

Course Outcomes

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

CO1-Understand the concept and effects of global warming(**K2**)

CO2-Understand Climate system, earth's atmosphere and its components.(**K2**)

CO3-Analyze the Impacts of Climate Change on various sectors(**K4**)

CO4-Assess the concept about carbon credit and clean development mechanism.(**K3**)

CO5-Understand climate changes, its impact and mitigation activities.(**K2**)

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I EARTH'S CLIMATE SYSTEM(9 Hrs)

Ozone layer-Role of ozone in environment-ozone depleting -Green House gases- Effects of Greenhouse Gases- Global Warming -Hydrological Cycle – Radiative Effects and Carbon Cycle.

UNIT II ATMOSPHERE AND ITS COMPONENTS (9 Hrs)

Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE(9 Hrs)

Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV OBSERVED CHANGES AND ITS CAUSES(9 Hrs)

Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks –The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India .

UNIT V CLIMATE CHANGE AND MITIGATION MEASURES(9 Hrs)

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels —Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices–Carbon sequestration – Carbon capture and storage (CCS) – International and Regional cooperation-Remedial measures.

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change,Oxford University Press 2020.
2. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
3. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
4. Andrew Dessler and Edward A. Parson"The Science and Politics of Global Climate Change"2009
5. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. Jason Smerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. van Dam,(2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press,.

Web References

1. <https://nptel.ac.in/courses/105102089/>
2. <https://www.warmheartworldwide>
3. <https://nptel.ac.in/content/storage>

COs/POs/PSOs Mapping

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

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

U19ADO73	DATA SCIENCE APPLICATION OF NLP	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME and Mechatronics)	3	0	0	3	45

Course Objectives

- To introduce the fundamental concepts and techniques of Natural language Processing(NLP)
- To analyzing words based on Text processing.
- To analyzing words based on Morphology.
- To examine the syntax and language modeling
- To get acquainted with syntax and semantics

Course Outcomes

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

CO1 - Understand the principles and process the Human Languages such as English using computers. **(K2)**

CO2 - Creating CORPUS linguistics based on digestive approach (Text Corpus method). **(K2)**

CO3 - Demonstrate the techniques for text-based Processing of NLP with respect to morphology. **(K4)**

CO4 - Perform POS tagging for a given natural language. **(K3)**

CO5 - Check the syntactic and semantic correctness of sentences using grammars and labelling. **(K3)**

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

Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, and machine translation.

UNIT II TEXT PROCESSING**(9 Hrs)**

Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis.

UNIT III MORPHOLOGY**(9 Hrs)**

Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers.

UNIT IV LEXICAL SYNTAX AND LANGUAGE MODELING**(9 Hrs)**

Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multi-word Expressions - The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

UNIT V SYNTAX AND SEMANTICS**(9 Hrs)**

Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense. Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs. Applications of NLP.

Text Books

1. Dan Jurafsky, James H. Martin, "Speech and Language Processing", Third Edition, Prentice Hall, 2018.
2. Emily Bender, "Linguistics Fundamentals for NLP", Morgan Claypool Publishers, 2013.
3. Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press, 2019.

Reference Books

1. Chris Manning, Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
2. Cole Howard, Hobson Lane, Hannes Hapke, "Natural Language Processing in Action" Manning Publication 2019.
3. Li Deng, Yang Liu "Deep Learning in Natural Language Processing" Springer, 2018.
4. Tom Hoobyar, Tom Dotz, Susan Sanders, "NLP The Essential Guide to Neuro-Linguistic Programming", William Morrow Paperbacks, 2013.
5. Kate Burton, "Coaching With NLP For Dummies", Wiley, 2011.

Web Resources

1. <https://machinelearningmastery.com/natural-language-processing/>
2. <https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1>
3. <https://www.nlp.com/what-is-nlp/>

COs/POs/PSOs 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

ARTIFICIAL INTELLIGENCE APPLICATIONS**U19ADO74**(Common to EEE, ECE, CSE, IT, ICE,
MECH, CIVIL, CCE and 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 Learning? - Drawbacks of deep learning.

UNIT IV ROBOTIC PROCESS AUTOMATION**(9 Hrs)**

RPA - pros and cons of RPA - Determine the right function to automate - assess the processes - RAP and AI - RPA in the real world.

UNIT V NATURAL LANGUAGE PROCESSING**(9 Hrs)**

Challenges of NLP - Understanding How AI translated Language - NLP in real World - Voice Commerce - Virtual assistants – Chatbot - Future of NLP - The Future of AI.

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing" Third Edition. 2000.
2. S. Kanimozhi Suguna, M. Dhivya, Sara Paiva, "Artificial Intelligence (AI) Recent Trends and Applications" CRC Press, 2021.
3. Navin Sabharwal; Amit Agrawal, "Cognitive Virtual Assistants Using Google Dialogflow" Apress, 2020.

Reference Books

1. Durkin, J., "Expert systems Design and Development", Macmillan, 1994.
2. Peter Jackson, "Introduction to Expert Systems", Addison Wesley Longman, 1999.
3. Amir Shevat, "Designing Bots: Creating Conversational Experiences" O'Reilly, 2017.
4. Anik Das and Rashid Khan, "Build Better Chatbots: A Complete Guide to Getting Started with Chatbots" Apress, 2017.
5. Akhil Mittal "Getting Started with Chatbots: Learn and create your own chatbot with deep understanding of Artificial Intelligence and Machine Learning" BPB Publications, 2019

Web Resources

1. <https://www.javatpoint.com/application-of-ai>
2. https://pytorch.org/tutorials/beginner/chatbot_tutorial.html
3. <https://www.mygreatlearning.com/blog/basics-of-building-an-artificial-intelligence-chatbot/>
4. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-3-reasoning-goal-trees-and-rule-based-expert-systems/>
5. <http://www.umsl.edu/~joshik/msis480/chapt11.htm>

COs/POs/PSOs Mapping

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

SEMESTER VIII

U19CST81	BLOCKCHAIN AND CRYPTOGRAPHY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To understand about Bitcoin, Crypto currency, Ethereum and create own Blockchain network application.
- To understand cryptography concepts.
- To Understand Public Key Cryptography and Key management

Course Outcomes

After completion of the course, the students should be able to:

CO1 - Explain design principles of Bitcoin and Ethereum. Explain Nakamoto consensus.

CO2 - Explain the Simplified Payment Verification protocol. List and describe differences between proof-of-work and proof-of-stake consensus.

CO3 - Design, build, and deploy a distributed application. Evaluate security, privacy, and efficiency of a given blockchain system.

CO4 - Explain cryptography concepts.

CO5 - Identify and investigate public key cryptography and key management concepts.

UNIT I BASICS (9 Hrs)

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

UNIT II BLOCKCHAIN (9 Hrs)

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

UNIT III CRYPTOCURRENCY AND CRYPTOCURRENCY REGULATION(9 Hrs)

History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin. Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain.

UNIT IV INTRODUCTION TO CRYPTOGRAPHY(9 Hrs)

Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks-Dimensions of Cryptography, Classical Cryptographic Techniques - Block Ciphers (DES, AES) : Feistel Cipher Structure, Simplified DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations.

UNITV PUBLIC-KEY CRYPTOGRAPHY AND KEY MANAGEMENT (9 Hrs)

Public-Key Cryptography: Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Elgamal Algorithm, Elliptic Curve Cryptography, Key Management: Key Distribution Techniques, Kerberos.

Text books

1. Douglas Robert Stinson and Maura Paterson, "Cryptography: Theory and Practice", CRC press, 2018.
2. Imran Bashir, "Mastering Blockchain: Deeper insights into decentralization, cryptography", Packet Publishing Ltd, Kindle Edition, 2017.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, Kindle Edition, 2016.

Reference books

1. Imran Bashir, "Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more", Packt Publishing Limited, 3rd Edition, 2020.
2. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, 2nd Edition 2017.
3. Keith M. Martin, "Everyday Cryptography: Fundamental Principles & Applications", Oxford University Press, First edition 2016.
4. Dr. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger", Yellow paper, 2014.
5. Dr. T R Padmanabhan C K Shyamala, N Harini, "Cryptography and Security", Wiley, 1st Edition, 2011.

Web Resources

1. <http://chimera.labs.oreilly.com/books/1234000001802/ch08.html>
2. <https://bitcoin.org/bitcoin.pdf>
3. <https://www.geeksforgeeks.org/introduction-to-crypto-terminologies>
4. <https://complyadvantage.com/knowledgebase/crypto-regulations/cryptocurrency-regulations-india>
5. <https://www.proofpoint.com/us/threat-reference/encryption>

COs/POs/PSOs Mapping

CO'S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
1	1	1	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

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

U19CSP81	ENTREPRENEURSHIP MANAGEMENT	L	T	P	C	Hrs
		0	0	2	1	45

Course Objectives

- To develop a clear understanding on Time Management, Stress Management and Networking Skills
- To understand the significance of Finance Skills, Branding, and Sales Skills for an Entrepreneur
- To develop an ability to identify the critical challenges hindering growth of entrepreneurs
- To examine the strategies to handle the entrepreneurial challenges
- 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** - Demonstrate the acquisition of time management, stress handling and networking skills
- CO2** - Practice cash management, brand building and enhancing turnover.
- CO3** - Identify the key challenges faced by entrepreneurs.
- CO4** - Be familiar with ways to handle the key challenges.
- CO5** - Understand various schemes and subsidies that are offered by various Government agencies for the benefit of entrepreneurs in general, and women entrepreneurs in particular.

UNIT I: ENTREPRENEURIAL SKILLS 1**(6 Hrs)**

Time Management – Priority Planning – Defining Milestones (Immediate, Very Short-Term, Short Term and Medium Term) – Addressing the issue of ‘procrastination’ – Timely Execution of Plans.

Stress Handling – Coping with the stress – Strategies to handle rejections – Addressing slow progress issues

Networking – Key to Success – Power of Referral and Word of Mouth.

UNIT II: ENTREPRENEURIAL SKILLS 2**(6 Hrs)**

Financial Skills – Cash Management – Problems of Poor Cash Management – Learning to be Frugal.

Branding – Building a ‘niche’ follower for your product/service – Developing and Establishing a Brand

Sales skills – KPI of Success of Entrepreneurship – Ensuring Growth in Turnover

UNIT III: ENTREPRENEURIAL CHALLENGES: IDENTIFYING**(6 Hrs)**

Identifying the typical problems of Entrepreneurs in your industry/service – Key Challenges: Operational Challenges – Marketing Challenges – Financial Challenges.

UNIT IV: ENTREPRENEURIAL CHALLENGES: HANDLING**(6 Hrs)**

Challenges Handling – Synergy Creation – Networking with Successful people in the industry – Learning from Best Practices – Understanding the Market Needs and Addressing them adequately – Financial Planning – Avoiding ‘Fund Diversions’ – Maintaining Financial integrity.

UNIT V: ENTREPRENEURIAL OPPORTUNITIES**(6 Hrs)**

Awareness of Government Schemes and Subsidies for various Entrepreneurial Categories – Special Schemes for Women Entrepreneurs – Understanding the Procedure and Documentation Process for availing the Government Schemes – Venture Capital – Crowd funding – Angel Investors.

Text Books

1. Storey, D. J., & Greene, F. J. (2010). Small business and entrepreneurship. Financial Times/Prentice Hall.
2. Scarborough, N. M. (2011). Essentials of entrepreneurship and small business management. publishing as Prentice Hall, One Lake Street, Upper Saddle River, New Jersey 07458..

Reference Books

1. Brian Tracy – The Psychology of Selling.
2. Dale Carnegie – How to Win Friends & Influence People.
3. Robert Kiyosaki and Sharon Lechter – Rich Dad, Poor Dad.
4. Reid Hoffman – The Startup of You: Adapt to the Future, Invest in Yourself, and Transform Your Career.
5. Michael E. Gerber – The E-Myth Revisited.
6. Chris Guillebeau – The Art of Non-Conformity.
7. Eric Ries – The Lean Startup.
8. Kevin D. Johnson – The Entrepreneur Mind.

Web Resources

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

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

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

U19CSW81

PROJECT PHASE-II

L	T	P	C	Hrs
0	0	16	8	60

Course Objectives

- To make literature survey.
- To identify problem definition.
- To build a project design.
- To carry out project implementation.
- To perform project testing and documentation.

Course Outcomes

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

CO1 - Use the techniques and skills for the project. **(K3)**

CO2 - Identify, formulate, and solve engineering problems. **(K3)**

CO3 - Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health care, safety and sustainability **(K4)**

CO4 - Develop presentation skills. **(K4)**

CO5 - Develop project management skills. **(K4)**

Exercises

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Reference Books

- Papers published in reputed journals, conferences related to the project

COs/POs/PSOs Mapping

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

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

U19CSS81	SKILL DEVELOPMENT COURSE 10 (NPTEL / MOOC - II)	L 0	T 0	P 0	C -	Hrs 30
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Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

PROFESSIONAL ELECTIVES - V

U19CSE80

ETHICAL HACKING

L	T	P	C	Hrs
3	-	-	3	45

Course Objectives

- Investigate how to attack a computer system.
- Explore low tech hacking techniques Investigate web-based hacking.
- Explore wireless network hacking.
- Investigate Trojans and other attacks.
- Perform penetration testing.

Course Outcomes

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

CO1 - Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system.

CO2- Identify tools and techniques to carry out a penetration testing.

CO3- Critically evaluate security techniques used to protect system and user data.

CO4- Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.

CO5- Develop a practical understanding of the current cyber security issues.

UNIT I (9 Hrs)

Ethical Hacking Introduction - Attack Scenarios - Emulating Cyber Attacks - Cyber Laws - Programming (C, Python, Assembly Language Basics, Computer Memory)

UNIT II**(9 Hrs)**

Scope of Hacking Red Team Operations - Purple Team Operation - Bug Bounty Programs- Vulnerability Data Resources – Exploit Databases – Network Sniffing – Types of Sniffing -Promiscuous versus Nonpromiscuous Mode – MITM Attacks – ARP Attacks – Denial of Service Attacks -Hijacking Session with MITM Attack.

UNIT III**(9 Hrs)**

System Exploitation Basic System Exploits - Windows Exploits - Powershell Exploitation - Web Application Exploitation

UNIT IV**(9 Hrs)**

Malware Analysis Study of Malware - Mobile Malware –Ransomware.- Penetration Test – Vulnerability Assessments versus Penetration Test – Pre-Engagement – Rules of Engagement -Penetration Testing Methodologies – OSSTMM – NIST – OWASP.

UNIT V**(9 Hrs)**

Internet-of-Things Introduction - Embedded Devices – Exploitation - Wireless Hacking – Introducing Aircrack- Cracking the WEP – Cracking a WPA/WPA2 Wireless Network Using Aircrack-ng – Evil Twin Attack – Causing Denial of Service on the Original AP – Web Hacking – Attacking the Authentication – Brute Force and Dictionary Attacks.

Text Books

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, Gray Hat Hacking The Ethical Hacker's Handbook, McGraw-Hill, 5th Edition, 2018.
2. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010.
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", CRC Press, 2014.

Reference Books

1. Sean-Philip Oriyano, Hacker Techniques, Tools, and Incident Handling, Jones and Bartlett Learning LLC, 3rd Edition, 2018.
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010.
3. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007.
4. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006.
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003.

Web Resources

1. <https://freedomhacker.net> › Internet Security.
2. <https://www.guru99.com/c-sharp-tutorial.html>.
3. <https://www.w3schools.in/ethical-hacking/>
4. <https://www.javatpoint.com/ethical-hacking-tutorial>
5. https://www.tutorialspoint.com/ethical_hacking/index.htm

COs/POs/PSOs Mapping

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

U19CSE81

DEEP LEARNING

L	T	P	C	Hrs
3	-	-	3	45

Course Objectives

- To present the mathematical, statistical and computational challenges of building neural networks
- To study the concepts of deep neural networks
- 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

CO2 - Implement various deep learning models

CO3 - Realign high dimensional data using reduction techniques

CO4 - Analyze optimization and generalization in deep learning

CO5 - Explore the deep learning applications

UNIT I INTRODUCTION(9 Hrs)

Introduction to Machine Learning - Linear Models: SVMs and Perceptrons, Logistic Regression - Introduction to Neural Nets: Shallow Network Computes - Training a network: loss functions, Back Propagation and Stochastic Gradient Descent- Neural Networks as universal function approximates.

UNIT II DEEP NEURAL 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 Networks- Convolutional 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 Convolutional Neural Networks: Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

UNIT IV OPTIMIZATION ON DEEP LEARNING**(9 Hrs)**

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization- Generalization 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-Vision-Speech-Natural Language Processing Word2Vec - Joint Detection- BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

Text Books

1. "Introduction to Deep Learning" Eugene Charniak, MIT Press January 2019.
2. Neural Networks and Deep Learning" ,Charu C. Aggarwal, Springer, 2018
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.

Reference Books

1. Deep Learning: A Practitioner's Approach Paperback – 1 by Josh Patterson, Adam Gibson September 2017.
2. Deep Learning (Adaptive Computation and Machine Learning series) Hardcover – 18 November 2016 by Ian Goodfellow, Yoshua Bengio, Aaron Courville.
3. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
5. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.

Web Resources

1. <http://deeplearning.net/>
2. <https://www.guru99.com/deep-learning-tutorial.html>.
3. https://en.wikipedia.org/wiki/Deep_learning
4. <https://www.ibm.com/cloud/learn/deep-learning>
5. <https://www.deeplearning.ai/>

COs/POs/PSOs Mapping

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

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

U19CSE82

MOBILE COMPUTING

L	T	P	C	Hrs
3	-	-	3	45

Course Objectives

- To understand the typical mobile networking infrastructure through a popular GSM
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the database issues in mobile environments & data delivery models.
- To understand the ad hoc networks and related concepts.
- To understand the platforms and protocols used in mobile environment.

Course Outcomes

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

CO1 - Think and develop new mobile application.

CO2 - Take any new technical issue related to this new paradigm and come up with a solution(s).

CO3 - Develop new ad hoc network applications and/or algorithms/protocols

CO4 - Understand & develop any existing or new protocol related to mobile environment

CO5 –Understand the current issues in broadcasting and synchronization of data.

UNIT I MOBILE COMMUNICATON**(9 Hrs)**

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT IIMEDIUM ACCESS CONTROL**(9 Hrs)**

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP

UNIT IIIMobile Transport Layer(9 Hrs)

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT IV DATA DISSEMINATION AND SYNCHRONIZATION (9 Hrs)

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols

UNIT V**(9 Hrs)**

Mobile Adhoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, Java Card, Palm OS, Windows CE, Symbian OS, Linux for Mobile Devices, Android.

Text Books

1. Jochen Schiller, —Mobile CommunicationsII, PHI, Second Edition, 2013.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772.

Reference Books

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2004.
2. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028.
3. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, ISBN: 0521817331, Cambridge University Press, Oct 2004.

Web Resources

1. <https://freedomhacker.net> Mobile computing.
2. <https://www.guru99.com/c-sharp-tutorial.html>.
3. <http://developer.android.com/index.html>
4. <http://gecnilokheri.ac.in/GPContent/MOBILE%20COMPUTING%20UNIT-II%206th%20Sem%20CSE-converted.pdf>

COs/POs/PSOs Mapping

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

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

U19CSE83

PERVASIVE COMPUTING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To study the pervasive computing and its applications
- To study the pervasive computing web based applications
- To study voice enabling pervasive computing
- To study PDA in pervasive computing
- To study user interface issues in pervasive computing

Course Outcomes

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

CO1 - Be able to learn pervasive computing devices and interfaces.

CO2 - Be able to learn XML role in pervasive computing.

CO3 - To get clear idea about WAP architecture and security.

CO4 - Be able to learn speech application in pervasive computing.

CO5 - Become familiar with different voice standards. Identify user interface issues in pervasive computing.

UNIT I INFRASTRUCTURE (9 Hrs)

Pervasive computing infrastructure-applications-Device Technology -Hardware, Human-machine Interfaces, Biometrics, and Operating systems–Device Connectivity –Protocols, Security, and Device Management

UNITII WEB BASED APPLICATIONS(9 Hrs)

Pervasive Computing and web based Applications: - XML, XML Schema and DTD document definitions - XSLT transformations and programming - XML and its role in Pervasive Computing - Wireless Application Protocol (WAP) Architecture and Security - Wireless Mark-Up language (WML).

UNIT III VOICE ENABLING PERVASIVE COMPUTING(9 Hrs)

Voice Enabling Pervasive Computing: - Voice Standards - Speech Applications in Pervasive Computing and security. Middleware for Pervasive: Adaptive middleware, Context aware middleware, Mobile middleware, Service Discovery, Mobile Agents.

UNITIV PDAIN PERVASIVE COMPUTING(9 Hrs)

PDA in Pervasive Computing: – Introduction - PDA software Components, Standards, emerging trends - PDA Device characteristics - PDA Based Access Architecture. Security in Pervasive Computing: Security and Privacy in Pervasive Networks, Experimental Comparison of Collaborative Defence Strategies for Network Security.

UNIT V DESIGN OF PERVASIVE COMPUTING SYSTEMS(9 Hrs)

Design of pervasive computing systems, The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, User Interface Issues in Pervasive Computing, Architecture: - Smart Card- based Authentication Mechanisms - Wearable computing Architecture.

Text Books

1. JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaec& Klaus Rindtorff. --- Pervasive Computing Technology and Architecture of Mobile Internet Applications, Addison Wesley, Reading, 2002.
2. Uwe Hansman, LothatMerk, Martin S Nicklous& Thomas Stober: Principles of Mobile Computing, Second Edition, Springer- Verlag, New Delhi, 2003.
3. Jochen Burkhardt, "Pervasive Computing - Technology and Architecture of Mobile Internet Applications", 14th Edition, 2004

Reference Books

1. Rahul Banerjee: Internetworking Technologies: An Engineering Perspective, Prentice –Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5)
2. Rahul Banerjee: Lecture Notes in Pervasive Computing, Outline Notes, BITS-Pilani, 2003.
3. Mohammad S. Obaidat, Mieso Denko, Isaac Woungang, "Pervasive Computing and Networking", 2011.
4. A. Genco and S. Sorce, "Pervasive Systems and Ubiquitous Computin", University of Palermo, 2010.
5. Varuna Godara, "Strategic Pervasive Computing Applications: Emerging Trends", 1st Edition, 2017.

Web Resources

1. <https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing>
2. <https://navveenbalani.dev/index.php/articles/the-complete-pervasive-computing-tutorial/>
3. <https://www.goodreads.com>

COs/POs/PSOs 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	2	1	2	2
2	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
3	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
4	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2
5	3	3	3	-	-	-	-	-	-	2	2	2	1	2	2

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

	L	T	P	C	Hrs
U19CSE84 CYBER SECURITY AND DIGITAL FORENSICS	3	0	0	3	45

Course Objectives

- To define the fundamental ideas behind Cyber Security.
- To define the fundamental ideas behind Cybercrime and cyber Investigations.
- To explain the basic ideas behind Digital Forensics.
- To relate windows systems and artifacts, Linux systems and artifacts.
- To Define Current Computer Forensics Tools.

Course Outcomes

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

CO1 - Explain the core concepts of the cyber security including systems vulnerability scanning and network defence tools.

CO2 - Explain the core concepts of the Cybercrime and cyber Investigations.

CO3 - Illustrate the fundamental concepts of Digital Forensics and demonstrate their use Cyber Security.

CO4 - Relate windows systems and artifacts, Linux systems and artifacts.

CO5 - Advancing towards a Current Computer Forensics Tools.

UNIT I SYSTEMS VULNERABILITY SCANNING AND NETWORK DEFENCE TOOLS (9 Hrs)

Overview of vulnerability scanning - Networks Vulnerability Scanning - Network Sniffers and Injection tools = Firewalls and Packet Filters: Firewall Basics - Packet Filter Vs Firewall - Stateless Vs Stateful Firewalls - Network Address Translation (NAT) and Port Forwarding - Basic of Virtual Private Networks - Linux Firewall - Windows Firewall.

UNIT II INTRODUCTION TO CYBER CRIME, LAW AND CYBER CRIME INVESTIGATION(9 Hrs)

Cyber Crimes - Types of Cybercrime - Traditional Problems Associated with Computer Crime - Introduction to Incident Response - Realms of the Cyber world - Recognizing and Defining Computer Crime - Contemporary Crimes - Contaminants and Destruction of Data - Indian IT ACT 2000 - password Cracking - Keyloggers and Spyware - Virus and Worms - Trojan and backdoors..

UNIT III DIGITAL FORENSIC**(9 Hrs)**

Computer forensics and investigations as a profession - Understanding computer forensics - Understanding case laws - Developing computer forensics resources - Preparing for computer investigations - Understanding law enforcement agency investigations - Following the legal process - Understanding corporate investigations - Establishing company policies - Displaying warning Banners.

UNIT IV WINDOWS SYSTEMS AND ARTIFACTS, LINUX SYSTEMS AND ARTIFACTS(9 Hrs)

Windows Systems and Artifacts: Introduction - Windows File Systems - File Allocation Table - New Technology File System - File System Summary – Registry - Event Logs - Prefetch Files - Shortcut Files - Windows Executables - Linux Systems and Artifacts: Introduction - Linux File Systems - File System Layer - File Name Layer - Metadata Layer - Data Unit Layer - Journal Tools - Deleted Data - Linux Logical Volume Manager - Linux Boot Process and Services.

UNIT V Current Computer Forensics Tools**(9 Hrs)**

Evaluating Computer Forensics Tool Needs - Types of Computer Forensics Tools - Tasks Performed by Computer Forensics Tools - Tool Comparisons - Other Considerations for Tools - Computer Forensics Software Tools -

Command-Line Forensics Tools - UNIX/Linux Forensics Tools - Other GUI Forensics Tools - Computer Forensics Hardware Tools - Forensic Workstations - Using a Write-Blocker.

Text Books

1. John Sammons, "The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics", Syngress , 2nd edition, 2014
2. Mike Shema , "Anti-Hacker Tool Kit ", Publication Mc Graw Hill Indian Edition, 2014.
3. Cory Altheide, Harlan Carvey, "Digital Forensics with Open Source Tools", Syngress imprint of Elsevier, 2011.

Reference Books

6. Gerard Johansen , 'Digital Forensics and Incident Response: Incident response techniques and procedures to respond to modern cyber threats', Packt Publishing Limited; 2nd edition (29 January 2020)
7. William Oettinger, 'Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence', Packt Publishing Limited, 2020
8. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley, 2011.
9. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Fourth Edition, Course Technology, 2009.
10. Angus M. Marshall, "Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, 2008.

Web Resources

1. <https://www.britannica.com/topic/cybercrime>
2. <https://www.guru99.com/digital-forensics>
3. <https://resources.infosecinstitute.com/computer-forensics-tools>
4. <https://resources.infosecinstitute.com/topic/computer-forensics-tools>
5. <https://www.utc.edu/document/71921>

COs/POs/PSOs Mapping

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

PROFESSIONAL ELECTIVES - VI

U19CSE85

QUANTUM COMPUTING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To explain the major concepts in Quantum computing
- To extend quantum circuits and algorithms
- To describe the building blocks of a quantum computer
- To understand the principles, quantum information and limitations of quantum operations formalism
- To discuss the quantum errors and its correction.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1 - Outline the key concepts of Quantum computing

CO2 - Develop logic gate circuits and quantum algorithms

CO3 - List the various quantum computers

CO4 - Discover quantum noise and its operations

CO5 - Illustrate errors and corrections in quantum computing

UNIT I FUNDAMENTAL CONCEPTS**(9 Hrs)**

Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II QUANTUM COMPUTATION**(9 Hrs)**

Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III QUANTUM COMPUTERS**(9 Hrs)**

Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance

UNIT IV QUANTUM INFORMATIONS**(9 Hrs)**

Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information

UNIT V QUANTUM ERROR CORRECTION**(9 Hrs)**

Introduction, Short code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub-Additivity, Data Compression, Entanglement as a physical resource

Text Books

1. Micheal A. Nielsen and Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian Edition, 2002.
2. Bennett C.H., Bernstein E., Brassard G., Vazirani U., The strengths and weaknesses of quantum computation. SIAM Journal on Computing.
3. Phillip Kaye Raymond Laflamme Michele Mosca, “An Introduction to Quantum Computing”, Oxford University Press, 2007.

Reference Books

1. Nayak, Chetan; Simon, Steven; Stern, Ady; Das Sarma, Sankar, "Nonabelian Anyons and Quantum Computation", 2008.
2. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.
3. Clarke, John; Wilhelm, Frank, "Superconducting quantum bits", 2008.
4. William M Kaminsky, "Scalable Superconducting Architecture for Adiabatic Quantum Computation", 2004.
5. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.

Web Resources

1. <https://nptel.ac.in/courses/115101092/Quantumcomputation>.
2. <https://nptel.ac.in/courses/104104082/Quantumcomputing> and information.
3. <https://www.futurelearn.com/courses/intro-to-quantum-computing>.

COs/POs/ PSOs Mapping

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

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

U19CSE86

TRUSTED COMPUTING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To design the goals in the trusted platforms.
- To understand the comprehensive overview of the trust architecture and its applications.
- To experiment with TCG and to implement different tools.
- To demonstrate different encryption algorithms for security purposes.
- To learn about the trusted devices and their maintenance.

Course Outcomes

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

CO1 – Summarize the concept of trust categories.

CO2 – Demonstrate trust architecture and formalization of security architecture.

CO3 – Analyse about the TPM and TCG.

CO4 – Understand about the cryptographic standards.

CO5 – Summarize trusted computing and its administration.

UNIT I INTRODUCTION TO TRUST COMPUTING**(9Hrs)**

Introduction – Trust and Computing – Instantiations – Design and Applications – Progression – Motivating scenarios – Attacks. Design goals of the trusted platform modules. Introduction to simulators – Implementation of attacks.

UNIT II TRUST ARCHITECTURE**(9Hrs)**

Foundations – Design challenges – Platform Architecture – Security architecture – erasing secrets – sources – software threats – code integrity and code loading. Outbound Authentication – Problem – Theory – Design and Implementation - Validation – Process – strategy – Formalizing security properties – Formal verification – other validation tasks – reflection.

UNIT III TCG TCGA**(9Hrs)**

Programming Interfaces To TCG. Experimenting with TCGA/TCG – Desired properties- Lifetime mismatch – Architecture – Implementation – Applications. Writing a TPM device driver- Low level software – Trusted boot – TCG software stack – Using TPM keys. Implementation using simulator tools.

UNIT IV CRYPTOGRAPHIC STANDARDS(9Hrs)

TSS core service – Public key cryptography standard – Architecture – Trusted computing and secure storage – Linking to encryption algorithms – encrypting files and locking data to specific PCs-content protection – secure printing and faxing. Simulation analysis of symmetric and public key cryptographic standards – performance evaluation of these trust models.

UNIT V ADMINISTRATION OF TRUSTED DEVICES**(9Hrs)**

Trusted Computing And Secure Identification Administration of trusted devices – Secure /backup maintenance – assignment of key certificates-secure time reporting-key recovery – TPM tools- Ancillary hardware.

Text Books

1. Xujan Zhou, YueXu, Yuefeng Li, Audun Josang, and Clive Cox. "The state of-the-art in personalized recommender systems for social networking. Artificial Intelligence Review", Issue C, pp.1-14, Springer, 2011.
2. Challener D., Yoder K., Catherman R., Safford D., Van Doorn L. "A Practical Guide to Trusted Computing", IBM press, 2008.
3. Sean W. Smith, "Trusted Computing Platforms: Design and Applications", Springer Science and Business media, 2005.

Reference Books

1. Dengguo Feng, "Trusted Computing" Tsinghua University Press Released December
Publisher(s): De Gruyter, 2017.
2. A Practical Guide to Trusted Computing (IBM Press), December 2007.
3. Trusted Computing Platforms Design and Applications, 2005.
4. Trusted Computing Platforms: TCPA Technology in Context by Pearson Education, July 2002.
5. John Linn, "Trust Models and management in Public Key Infrastructures", November 2000.

Web Resources

1. <https://trustedcomputinggroup.org/>
2. https://en.wikipedia.org/wiki/Trusted_Computing
3. <https://www.techopedia.com/definition/16523/trusted-computing>
4. <https://webstore.ansi.org/industry/software/encryption-cryptography>
5. <https://csrc.nist.gov/Projects/Cryptographic-Standards-and-Guidelines>.

COs/POs/PSOs Mapping

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

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

U19CSE87

CLIENT SERVER COMPUTING

L	T	P	C
3	0	0	3

Course Objectives

- Comprehend the basic concepts of the client-server model
- Describe how the hardware and software are combined to implement client/server computing.
- To expose terminology, concepts and types of servers in client/server architecture.
- Explore the different server operating systems and its components

- Explore about the Impact of Technology & Training and Testing Technology

Course Outcomes

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

CO1 - Understand and analyze about the history of C/S computing.

CO2 - Analyze the different client/server models.

CO3 - Be familiar with the types, features and components of Server in C/S systems.

CO4 - Analyze the different server operating systems and its components.

CO5 - Known about the impact of Technology, Training and Testing Technology.

UNIT I INTRODUCTION TO CLIENT/SERVER COMPUTING (9 Hrs)

Introduction to client/server computing-What is client/server computing-Benefits of client/server computing-Evolution of C/S computing-Hardware trends-Software trends-Evolution of operating systems-Networking (N/W) trends-Business considerations.

UNIT II CLASSIFICATION OF CLIENT / SERVER SYSTEMS (9Hrs)

Two-tire client / Server Model: Hardware and Software Requirements operating system services – Types of clients – Server tier.

Three- Tier client / Server Model: Hardware and Software Requirements – Netware connectivity – Types of Middleware – Database Middleware.

N- Tier client / Server Model: Overview – Benefits – Disadvantages – Components – Tier separations and interaction.

UNIT III SERVERS (9Hrs)

Server Hardware, Categories - Features classes of Server Machines - Server Environment - Network management environment - network Computing Environment - Network Operating Systems - Server requirements, Platform Independence - Transaction Processing and Connectivity - Server Data Management and Access Tools

UNIT IV SERVER OPERATING SYSTEM (9Hrs)

Server operating system: OS/2 2. 0-Windows new technology-Unix based OS-Server requirements: Platform independence-Transaction processing-Connectivity-Intelligent database-Stored procedure-Triggers-Load leveling-Optimizer-Testing and diagnostic tools – Backup&recovery mechanisms.

UNIT V IMPACT OF TESTING TECHNOLOGY (9Hrs)

Client / Server Administration and Management – Client /Server Software – Testing techniques – Testing aspects – Measures of Completeness – Testing Client / Server Application.

Text Books

1. Munesh Chandra Trivedi, "Client/Server Computing", Khanna Book Publishing Company, Second edition, 2014.
2. Chandra YadavSubhash, "Introductions to Client Server Computing", New Age International, 2009.
3. Dawana Travis Dewire, "Client/Server Computing", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

Reference Books

1. Dr. S.T. Deepa, Mrs.T.Yegammai, "Client Server Computing", Charulatha Publications Private Limited, 2019.
2. Patrick Smith, Steve Guengerich, " Client/Server Computing, Prentice Hall India Learning Private Limited, 2nd edition, 2011.
3. Robert Orfali, Dan Harkey and Jeri Edwards, "Essential Client/Server SurvivalGuide", Galgotia Publications, New Delhi, 2001.
4. Joel P Kaster, "Understanding Thin Client/Server Computing", Prentice Hall of India, New Delhi, 2001.
5. Karen Watterson, "Client/Server Technology for Managers ", Addition-Wesley, USA, 1996.

Web Resources

1. <http://www.studentshangout.com/topic/142825-client-server-computing-notes>

2. <http://www.slideshare.net/jayasreep3/client-servercomputing>
3. <http://www.infomotions.com/musings/waves/clientservercomputing.html>
4. <https://teachcomputerscience.com/client-server-architecture/>
5. <https://nptel.ac.in/content/storage2/courses/106105087/pdf/m17L41.pdf>

COs/POs/ PSOs Mapping

COs	Program Outcomes(POs)												Program Specific Outcomes(PSOs)		
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3	3	2	2	2	2	2	1	-	-	2	2	-	3	3	3
4	2	2	3	3	3	2	1	-	-	2	2	-	2	2	3
5	3	2	3	3	3	3	1	-	-	2	2	-	2	2	2

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

U19CSE88

HUMAN COMPUTER INTERACTION

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To Learn the foundations of Human Computer Interaction
- To be familiar with the design technologies for individuals and persons with disabilities
- To demonstrate the communication using multimedia and www.
- To study about mobile ecosystem.

- To learn about user interface.

Course Outcomes

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

CO1 - Collect fundamentals of human interaction and problem solving

CO2 - Design effective HCI for individuals..

CO3 - Enumerate the cognitive computerized models for HCI

CO4 - Design mobile application framework using HCI tools.

CO5 - Develop web interface using various tools

UNIT I INTRODUCTION

(9 Hrs)

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics– styles – elements – interactivity-Paradigms.

UNIT II INTERACTIVE DESIGN AND RULE

(9Hrs)

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III COGNITIVE COMPUTERIZED MODELS

(9Hrs)

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV APPLICATION FRAMEWORK

(9Hrs)

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT V DESIGNING WEB INTERFACES

(9Hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Text Books

1. Interaction Design: Beyond Human-Computer Interaction by Helen Sharp & Jenny Preece & Yvonne Rogers 2019.
2. Interaction Design - Beyond Human-Computer Interaction, 4th Edition, 2016
3. Computer-Human Interaction. Cognitive Effects of Spatial Interaction, Learning, and Ability by Theodor Wyeld & Paul Calder & Haifeng Shen (eds.) ,2015
4. Designing Interactive Systems: A Comprehensive Guide to HCI, UX and Interaction Design. by David R. Benyon 2013.
5. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004.

Reference Books

1. Brian Fling, "Mobile Design and Development", Fourth Edition, O'Reilly Media Inc., 2018.
2. Modular Design Frameworks: A Projects-based Guide for UI/UX Designers by Cabrera & James 2017.
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edit ion, O'Reilly 2009.
4. Research Methods in Human-Computer Interactionby Jonathan Lazar, 2009.
5. Interaction Design: Beyond Human-Computer Interaction byYvonne Rogers, 2001.

Web Resources

1. <https://www.interaction-design.org/literature/topics/human-computer-interaction>
2. <https://www.hcii.cmu.edu/academics/mhci>

3. <https://www.rit.edu/study/human-computer-interaction-ms>
4. <https://www.udacity.com/course/human-computer-interaction--ud400>
5. <https://xd.adobe.com/ideas/principles/human-computer-interaction/>

COs/POs/PSOs Mapping

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

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

U19CSE89**NATURAL LANGUAGE PROCESSING****L TP C Hrs
3 003 45****Course Objectives**

- To learn the syntax and semantics of Natural Language Processing.
- To apply transformations morphology and part of speech tagging
- To design various transforming models.
- To learn the syntax parsing techniques.
- To acquire the knowledge of applications of NLP.

Course Outcomes

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

- CO1** – Outline Natural Language Processing tasks in syntax, semantics and pragmatics.
- CO2** – Explain morphology and Part of Speech Tagging.
- CO3** – Explain various Transformations based Models.
- CO4** – Demonstrate the usage of syntax parsing techniques.
- CO5** – Explain the use of semantic analysis methods and summarize the application of NLP.

UNIT I INTRODUCTION OF NLP

(9 Hrs)

Natural Language processing tasks in syntax, semantics and pragmatics–Issues- Applications-The role of machine learning-Probability Basics–Information theory– Collocations- N-gram Language Models –Estimating parameters and smoothing- Evaluating language models

UNIT II MORPHOLOGY AND PART OF SPEECH TAGGING

(9 Hrs)

Linguistic essentials-Lexical syntax – Morphology and Finite State Transducers –Part of speech Tagging - Rule-Based Part of Speech Tagging -Markov Models - Hidden Markov Models–Transformation based Models- Maximum Entropy Models –Conditional Random Fields.

UNIT III SYNTAX PARSING

(9 Hrs)

Syntax Parsing-Grammar formalisms and tree banks –Parsing with Context Free Grammars- Features and Unification –Statistical parsing and probabilistic CFGs (PCFGs)Lexicalized PCFGs

UNIT IV SEMANTIC ANALYSIS

(9 Hrs)

Representing Meaning –Semantic Analysis-Lexical semantics–Word-sense disambiguation – Supervised– Dictionary based and Unsupervised Approaches – Compositional semantics-Semantic Role Labeling and Semantic Parsing– Discourse Analysis.

UNIT V APPLICATIONS OF NLP

(9 Hrs)

Named entity recognition and relation extraction- IE using sequence labelling - Machine Translation(MT)- Basic issues in MT - Statistical translation-word alignment - phrase-based translation–Question Answering.

Text Books

1. Nitin Indurkha, Fred J. Damerau “Handbook of Natural Language Processing”, Second Edition, CRC Press, 2010.
2. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O'Reilly Media, First Edition, 2009.
3. James Allen, “Natural Language Understanding”, Pearson Education, 2003.

Reference Books

1. Roland R. Hausser, “Foundations of Computational Linguistics: Human- Computer Communication in Natural Language”, Paperback, MIT Press, 2011.
2. Pierre M. Nugues, “An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies)”, Soft cover reprint, 2010.
3. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O'Reilly Media, First Edition, 2009.
4. Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Second Edition, Prentice Hall, 2008.
5. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:, 1999.

Web Resources

1. <https://nptel.ac.in/courses/106/105/106105158/>
2. <https://www.kaggle.com/learn/natural-language-processing>
3. <https://www.javatpoint.com/nlp>
4. <https://www.coursera.org/in>
5. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-863j-natural-language-and-the-computer-representation-of-knowledge-spring-2003/>

COs/POs/PSOs Mapping

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

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