SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

B.TECH.

COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS 2023
(R - 2023)

CURRICULUM

Head of the Department

Dr. N. DANAPAQUIAME
Professor & Head
Department of Computer Science of Engineering
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry - 605 107.

COLLEGE VISION AND MISSION

VISION

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

MISSION

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

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

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

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

DEPARTMENT VISION AND MISSION

VISION

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

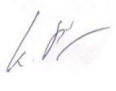
MISSION

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

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

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

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



PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

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

PO2: Problem analysis:

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

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

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

PO5: **Modern tool usage:**

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

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

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

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

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

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

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

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

Sl. No.	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	**15**
2	Basic Science Courses (BS)	**20**
3	Engineering Science including workshop, drawing, basics of electrical / mechanical / computer etc. (ES)	**18**
4	Professional Core Courses (PC)	**77**
5	Professional Electives Courses (PE)	**18**
6	Open Electives Courses (OE)	**9**
7	Project Work and Internship (PA)	**13**
8	Ability Enhancement Courses (AEC*)	
9	Mandatory Courses (MC*)	-
Total		**170**

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

Sl. No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	5	3	1	1	2	-	-	3	**15**
2	Basic Sciences (BS)	4	7	5	4	-	-	-	-	**20**
3	Engineering Sciences (ES)	9	5	-	4	-	-	-	-	**18**
4	Professional Core (PC)	3	8	17	11	12	15	11	-	**77**
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	**18**
6	Open Electives (OE)	-	-	-	-	3	3	3	-	**9**
7	Project Work (PA)	-	-	-	-	1	1	2	8	**12**
8	Internship (PA)	-	-	-	-	-	-	1	-	**1**
9	Employability Enhancement Courses (AEC)*	-	-	-	-	-	-	-	-	-
10	Mandatory Courses (MC)*	-	-	-	-	-	-	-	-	-
Total		**21**	**23**	**23**	**23**	**21**	**22**	**20**	**17**	**170**

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

HONOURS DEGREE PROGRAMME:

The student is permitted to opt for earning an *honours degree* in the same discipline ofengineeringin addition to the degree in his/her own discipline. To earn an honours degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA* (*for lateral entry) of not less than 8.0.The prescribed courses offered for Honours degree are given in **Annexure IV**.

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics - I	BS	3	1	0	4	25	75	100
2	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
3	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
4	U23CSTC02	Problem Solving Approach	PC	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values- II	HS	2	0	0	2	25	75	100
Theory Cum Practical										
6	U23ENBC01	Communicative English - I	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
9	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CSC1XX	Certification Course – I **	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CSM101	Induction Programme	MC	2 Weeks			-	-	-	-
							21	425	575	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics - II	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
4	U23CSTC03	Data Structures	PC	3	0	0	3	25	75	100
5	U23ITTC01	Digital Design and System Architecture	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23ENBC02	Communicative English - II	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
8	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC02	Data Structures Laboratory	PC	0	0	2	1	50	50	100
10	U23ITPC01	Digital Design and System Architecture Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC2XX	Certification Course – II **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							23	575	625	1200

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

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23CST301	Embedded System Architecture and Interfacing	PC	3	0	0	3	25	75	100
3	U23CST302	Software Engineering and Testing	PC	3	0	0	3	25	75	100
4	U23CSDC01	Automata and Compiler Design	PC	3	0	0	3	25	75	100
5	U23CST303	Computer Networks	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSBC01	Design and Analysis of Algorithms	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC01	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23CSP301	Embedded System Architecture and Interfacing Laboratory	PC	0	0	2	1	50	50	100
10	U23CSP302	Software Engineering and Testing Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC3XX	Certification Course – III**	AEC	0	0	4	-	100	-	100
12	U23CSS301	Skill Enhancement Course – I*	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23CSM303	Climate Change	MC	2	0	0	-	100	-	100
							23	675	625	1300

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC05	Discrete Mathematics and Graph Theory	BS	3	1	0	4	25	75	100
2	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
3	U23CSTC04	Database Management Systems	PC	3	0	0	3	25	75	100
4	U23CSTC05	Operating Systems	PC	3	0	0	3	25	75	100
5	U23CSE4XX	Professional Elective I #	PE	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSB401	Android Programming	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U23ITPC02	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC03	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
10	U23CSPC04	Operating Systems Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC4XX	Certification Course – IV **	AEC	0	0	4	-	100	-	100
12	U23CSS402	Skill Enhancement Course -II *	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23CSM404	Right to Information and Good Governance	MC	2	0	0	0	100	-	100
							23	675	625	1300

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

**** Skill Enhancement Courses (1and 2) are to be selected from the list given in Annexure III***

SEMESTER – V										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23CST504	Cloud Computing	PC	3	0	0	3	25	75	100
3	U23CSTC06	Artificial Intelligence	PC	3	0	0	3	25	75	100
4	U23CSTC07	Web Designing	PC	3	0	0	3	25	75	100
5	U23CSE5XX	Professional Elective II #	PE	3	0	0	3	25	75	100
6	U23XXOCXX	Open Elective I $	OE	3	0	0	3	25	75	100
Practical										
7	U23CSP503	Cloud Computing Laboratory	PC	0	0	2	1	50	50	100
8	U23CSPC05	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
9	U23CSPC06	Web Designing Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CSW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CSC5XX	Certification Course –V **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITTC03	Machine Learning	PC	3	0	0	3	25	75	100
2	U23CST605	Designing and Building of Bots	PC	3	0	0	3	25	75	100
3	U23CST606	Animation and Visual Effects	PC	3	0	0	3	25	75	100
4	U23CSE6XX	Professional Elective III #	PE	3	0	0	3	25	75	100
5	U23XXOCXX	Open Elective II $	HS	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSB602	Blockchain Concepts and Applications	PC	2	0	2	3	50	50	100
Practical										
7	U23ITPC03	Machine Learning Laboratory	PC	0	0	2	1	50	50	100
8	U23CSP604	Designing and Building of Bots Laboratory	PC	0	0	2	1	50	50	100
9	U23CSP605	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CSW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CSC6XX	Certification Course – VI **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	625	575	1200

$ Open electives are to be selected from the list given in Annexure II

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CST707	Internet of Things and its Applications	PC	3	0	0	3	25	75	100
2	U23CST708	Data Analytics	PC	3	0	0	3	25	75	100
3	U23CST709	Neural Networks and Deep Learning	PC	3	0	0	3	25	75	100
4	U23CSE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXOCXX	Open Elective III $	OE	3	0	0	3	25	75	100
Practical										
6	U23CSP706	Internet of Things and its Applications Laboratory	PC	0	0	2	1	50	50	100
7	U23CSP707	Data Analytics Laboratory	PC	0	0	2	1	50	50	100
Project Work										
8	U23CSW703	Project phase – I	PA	0	0	4	2	50	50	100
9	U23CSW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23CSE8XX	Professional Elective V #	PE	3	0	0	3	25	75	100
3	U23CSE8XX	Professional Elective VI #	PE	3	0	0	3	25	75	100
Project Work										
4	U23CSW805	Project phase – II	PA	0	0	16	8	50	100	150
							17	125	325	450

ANNEXURE - I
PROFESSIONAL ELECTIVE COURSES

Professional Elective –I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE401	Programming in C++
2.	U23CSE402	Computer Graphics
3.	U23CSE403	Distributed Systems
4.	U23CSE404	IoT Design Protocols
5.	U23CSE405	UI / UX Development
Professional Elective –II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE506	Programming in C#
2.	U23ECEC01	Digital Image Processing
3.	U23CSE507	Network Security
4.	U23CSE508	Open-Source Programming for IOT
5.	U23CSE509	Software Project Management
Professional Elective –III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE610	Haskell Programming
2.	U23CSE611	Game Design and Development
3.	U23CSE612	NOSQL Database
4.	U23CSE613	IOT challenges and Future
5.	U23CSE614	Server-Side Scripting Languages
Professional Elective –IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSEC01	Go Programming
2.	U23CSE715	Augmented Reality
3.	U23CSE716	Fundamentals of 5G Network
4.	U23CSE717	Digital Security
5.	U23CSE718	Drone Technology
Professional Elective –V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE819	Redux Programming
2.	U23CSE820	Virtual Reality
3.	U23CSE821	Social Networking
4.	U23CSEC02	Introduction to Industry 4.0
5.	U23CSE822	Generative AI and its application
6.	U23CSE823	Testing and Automation
Professional Elective –VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE824	Kotlin Programming
2.	U23CSE825	High Performance Computing
3.	U23CSE826	Quantum Information Science
4.	U23CSE827	IOT Security
5.	U23CSE828	Open AI

ANNEXURE - II
OPEN ELECTIVE COURSES (R-2023)

Open Elective – I / Open Elective – II				
S. No	**Course Code**	**Course Title**	**Offering Department**	**Eligible Department to opt OE course**
1	U23HSOC01	Intellectual Property Rights	**MBA**	**Common to B. Tech** (Offered in Semester V for EEE, ECE, ICE, CIVIL, BME, CCE) (Offered in Semester VI for CSE, IT, MECH, Mechatronics, AI&DS)
2	U23HSOC02	New Product Development		
3	U23HSOC03	Finance for Engineers		
4	U23HSOC04	Economics for Engineers		
5	U23HSOC05	Marketing Management		
Open Elective – I / Open Elective – II (Offered in Semester V for CSE, IT, MECH, Mechatronics, AI&DS) (Offered in Semester VI for EEE, ECE, ICE, CIVIL, BME, CCE)				
1	U23EEDC01	Electrical Safety Engineering	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, AI&DS
2	U23EEOC01	Solar Photovoltaic Fundamental and Applications	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, AI&DS
3	U23ECOC01	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U23ECOC02	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U23CSOC01	Structured Query Language	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U23CSOC02	Cloud Technologies	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U23ITOC01	Database System: Design & Development	IT	EEE, ECE, ICE, BME,MECH,CIVIL, MECHATRONICS
8	U23ITOC02	Computer Hardware and Troubleshooting	IT	EEE, ECE, ICE, CCE, BME, MECH, MECHATRONICS
9	U23ICOC01	Neural Networks and Fuzzy Logic	ICE	CSE, IT, MECH, CCE, CSE&BS, AI&DS
10	U23ICOC02	Sensors for Engineering Applications	ICE	EEE, ECE, CSE, IT, MECH,, CCE, CSE&BS, AI&DS
11	U23MEOC01	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME
12	U23MEOC02	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
13	U23CEOC01	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, CSBS
14	U23CEOC02	Energy Efficient Buildings	CIVIL	EEE, MECH, BME
15	U23BMOCO1	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL, Mechatronics, AI&DS,CSEBS
16	U23BMOCO2	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL, Mechatronics, AI&DS,CSEBS
17	U23MCDC01	Automaton in manufacturing systems	MCTR	EEE,MECH, CIVIL
18	U23MCDC02	Building Automation	MCTR	EEE,MECH, CIVIL
19	U23CCOC01	Introduction to Communication Technologies	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS
20	U23CCOC02	Introduction to Computer Networks	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME, AI&DS
21	U23ADDC02	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
22	U23ADOC01	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
23	U23CBOC01	Object Oriented Progamming	CSEBS	EEE,ECE,ICE,CIVIL,MECH,Mechatronics,BME
24	U23CBOC02	Cryptology and Analysis	CSEBS	EEE,ECE,ICE,CIVIL,MECH,Mechatronics,BME
25	U23ESOC01	Introduction to Sustainable Engineering	All branch of Engineering (Sustainable Development Goals (SDGs) courses)	
26	U23ESOC02	Water and Waste Water Treatment		
27	U23ESOC03	Technologies for Clean and Renewable Energy		
28	U23ESOC04	Economic Growth and Development		

	Open Elective – III (Offered in Semester VII)			
1	U23EEDC02	Electric and Hybrid Vehicles	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, AI&DS,CSBS
2	U23EEOC02	Energy Conservation and Management	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, AI&DS,CSBS
3	U23ECOC03	IIoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE
4	U23ECOC04	RFID System Design and Testing	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U23CSOC03	Web Programming	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U23CSOC04	Computer Peripherals and Networking	CSE	EEE, ICE, MECH, CIVIL, CCE, BME, Mechatronics
7	U23ITOC03	Essentials of Data Science	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME, Mechatronics
8	U23ITOC04	Big Data Technologies	IT	EEE, ICE, MECH, CIVIL, CCE, BME
9	U23ICOC03	Artificial Intelligence in Automation	ICE	EEE, ECE, CSE, IT, MECH, Mechatronics, CCE, CSE&BS, AI&DS
10	U23ICOC04	Embedded Systems for AI Applications	ICE	CSE, IT, BME, CCE, CSE&BS, AI&DS
11	U23MEOC03	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
12	U23MEDC03	Supply Chain Management	MECH	EEE, ECE, ICE, CIVIL, Mechatronics
13	U23CEOC03	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, CSBS
14	U23CEOC04	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, MECH
15	U23BMOCO3	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS,CSBS
16	U23BMOCO4	Telehealth Technology	BME	EEE,ECE,CSE, IT, ICE, CCE,CIVIL, AI&DS,CSEBS
17	U23MCDC03	Non Destructive Testing	MCTR	ECE, ICE, CCE, MECH
18	U23MCDC04	Robot and system in smart manufacturing	MCTR	EEE, ECE, MECH
19	U23CCOC03	Flutter Application Development	CCE	EEE, ECE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AIDS
20	U23CCOC04	Network Essentials and Security	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AIDS
21	U23ADOC02	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
22	U23ADOC03	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME,Mechatronics
23	U23CBOC03	Engineering Economics	CSEBS	EEE,ECE,CSE,IT,ICE,CIVIL,MECH,Mechatronics,CCE,BME,AIDS
24	U23CBOC04	Conversational AI	CSEBS	EEE,ECE,ICE,CIVIL,MECH,Mechatronics,BME
25	U23ESOC05	Social Innovation in Industry 4.0	All branch of Engineering (Sustainable Development Goals (SDGs) courses)	
26	U23ESOC06	Urbanization and Environment		
27	U23ESOC07	Sustainable River Basin Management		
28	U23ESOC08	Environment and Development		

ANNEXURE – III

ABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23XXCX01	Adobe Photoshop	Adobe
2	U23XXCX02	Adobe Animate	Adobe
3	U23XXCX03	Adobe Dreamweaver	Adobe
4	U23XXCX04	Adobe After Effects	Adobe
5	U23XXCX05	Adobe Illustrator	Adobe
6	U23XXCX06	Adobe InDesign	Adobe
7	U23XXCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23XXCX08	Autodesk Inventor - ACU	Autodesk
9	U23XXCX09	Autodesk Revit - ACU	Autodesk
10	U23XXCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23XXCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23XXCX12	Autodesk Maya - ACU	Autodesk
13	U23XXCX13	Cloud Security Foundations	AWS
14	U23XXCX14	Cloud Computing Architecture	AWS
15	U23XXCX15	Cloud Foundation	AWS
16	U23XXCX16	Cloud Practitioner	AWS
17	U23XXCX17	Cloud Solution Architect	AWS
18	U23XXCX18	Data Engineering	AWS
19	U23XXCX19	Machine Learning Foundation	AWS
20	U23XXCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23XXCX21	Advance Programming Using C	CISCO
22	U23XXCX22	Advance Programming Using C ++	CISCO
23	U23XXCX23	C Programming	CISCO
24	U23XXCX24	C++ Programming	CISCO
25	U23XXCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23XXCX26	CCNP Enterprise: Core Networking	CISCO
27	U23XXCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23XXCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23XXCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23XXCX30	Fundamentals Of Internet of Things	CISCO
31	U23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23XXCX32	Java Script Programming	CISCO
33	U23XXCX33	NGD Linux Essentials	CISCO
34	U23XXCX34	NGD Linux I	CISCO
35	U23XXCX35	NGD Linux II	CISCO
36	U23XXCX36	Advance Java Programming	Ethnotech
37	U23XXCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23XXCX38	Angular JS	Ethnotech
39	U23XXCX39	Catia	Ethnotech
40	U23XXCX40	Communication Skills for Business	Ethnotech
41	U23XXCX41	Coral Draw	Ethnotech
42	U23XXCX42	Data Science Using R	Ethnotech
43	U23XXCX43	Digital Marketing	Ethnotech

44	U23XXCX44	Embedded System Using C	Ethnotech
45	U23XXCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23XXCX46	English For IT	Ethnotech
47	U23XXCX47	Plaxis	Ethnotech
48	U23XXCX48	Sketch Up	Ethnotech
49	U23XXCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23XXCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23XXCX52	IOT Using Python	Ethnotech
53	U23XXCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23XXCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23XXCX55	Software Testing	Ethnotech
56	U23XXCX56	MX-Road	Ethnotech
57	U23XXCX57	CLO 3D	Ethnotech
58	U23XXCX58	Solid works	Ethnotech
59	U23XXCX59	Staad Pro	Ethnotech
60	U23XXCX60	Total Station	Ethnotech
61	U23XXCX61	Hydraulic Automation	Festo
62	U23XXCX62	Industrial Automation	Festo
63	U23XXCX63	Pneumatics Automation	Festo
64	U23XXCX64	Agile Methodologies	IBM
65	U23XXCX65	Block Chain	IBM
66	U23XXCX66	Devops	IBM
67	U23XXCX67	Artificial Intelligence	ITS
68	U23XXCX68	Cloud Computing	ITS
69	U23XXCX69	Computational Thinking	ITS
70	U23XXCX70	Cyber Security	ITS
71	U23XXCX71	Data Analytics	ITS
72	U23XXCX72	Databases	ITS
73	U23XXCX73	Java Programming	ITS
74	U23XXCX74	Networking	ITS
75	U23XXCX75	Python Programming	ITS
76	U23XXCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23XXCX77	Network Security	ITS & Palo alto
78	U23XXCX78	MATLAB	MathWorks
79	U23XXCX79	Azure Fundamentals	Microsoft
80	U23XXCX80	Azure AI (AI-900)	Microsoft
81	U23XXCX81	Azure Data (DP -900)	Microsoft
82	U23XXCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23XXCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23XXCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23XXCX86	Microsoft Excel	Microsoft
87	U23XXCX87	Microsoft Excel Expert	Microsoft
88	U23XXCX88	Securities Market Foundation	NISM
89	U23XXCX89	Derivatives Equinity	NISM
90	U23XXCX90	Research Analyst	NISM
91	U23XXCX91	Portfolio Management Services	NISM

92	U23XXCX92	Cyber Security	Palo alto
93	U23XXCX93	Cloud Security	Palo alto
94	U23XXCX94	PMI – Ready	PMI
95	U23XXCX95	Tally – GST & TDS	Tally
96	U23XXCX96	Advance Tally	Tally
97	U23XXCX97	Associate Artist	Unity
98	U23XXCX98	Certified Unity Programming	Unity
99	U23XXCX99	VR Development	Unity

ABILITY ENHANCEMENT COURSES - (B) SKILL ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1.	U23CSS301	Skill Enhancement Course 1 *
		1) Computer Assembly and Troubleshooting
		2) Aptitude - I
		3) Electronic Devices and Circuits
2.	U23CSS402	Skill Enhancement Course 2 *
		1) Exploring Photoshop
		2) Aptitude - II
		3) Office Automation

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

ANNEXURE – IV

DETAILS OF HONOURS/MINOR DEGREE

HONORS/MINOR IN CYBER SECURITY

SEMESTER – VIII											
Sl. No.	**Semester**	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
					L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory											
1	IV	U23KXB401	Cryptography and Cyber Security	PC	2	0	2	4	50	50	100
2	V	U23KXT502	Cyber Security Essentials	PC	3	0	0	3	25	75	100
3	VI	U23KXT603	Ethical Hacking	PC	3	0	0	3	25	75	100
4	VII	U23KXB704	Artificial Intelligence for Cyber Security	PC	2	0	2	4	50	50	100
5	VIII	U23KXT805	Security Incident and Response Management	PC	3	0	0	3	25	75	100
Total								**20**	**125**	**375**	**500**
Equivalent NPTEL courses##											
1	IV to VII Semester	U23KXN01	Cyber Security **Equivalent NPTEL courses**	**3**					**12 Weeks' Course**		

The student shall be given an option to earn 3 credits through one 12 week NPTEL course (equivalent) instead of any one course listed for honours degree programme and shall be completed before the commencement of eighth semester. The equivalent courses are subject to change based on its availability as per NPTEL course list.

SEMESTER I

Department	**Mathematics**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **BS**			End Semester Exam Type: **TE**			
Course Code	**U23MATC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics – I**	**3**	**1**	**-**	**4**	**25**	**75**	**100**

(Common to ALL Branches Except CSBS)

Prerequisite	Basic Mathematics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the concept of Eigen values and Eigen vectors, Diagonalization of a Matrix	**K3**
	CO2 Solve higher order differential equations	**K3**
	CO3 Understand the different types of partial differential equations	**K3**
	CO4 Know about the Applications of double and triple integrals	**K3**
	CO5 Gain the knowledge about Vector Calculus and its Applications	**K3**

UNIT – I	**Matrices**	**Periods:12**	
Rank of a Matrix – Systems of Linear Equations – Characteristic equation – Cayley Hamilton Theorem – Eigen values and Eigen vectors of a real Matrix–Diagonalization of Matrices.			**CO1**
UNIT – II	**Differential Equations (Higher Order)**	**Periods:12**	
Linear Differential equations of higher order with constant coefficients – Euler's linear equation of higher order with variable coefficients –Method of Variation of parameters.			**CO2**
UNIT – III	**Functions Of Several Variables**	**Periods:12**	
Partial derivatives – Total derivatives – Maxima and Minima of two variables – Lagrange's Method of multipliers.			**CO3**
UNIT – IV	**Multiple Integrals**	**Periods:12**	
Multiple Integrals – Change of order of integration (Cartesian form). Applications: Area as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).			**CO4**
UNIT – V	**Vector Calculus**	**Periods:12**	
Gradient – Divergence and Curl – Directional derivatives – Irrotational and Solenoidal vector fields – Properties (Statement only) – Gauss Divergence Theorem and Stoke's Theorem (without proofs).			**CO5**

Lecture Periods:45	**Tutorial Periods:15**	**Practical Periods: -**	**Total Periods:60**

Text Books

1. M.K. Venkataraman, "Engineering Mathematics", The National Publishing Company, 2nd Edition Chennai, 2016.
2. N. P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018.
3. S. Narayanan and T.K. Manickavasagam Pillay," Differential Equations and Its Applications", Viswanathan.S, Printers & Publishers Pvt Ltd, 2009.

Reference Books

1. G. Balaji, "Matrices and Calculus (Engineering Mathematics – I)" Balaji Publications, 9th Edition June 2023
2. A. Singaravelu, "Engineering Mathematics – I", Meenakshi publications, 1998.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", Wiley, 10th Edition, 2019.
4. B.V.Ramana," Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition, 2018.
5. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I / II**	Course Category: **ES**				End Semester Exam Type: **TE**		
Course Code	**U23ESTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Electrical and Electronics Engineering**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to CSE, IT, MECH, CIVIL, MCTR, CCE, AI&DS, FT and CSBS Branches)

Prerequisite	**Mathematics and Physics**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply the basic concepts and various laws in DC circuits.	**K3**
	CO2 Analyze the AC circuits and develop resonance conditions for transmitter and receiver circuits.	**K3**
	CO3 Gain the knowledge of power system components, importance of electrical safety measures and real time applications of transformer and motor.	**K2**
	CO4 Understand the operator of semiconductor diode and its applications.	**K2**
	CO5 Explain the characteristics and operation of BJT and FET.	**K2**
	CO6 Relate and Explain Different Communication Systems.	**K2**

Section A – Electrical Engineering

UNIT - I	**DC Circuits**	**Periods: 8**
Concept of Potential Difference, Current, Resistance, Inductance and Capacitance, Work, Power, Energy, Current and Voltage sources - ideal and practical sources - concept of dependent and independent sources, Ohm's law, Kirchhoff's law, Series parallel combination of R, L, C components, Voltage Divider and Current Divider Rules, Mesh and Nodal analysis, Star/Delta transformation, Network Theorems - Superposition, Thevenin, Norton and Maximum Power Transfer.		**CO1**
UNIT - II	**AC Circuits**	**Periods: 8**
AC waveform definitions - form factor, peak factor, R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, Resonance in series and parallel circuits, band-width and quality factor, Three Phase balanced AC Circuits (Y-Δ and Y-Y) - Power Measurement – Two Wattmeter method.		**CO2**
UNIT - III	**Electrical Safety and Electrical Machines**	**Periods: 7**
Layout of electrical power system and its functions, Wiring Accessories, Types of domestic wiring, Necessity of earthing, insulators and cables, Safety devices - fuse, relay and circuit breaker - Sensors and its types. Faraday's Law of electromagnetic induction, Fleming's Right and Left hand rule - DC Generator and DC Motor - construction, principle, load test and performance characteristics - Auto transformer, Single phase transformer- construction, principle, load test - Single phase capacitor start and run induction motor – Load test.		**CO3**

Section B – Electronics Engineering

UNIT - IV	**Semiconductor Diodes and Applications**	**Periods: 7**
Introduction semiconductor materials – Doping - Intrinsic and Extrinsic Semiconductor – PN junction diode, structure, characteristics - diffusion and depletion capacitance - Rectifier, Half wave and Full wave rectifier - zener diode characteristics - zener diode as regulator – Light Emitting Diode (LED) - Solar Cell.		**CO4**
UNIT - V	**Transistors**	**Periods: 7**
Bipolar Junction Transistor - construction – operation - Common Base, Common Emitter, Common collector Configuration – characteristics – Biasing - numerical application. Junction Field Effect Transistor (JFET), Metal oxide semiconductor Field Effect Transistor, EMOSFET-DMOSFET operation characteristics - Numerical application.		**CO5**
UNIT - VI	**Communication Systems**	**Periods: 8**
Need for Modulation – Block diagram of analog communication System - AM, FM, PM Definitions and Waveforms – Comparison of digital and analog communication system- Block diagram of digital communication system – Electromagnetic Spectrum. Wired and wireless Channel – Block diagram of communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.		**CO6**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. R. K. Rajput, "Basic Electrical and Electronics Engineering", University Science Press, 2nd Edition, 2017.
2. Dr. R. Saravanakumar, Dr.V. Jegathesan, Dr. K. Vinoth Kumar, Dr. K. Kowsalya, "Basic Electrical and Electronics Engineering", Wiley Publisher, 2nd Edition, 2022.
3. R. Muthusubramaniam, S. Salivahanan and K. A. Mureleedharan, "Basic Electrical Electronics and Computer Engineering", Tata McGraw Hill, 2018.

Reference Books

1. A. Sudhakar and S. P. Shyam Mohan, “Circuits and Networks: Analysis and Synthesis”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th Edition, 2017.
2. D. P. Kothari and I. J. Nagrath, “Electric Machines”, Tata McGraw Hill, New Delhi, 5th Edition, 2017.
3. B. L. Theraja, A. K. Theraja, “A Textbook of Electrical Technology – Volume - II”, S Chand & Co. Ltd., New Delhi, 23rd Edition, 2009.
4. David. A. Bell, “Electronic Devices and Circuits”, PHI Learning Private Ltd, India, 4th Edition, 2020
5. Wayne Tomasi, “Electronic Communication Systems- Fundamentals Theory Advanced”, Pearson Education, 6th Edition, 2018.

Web References

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://www.electrical4u.com/
3. https://nptel.ac.in/courses/108/102/108102146/
4. https://onlinecourses.nptel.ac.in/noc21_ee55/
5. https://nptel.ac.in/courses/117/102/117102059

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**I / II**	Course Category: **ES**				End Semester Exam Type: **TE**		
Course Code	**U23CSTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to All Branches Except CSBS and FT)

Prerequisite	NIL		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Comprehend the basics of Computers.	**K2**
	CO2	Illustrate the concepts of control structures and looping.	**K2**
	CO3	Implement programs using arrays and functions.	**K3**
	CO4	Demonstrate programs using Structure and Pointers.	**K3**
	CO5	Build the programs using Union and File management Operations.	**K3**

UNIT - I	**Introduction**	**Periods:09**	
Generation and Classification of Computers - Block Diagram of a Computer –Categories of Software – Network Structure - Number System – Binary – Decimal – Conversion – Algorithm – Pseudo code – Flow Chart.			**CO1**
UNIT - II	**C Programming Basics**	**Periods:09**	
Introduction to 'C' Programming – Basic structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements.			**CO2**
UNIT - III	**Arrays and Functions**	**Periods:09**	
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations- Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion			**CO3**
UNIT - IV	**Structure and Pointers**	**Periods:09**	
Structure Introduction – Structure definition – Structure declaration – Structure within a structure –Self Referential Structure. Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays -Pointer to Function –Pointer and Structure- Simple programs.			**CO4**
UNIT - V	**Unions and Files**	**Periods:09**	
Union Introduction - Programs Using Structures and Unions – Introduction to File - File Operations - File Input and Output Functions - Random Access to Files - File System Functions - Command Line Arguments- Storage Classes - Pre-Processor Directives- Dynamic Memory Functions.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

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

Reference Books

1. Vikas B. Agarwal Jyoti P. Mirani, "Computer Fundamentals, Nirali Prakashan Aug-2019.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression,2012.
3. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
4. P. Visu, R.Srinivasan and S. Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, "Programming in C", Second Edition, Oxford University Press, 2011.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**I**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CSTC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Problem Solving Approach**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to CSE, ICE and CCE)

Prerequisite	NIL		
Course Outcomes	**After completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Explain the basic concepts of computational thinking and problem solving.	**K2**
	CO2	Explain basic concepts of algorithm and data organization.	**K2**
	CO3	Illustrate algorithmic solution to problem solving.	**K3**
	CO4	Explain the concepts of array, merging, sorting & searching.	**K2**
	CO5	Implement recursive algorithm to solve problems.	**K3**

UNIT-I	**Computational Thinking and Logic-Solving Problems**	**Periods:9**	
Computational Thinking – Information and Data – Converting Information into Data – Data Capacity – Data Types and Encoding – Logic-Solving Problems – Limits of Computation – Pseudocode and Flow Chart.			**CO1**
UNIT-II	**Algorithmic Thinking and Data Organization**	**Periods:9**	
Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns – Pseudocode and Flow Chart.			**CO2**
UNIT-III	**Fundamental Algorithms and Factoring Methods**	**Periods:9**	
Fundamental Algorithms: Exchanging – Counting – Summing – Factorial Computation – Fibonacci Sequence – Reversing the Digit-Base Conversion – Character to number conversion. Factorial Methods: Finding Square Root – Greatest Common Divisor – Prime Number – Prime Factor – Pseudocode and Flow Chart.			**CO3**
UNIT-IV	**Array, Merging, Sorting and Searching**	**Periods:9**	
Array Techniques: Introduction – Array order reversal – Array Counting or Histogramming – Maximum and Minimum of a Set – Removal of Duplicate – Partitioning – Longest monotone. Sorting and searching: Sorting by Bubble, Selection, Insertion. Searching Linear, Binary – Pseudocode and Flow Chart.			**CO4**
UNIT-V	**Text Processing, Pattern Searching and Recursive Algorithms**	**Periods:9**	
Key word Searching – Text Line Adjustment – Linear Pattern Search – Sub Linear Pattern Search. Recursion:Towers of Hanoi-– Sample Generation – Combination Generation – Permutation Generation – Pseudocode and Flow Chart.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

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

Reference Books

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B. Tech.**						
Semester	**I / II**	Course Category: **HS**			End Semester Exam Type: **TE**			
Course Code	**U23HSTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Universal Human Values – II**	**2**	**-**	**-**	**2**	**25**	**75**	**100**

(Common to all Branch)

Prerequisite	**UHV – I**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Evaluate the significance of value inputs in formal education and start applying them in their life and profession	**K2**
	CO2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	**K2**
	CO3 Analyze the value of harmonious relationship based on trust and respect in their life and profession	**K2**
	CO4 Examine the role of a human being in ensuring harmony in society and nature.	**K2**
	CO5 Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	**K2**

UNIT - I	**Introduction to Value Education**	**Periods: 06**
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Understanding Value Education - Self-exploration as the Process for Value Education - Basic Human Aspirations - Happiness and Prosperity - Current Scenario- Method to Fulfil the Basic Human Aspirations		**CO1**
UNIT - II	**Harmony int he Human Being**	**Periods: 06**
Understanding Human being as the Co-existence of the Self and the Body-Distinguishing between the Needs of the Self and the Body-The Body as an Instrument of the Self-Understanding Harmony in the Self-Harmony of the Self with the Body-Programme to ensure self-regulation and Health		**CO2**
UNIT - III	**Harmony in the Family and Society**	**Periods: 06**
Harmony in the Family - Basic Unit of Human Interaction- 'trust' - Foundational Value in Relationship - 'Respect' - as the Right Evaluation - Other Feelings, Justice in Human-to-Human Relationship - Understanding Harmony in the Society-Vision for the Universal Human Order.		**CO3**
UNIT - IV	**Harmony in the Nature / Existence**	**Periods: 06**
Understanding Harmony in the Nature-Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - Holistic Perception of Harmony in Existence		**CO4**
UNIT - V	**Implications of the Holistic Understanding - A Look at Professional Ethics**	**Periods: 06**
Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics-Holistic Technologies, Production Systems and Management Models-Typical Case Studies-Strategies for Transition towards Value - based Life and Profession		**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Book

1. R. R. Gaur, R. Asthana, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, 2nd Revised Edition, New Delhi, 2019.

Reference Books

1. A Nagraj, Jeevan Vidya Prakashan, Amarkantak, "Jeevan Vidya: EkParichaya", 2013.
2. A.N. Tripathi, "Human Values", New Age International Publishers, New Delhi, 3rd Edition, 2019.
3. Annie Leonard, "The Story of Stuff", Free Press, Reprint Edition, 2011.
4. Mohandas Karam chand Gandhi, "The Story of My Experiments with Truth – Mahatma Gandhi Autobiography", Finger print Publisher, 2009.
5. E. F Schumacher, "Small is Beautiful", Vintage Publisher, 1993.
6. Cecile Andrews, "Slow is Beautiful", New Society Publishers, 2006.
7. J C Kumarappa, "Economy of Permanence", Sarva Seva Sangh Prakashan, 2017.
8. Pandit Sunderlal, "Bharat Mein Angreji Raj", Prabhat Prakashan Publisher, 2021.
9. Dharampal, "Rediscovering India", Stosius Inc/Advent Books Division Publisher, 1983.

10. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”, Gyan Publishing House, 2023.
11. Maulana Abdul Kalam Azad, “India Wins Freedom”, Orient BlackSwan Publisher, 1st Edition, 1988.
12. Life of Vivekananda, **“**Romain Rolland (English)”, Advaita Ashrama Publisher, India, 4th Edition, 2010.
13. Mahatma Gandhi, “Romain Rolland (English)”, Srishti Publishers & Distributors, 2020.

Web References

1. https://www.uhv.org.in/uhv-ii
2. http://www.storyofstuff.com
3. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
4. https://fdp-si.aicte-india.org/8dayUHV_download.php
5. https://www.youtube.com/watch?v=8ovkLRYXIjE

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **HS**			*End Semester Exam Type: **TE**			
Course Code	**U23ENBC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Communicative English - I**	**2**	**-**	**2**	**3**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the communication flow in organization and its objectives	**K2**
	CO2 Write the technical contents with grammatically precise sentences	**K2**
	CO3 Articulate with correct pronunciation and overcome vernacular impact in speaking	**K3**
	CO4 Express opinions confidently in formal and informal communicative contexts	**K2**
	CO5 Attend interview with assertiveness	**K3**

UNIT - I	**Workstead Communication**	**Periods:10**	
Communication, Definition, Process, Channels, Barriers, Strategies for Effective Communication, Verbal and Nonverbal Communication - Listening, Types, Barriers, Enhancing Listening Skills - Bibliography: Book, Journal and Internet References			**CO1**
UNIT - II	**Common Errors In Writing And Comprehension Strategies**	**Periods:10**	
Subject Verb Agreement, Misplaced Modifiers, Squinting Modifiers, Dangling Modifier, Fused Sentence, Comma Splice, Sentence Fragment - Reading Comprehension: Technical passage, Strategies: Skimming, Scanning, Intensive and Extensive Reading, Prediction, and Contextual Meaning			**CO2**
UNIT - III	**Phonetics**	**Periods:10**	
Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non-silent Letters, Intonation, Spelling Rules and Words often misspelled, Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue			**CO3**
UNIT - IV	**Communication Practice - I**	**Periods:15**	
List of Exercises **Listening**: Self Introduction videos **Speaking**: Self-Introduction, Extempore, and Role Play **Reading**: Non-Technical Comprehension Passage **Writing:** Common Errors in Writing			**CO4**
UNIT - V	**Interpersonal Communication - I**	**Periods:15**	
List of Exercises **Listening:** Speech Sounds, Interview Videos **Speaking**: Debate, Structured Group Discussion, and Conversation **Reading**: Commonly Confused Words **Writing:** Transcription			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Text Books

1. Richa Mishra , RatnaRao, “A textbook of English Language Communication Skills”, Macmillan Publishers India Private Ltd., Revised Edition 2021.
2. Rizvi M. Ashraf, “Effective Technical Communication”, New Delhi: Tata-McGraw-Hill Publishing Company Limited, 4th Edition, 2010.
3. Balasubramanian T, “English Phonetics for Indian students workbook”, 2nd Edition, Trinity Press, 2016.

Reference Books

1. N.P.Sudharshana, C. Savitha,” English for Engineers”, Cambridge University Press, 2018.
2. Raman, Meenakshi, and Sharma, Sangeetha, “Technical Communication - Principles and Practice”, 3rd Edition, Oxford University Press, 2017.
3. Comfort, Jeremy, etal., “Speaking Effectively: Developing Speaking Skills for Business English”, Cambridge University Press, Cambridge, Reprint 2011.
4. Wren & Martin, “High School English Grammar and Composition”, S Chandh & Co.Ltd, 2015.
5. Boove, Courtland L, “Business Communication Today”, Pearson Education, New Delhi, 2002.

Web References

1. https://lemongrad.com/subject-verb-agreement-rules/
2. https://opentextbc.ca/advancedenglish/chapter/misplaced-and-dangling-modifiers/
3. https://www.hitbullseye.com/Reading-Comprehension-Tricks.php
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://worldscholarshipvault.com/neutralize-mother-tongue-interference/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Theory

Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	10		5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical

Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		
Listening (L)*	10	Listening (L)*	10	40
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

- **LRW components of Practical can be evaluated through Language Lab Software**

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I / II**	Course Category: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Electrical and Electronics Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT, MECH, CIVIL, MCTR, CCE, AI&DS, FT, CSBS Branches)

Prerequisite: Mathematics and Physics

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Build the different wiring for domestic and commercial applications.	**K3**
	CO2 Design and analyze the domestic power distribution.	**K3**
	CO3 Estimate the performance of transformer and motors by conducting load test.	**K3**
	CO4 Describe characteristics of semiconductor diode and utilize it for different applications	**K5**
	CO5 Relate the characteristics of various transistor	**K2**
	CO6 Understand Rectifiers and Regulators	**K2**

List of Experiments

Section– A Electrical Experiments

Demonstration on Power Sources, Ammeter, Voltmeter, Wattmeter and Energy meter are Pre-requisite for conducting this Electrical Engineering Lab.

1. Electrical safety precautions and study of tools, accessories, electrical joints and electrical symbols.
2. Domestic Wiring Practice
   - Staircase wiring
   - Doctor's room wiring
   - Godown wiring
   - Wiring of Ceiling fan, LED lamps and Iron Box.
3. Design of Domestic power distribution.
4. Measurement of 3-phase power using two wattmeter method
5. Load test on DC shunt motor.
6. Load test on single phase transformer.
7. Load test on single phase Induction Motor.

Section – B Electronics Experiments

1. Study of Electronic components and equipment: Resistor, Capacitor
2. Measurement of AC signal parameter (Peak-Peak, rms period, frequency) using CRO.
3. VI Characteristics of PN junction diode, Zener diode
4. Input and output characteristics of Common Emitter configuration of BJT
5. Characteristics of JFET
6. Measurement of Ripple factor of HWR, FWR
7. Voltage Regulator using Zener Diode

Lecture Periods: -	Tutorial Periods: -	Practical Periods:30	Total Periods:30

Reference Books

1. S. Gowri, T. Jeyapoovan Nadar, "Engineering Practices Lab Manual", Vikas Publishing House Private Limited, New Delhi, 5th Edition, 2014.
2. A. Sudhakar and S. P. Shyam Mohan, "Circuits and Networks: Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 5th Edition, 2017.
3. D. P. Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill, New Delhi, 5th Edition, 2017.
4. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, "Electrical and Electronics Technology", Pearson Education Limited, New Delhi, 12th Edition, 2016.
5. S.K. Sahdev, "Fundamentals of Electrical Engineering and Electronics", Dhanpat Rai and Co, 2017.

Web References

1. http://eie.sliet.ac.in/laboratories/basic-electrical-engineering-lab/
2. https://www.electronics-tutorials.ws/accircuits/series-circuit.html
3. https://www.allaboutcircuits.com/textbook/experiments/
4. https://www.electronicshub.org/measurements-of-ac-current/
5. http://www.electronics-tutorials.ws

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in Practical classes			Model Practical Examination	Attendance		
	Conduction of Practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**I / II**	Course Category: **ES**				End Semester Exam Type: **LE**		
Course Code	**U23CSPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to All Branches Except CSBS and FT)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement logical formulations to solve simple problems leading to specific applications.	**K3**
	CO2 Execute C programs for simple applications making use of basic constructs, arrays and strings.	**K3**
	CO3 Experiment C programs involving functions, recursion, pointers, and structures.	**K3**
	CO4 Demonstrate applications using sequential and random access file processing.	**K3**
	CO5 Build solutions for online coding challenges.	**K3**

List of Exercises

1. Write a C program to find the Area of the triangle.
2. Develop a C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units
   For an input of 172.
3. Write a C program to check whether a given character is vowel or not using Switch – Case statement.
4. Write a C program to Print the numbers from 1 to 10 along with their squares.
5. Demonstrate do—While loop in C to find the sum of 'n' numbers.
6. Find the factorial of a given number using Functions in C.
7. Write a C program to check whether a given string is palindrome or not?
8. Write a C program to check whether a value is prime or not?
9. Develop a C program to swap two numbers using call by value and call by reference.
10. Construct a C program to find the smallest and largest element in an array.
11. Implement matrix multiplication using C program.
12. Write a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp.
13. Develop a C program to remove all characters in a string except alphabets.
14. Write a C program to find the sum of an integer array using pointers.
15. Write a C program to find the Maximum element in an integer array using pointers.
16. Construct a C program to display Employee details using Structures
17. Write a C program to display the contents of a file on the monitor screen.
18. Write a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
19. Write a C program to create two files with a set of values. Merge the two file contents to form a single file
20. Write a C program to pass the parameter using command line arguments.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Mechanical Engineering**	Programme: B.Tech.						
Semester	**I / II**	Course Category: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Graphics Using AutoCAD**	**-**	**-**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches)

Prerequisite	Nil	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Familiarize with the fundamentals and standards of engineering graphics.	**K3**
	CO2 Perform drawing of basic geometrical constructions and multiple views of objects.	**K2**
	CO3 Visualize the isometric and perspective sections of simple solids.	**K3**
	CO4 Connect side view associate on front view.	**K4**
	CO5 Correlate sectional views and lateral surface developments of various solids.	**K4**

List of Experiments

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing a Title Block with necessary text and projection symbol.
3. Drawing 2D sketch by applying modify tools like fillet, mirror, array, etc.,
4. Drawing front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. Simple stool, V-block, Mixie Base).
6. Drawing a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
8. Drawing lateral surface development of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creating 3D model of simple object and obtaining 2D multi-view drawings.
11. Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. James D. Bethune, “Engineering Graphics with AutoCAD”, A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020.
2. NS Parthasarathy and Vela Murali, “Engineering Drawing”, Oxford university press, 2015.
3. M.B Shah, “Engineering Graphics”, ITL Education Solutions Limited, Pearson **Education** Publication, 2011.
4. Bhatt N.D and Panchal V.M, “Engineering Drawing: Plane and Solid Geometry”, Charotar Publishing House, 2017.
5. Jeyapoovan T, “Engineering Drawing and Graphics Using AutoCAD”, Vikas Publishing House Pvt Ltd., 7th Edition, New Delhi, 2016.
6. C M Agrawal, Basant Agrawal, “Engineering Graphics”, McGraw Hill, 2012.
7. Dhananjay A. Jolhe, “Engineering Drawing: With An Introduction To CAD”,McGraw Hill, 2016.
8. James Leach, “AutoCAD 2017 Instructor”, SDC Publications, 2016.

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CSC1XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course – I**	**-**	**-**	**4**	**-**	**100**	**-**	**100**

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.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 50**	**Total Periods: 50**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **MC**			End Semester Exam Type: -			
Course Code	**U23CSM101**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Induction Programme**	2 Weeks			Non-Credit	-	-	-
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Develop holistic attitude and harmony in the individual, family, and Society	**K2**
CO2	Acquire grammar skills and capable to write and speak English confidently	**K2**
CO3	Understand the basic concepts in Mathematics and Programming	**K2**
CO4	Know about the art and culture, language and literature of this vastsecularnation	**K2**
CO5	Identify the inherent talent and develop it professionally	**K3**

UNIT - I	**Universal Human Values**	**Periods:12**
Welcome and Introductions - Getting to know each other, Aspirations and Concerns - Individual Academic and Career, Expectations of Family, Peers, Society, Nation, Fixing one's Goals, Self-Management - Self-confidence, Peer Pressure, Time Management, Anger, Stress Personality Development, Self-improvement, Health - Health issues, Healthy diet, Healthy lifestyle, Hostel life, Relationships - Home sickness, Gratitude towards Parents, Teachers and others Ragging and interaction, Competition and Cooperation, Peer Pressure, Society - Participation in Society, Natural Environment - Participation in Nature, Sum Up - Role of Education, Need for a Holistic Perspective, Self-evaluation and Closure - Sharing and feedback.		**CO1**
UNIT - II	**Proficiency in English**	**Periods:12**
Communication skills – Prognosticteston Grammar - Synonyms, Antonyms, Tenses, Sentence Completion, Idioms and Phrases, One- word Substitution, Homophones, Homonyms, Use of Prepositions, Subject – verb - Agreement - Writing – Paragraph writing, Letter writing, Essay writing, Story Development.		**CO2**
UNIT - III	**Bridge Course in Mathematics and C Programming**	**Periods:12**
Mathematics: Fundamentals of differential and integral calculus: Theory and Practice, Limit of function - Fundamental results on limits - Continuity of a function - Concept of differentiation - Concept of derivative - Slope of a curve -Differentiation Techniques - Derivatives of elementary functions from first principle –Derivatives of inverse functions – Logarithmic differentiation –Method of substitution –Differentiation of parametric functions – Differentiation of implicit functions –Higher order derivatives. Integrals of functions containing linear functions -Method of integration (Decomposition method, method of substitution, integration by parts)- Definite integrals. Simple definite integrals –Properties of Definite integrals –Reduction formulae - Area and volume - Length of curve -surface area of a solid. **C Programming:** Features of C and its basic Structure - Keywords - constants - variables - operators - Data types - Formatted input and output statements - Control and Looping statement - Arrays - Functions - Strings - writing simple C programs.		**CO3**
UNIT - IV	**Literary Activities**	**Periods:12**
Team building activities - Quiz - Oral Exercises - Group discussion, Debate, Extempore, Role play, சிறப்பு சஙொாொாற்செபொழிவு – தமிழர் மரபு மற்றும் தமிழர் செதொழில் நுட்பம்.		**CO4**
UNIT - V	**Creative Arts**	**Periods:12**
Introduction to painting and renowned artworks - Documentary and Short films - Music - Vocal, Instrumental - Dance - Classical, Cinematic -Mimicry -Mime.		**CO5**

Lecture Periods:60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:60**

Reference Books

1. R.R Gaur, R. Asthana, G.P. Bagaria," A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
2. Kumar Mohan R, "English Grammar for all (Functional and Applied Grammar)", Unicare Academy, 2022.
3. Seely, John," Oxford A-Z of Grammar and Punctuation, Oxford Publication, 2013.
4. B.V. Ramana," Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition, 2018.
5. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.
6. E. Balagurusamy, "PROGRAMMING IN ANSI C", Mc Graw Hill, 8th Edition, 2019.
7. Dr. K.K. Pillay,"Social Life of Tamils", A joint publication of TNTB & ESC and RMRL
8. R. Balakrishnan, "Journey of Civilization", Rojamuthiah research publishers, 1st Edition 2019.
9. தமிழகவரெலொறு - மக்களும்பண் ெபொடும், பிள்ளள, கக. கக. , சஙன்ளன : உலகத்தமிெழொெரொய்ப்ொ்சிநிறுவனம் , 2002.
10. கணினித்தமிழ் - முளனவரஇ ல.சுந்தரம், விகடன் பிரசுரம்.
11. கீழடி – எவளக நதிக்களரயில் ஙங்கெகொல நகர ெநொகரிகம், தமிழக செதொல்லியல் துளற.

Web References

1. http://www.newsociety.com/Books/S/Slow-isBeautiful
2. https://www.aplustopper.com/formal-letter/
3. https://www.javatpoint.com/c-programming-language-tutorial
4. http://www.math.cum.edu/~wn0g/2ch6a.pdf
5. https://education.nsw.gov.au/teaching-and-learning/curriculum/creative-arts

SEMESTER II

Department	**Mathematics**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **BS**			End Semester Exam Type: **TE**			
Course Code	**U23MATC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics – II**	**3**	**1**	**-**	**4**	**25**	**75**	**100**

(Common to ALL Branches Except CSBS, FT)

Prerequisite	Basic Mathematics		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Convert a periodic function into series form.	**K2**
	CO2	Compute Fourier transforms of various functions.	**K3**
	CO3	Solve Differential Equations using Laplace transforms.	**K3**
	CO4	Apply inverse Laplace transform of simple functions.	**K3**
	CO5	Solve difference equations using Z - transforms.	**K3**

UNIT – I	**Fourier Series**	**Periods:12**	
Dirichlet's conditions - General Fourier series - Odd and Even functions - Half-Range sine series and cosine series - Change of intervals – Parseval's Identity.			**CO1**
UNIT – II	**Fourier Transforms**	**Periods:12**	
Fourier Transforms and its inverse - Properties of Fourier Transform (without proof) - Fourier sine and cosine Transforms and their properties (excluding proof).			**CO2**
UNIT – III	**Laplace Transforms**	**Periods:12**	
Laplace transforms of elementary functions and Periodic functions - Basic properties (excluding proof) - Laplace transforms of derivatives and integrals - Initial and final value theorems.			**CO3**
UNIT – IV	**Inverse Laplace Transforms**	**Periods:12**	
Definition of inverse Laplace Transforms - Convolution theorem (excluding proof) - Solutions of Linear Ordinary Differential Equations of second order with constant coefficients.			**CO4**
UNIT – V	**Z – Transforms**	**Periods:12**	
Z-transforms - Elementary Properties - Inverse Z-transforms (using partial fraction and Residues) - Solution of difference equations using Z - transform.			**CO5**

Lecture Periods:45	**Tutorial Periods:15**	**Practical Periods:-**	**Total Periods:60**

Text Books

1. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill,New Delhi, 3rd Edition,2011.
2. C. P. Gupta, Shree Ram Singh. M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi,2nd Edition, 2016.
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand, New Delhi,22nd Edition 2019.

Reference Books

1. N.P. Bali and Dr. Manish Goyal, "A TEXTBOOK OF ENGINEERING MATHEMATICS", UNIVERSITY SCIENCE PRESS,India, 8th Edition, 2016.
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearson India Education services Pvt. Ltd, India 1st2017.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019.
4. G. Balaji, "Engineering Mathematics - Transforms and Partial Differential Equations", G. Balaji Publishers, 18th Edition, 2022.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi,2017.

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1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/
3. https://nptel.ac.in/courses/11110711
4. https://swayam.gov.in/nd1_noc20_ma17/preview
5. https://nptel.ac.in/courses/111/103/111103021/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Physics / Chemistry**	Programme: **B.Tech.**						
Semester	**I/II**	Course Category: **BS**				End Semester Exam Type: **TE**		
Course Code	**U23BSTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Physical Science for Engineers**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to all Branches)

Prerequisite	Physics of 12th standard or equivalent / Chemistry of 12th standard or equivalent.	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basic of properties of magnetic, dielectric and superconductors.	**K2**
	CO2 Identify the wave nature of the particles, physical significance of wave functions	**K3**
	CO3 Understand the basic principles of laser and fiber optics communication	**K2**
	CO4 Understand and familiar with the water treatment.	**K2**
	CO5 Understand the electrode potential for its feasibility in electrochemical reaction and uses of various batteries.	**K2**
	CO6 Understand the specific operating condition under which corrosion occurs and suggest a method to control corrosion.	**K2**

SECTION A - PHYSICS

UNIT - I	**Magnetic, Dielectric and Superconducting Materials**	**Periods: 8**	
Introduction to magnetic materials, Ferromagnetism- Domain theory-Types of energy-Hysteresis-Hard and Soft magnetic materials-ferrites-Dielectric materials-Types of polarization – Langevin-Debye equation-Frequency effects on polarization- Dielectric breakdown- Ferroelectric materials-Superconducting materials and their properties.			**CO1**

UNIT - II	**Quantum Mechanics**	**Periods: 7**	
Matter Waves - de Broglie Wavelength - Uncertainty Principle -Physical Significance of wave functions - Schrodinger wave Equation - Time Dependent - Time Independent - Application to Particle in a One Dimensional Box - Tunnel Diode.			**CO2**

UNIT-III	**Laser and Fiber Optics**	**Periods: 7**	
Lasers - Principles of Laser - Spontaneous and Stimulated Emissions - Einstein's Coefficients - Population Inversion and Laser Action -components of laser - Types of Lasers - NdYAG, CO_2 laser, GaAs Laser Fiber Optics - Principle and Propagation of light in optical fiber - Numerical aperture and acceptance angle - Types of optical fibers (material, refractive index, mode)			**CO3**

SECTION B – CHEMISTRY

UNIT-IV	**Water and its Treatment**	**Periods: 8**	
Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD. Desalination of brackish water: Reverse osmosis-disadvantages of using hard water in boiler - Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment-Ion exchange demineralization and zeolite process.			**CO4**

UNIT-V	**Electrochemical Cells and Storage Devices**	**Periods: 8**	
Galvanic cells, single electrode potential, standard electrode potential, electrochemical series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen, calomel and Ag/AgCl. Batteries and fuel cells: Types of batteries- alkaline battery-lead storage battery- nickel-cadmium battery- fuel cell H_2 -O_2 fuel cell-applications.			**CO5**

UNIT-VI	**rrosion**	**Periods: 7**	
Corrosion -Introduction - factors - types - chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection - sacrificial anode method and impressed current cathodic method. Uses of inhibitors, metallic coating - anodic coating, cathodic coating. Metal cladding, Electroplating of Copper and electroless plating of nickel.			**CO6**

Lecture Periods: 45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. V Rajendran, “Engineering Physics”, 2nd Edition, TMH, New Delhi 2011.
2. S.S Dara - “A text book of Engineering Chemistry” - 15th Edition, 2021. S.Chand Publications.
3. C. Jain, Monica Jain, ¯”Engineering Chemistry‖” 17thEd. Dhanpat Rai Pub. Co., NewDelhi, (2015).

Reference Books

1. R. Murugeshan, “Modern Physics”, S. Chand &Co, New Delhi 2006.
2. William D Callister Jr., “Material Science and Engineering”, 6th Edition, John Wiley and sons, 2009.
3. Jain & Jain “Engineering chemistry”, 23rd Edition, Dhanpat Rai Publishing Company. 2022
4. Mars Fontana “Corrosion Engineering”, July 2017
5. Jina Redlin, “Handbook of Electrochemistry”, March 28, 2005

Web References

1. https://www.sciencedaily.com/terms/materials_science.htm.
2. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials science.html.
3. https://study.com/academy/lesson/semiconductors-superconductors-definition-properties.html
4. https://mechanicalc.com/reference/engineering-materials
5. http://ndl.ethernet.edu.et/bitstream/123456789/89589/1/%5BPerez_N.%5D_Electrochemistry_and_corrosion%28BookZZ.org%29.pdf

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech**						
Semester	**II/III**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ADTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Python**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to All Branches)

Prerequisite	NIL		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Interpret the basic concepts of Python programs.	**K2**
	CO2	Articulate the concepts of Sets, Dictionaries and Object-Oriented concepts.	**K2**
	CO3	Experiment with Numpy package.	**K3**
	CO4	Apply and analyze Data Manipulation with Pandas.	**K3**
	CO5	Illustrate programming concept for Visualization with Matplotlib.	**K3**

UNIT - I	**Introduction To Python**	**Periods:09**	
Structure of Python Program - Underlying mechanism of Module Execution - Branching and Looping - Problem Solving Using Branches and Loops - Functions - Lambda Functions - Lists and Mutability - Problem Solving Using Lists and Functions.			**CO1**
UNIT - II	**Sequence Datatypes and Object-Oriented Programming**	**Periods:09**	
Sequences - Mapping and Sets - Dictionaries. Classes: Classes and Instances - Inheritance - Exception Handling - Introduction to Regular Expressions using "re" module.			**CO2**
UNIT - III	**Using Numpy**	**Periods:09**	
Basics of NumPy - Computation on NumPy - Aggregations - Computation on Arrays - Comparisons - Masks and Boolean Arrays - Fancy Indexing - Sorting Arrays - Structured Data: NumPy's Structured Array.			**CO3**
UNIT - IV	**Data Manipulation with Pandas**	**Periods:09**	
Introduction to Pandas Objects - Data indexing and Selection - Operating on Data in Pandas - Handling Missing Data - Hierarchical Indexing - Combining Data Sets. Aggregation and Grouping - Pivot Tables -Vectorized String Operations - Working with Time Series - High Performance Pandas - eval() and query().			**CO4**
UNIT - V	**Visualization With Matplotlib**	**Periods:09**	
Basic functions of Matplotlib - Simple Line Plot - Scatter Plot - Density and Contour Plots - Histograms - Binnings and Density - Customizing Plot Legends - Colour Bars - Three-Dimensional Plotting in Matplotlib.			**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. Jake VanderPlas, "Python Data Science Handbook - Essential Tools for Working with Data", O'Reily Media Inc, 2016.
2. Zhang.Y, "An Introduction to Python and Computer Programming", Springer Publications, 2016.
3. Wesley J Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2006.

Reference Books

1. John Paul Mueller, Luca Massaron, "Python for Data Science for Dummies", 2nd Edition, John Wiley& Sons, 2019.
2. Jesus Rogel-Salazar, "Data Science and Analytics with Python", CRC Press Taylor and Francis Group, 2017.
3. Brian Draper, "Python Programming A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language", CreateSpace Independent Publishing Platform, 2016.
4. Mark Lutz, Laura Lewin, Frank Willison, "Programming Python", O'Reilly Media, 3rd Edition, 2006.
5. Gowrishankar S, Veena A, "Introduction to Python Programming", CRC Press, 2018.

Web References

1. https://nptel.ac.in/courses/106/106/106106212/
2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: B.Tech						
Semester	**II/III**	Course Category: **ES**				End Semester Exam Type: **TE**		
Course Code	**U23CSTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to All Branches except CSBS and FT)

Prerequisite	Any Programming Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Compute time and space complexity for given problems	**K2**
	CO2 Demonstrate stack, queue and its operation.	**K2**
	CO3 Illustrate the various operations of linked list.	**K3**
	CO4 Use the concepts of tree for various applications.	**K3**
	CO5 Outline the various Tables, Graphs and Sets techniques.	**K3**

UNIT - I	**Basic Terminologies of Data Structures**	**Periods:09**
Introduction: Basic Terminologies - Asymptotic Notations: Complexity analysis. Array and its operations - Searching: Linear Search and Binary Search Techniques. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort. Performance and Comparison among the sorting methods.		**CO1**
UNIT - II	**Stack and Queue Operations**	**Periods:09**
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.		**CO2**
UNIT - III	**Linked List Operations**	**Periods:09**
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.		**CO3**
UNIT - IV	**Trees**	**Periods:09**
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree - Threaded Binary Tree - Binary Search Tree - Binary Tree Traversals - AVL Tree- Red Black Tree.		**CO4**
UNIT - V	**Graphs, Tables and Sets**	**Periods:09**
Graph: Basic Terminologies and Representations - Graph traversal algorithms. Tables: Different types of tables - Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.		**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:-**	**Total Periods:45**

Text Books

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

Reference Books

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23ITTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Digital Design and System Architecture**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to CSE and IT)

Prerequisite	Basic mathematics, Basics of Electrical and Electronics Engineering	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Demonstrate simplifications of Boolean functions.	**K2**
	CO2 Describe various combinational logic circuits.	**K2**
	CO3 Illustrate various sequential circuits.	**K2**
	CO4 Narrate the basic components and computer organization	**K2**
	CO5 Explain memory types and I/O organization	**K2**

UNIT - I	**Review of Number Systems**	**Periods:09**	
Review of Number systems – Conversion of Number systems – Binary addition and subtractions – Binary representation: Signed magnitude representation and Compliment representations - Binary codes – Boolean Algebra – Boolean functions – canonical forms - Simplifications of Boolean function: Theorems and laws, K-Map and Quine McCluskey method.			**CO1**
UNIT - II	**Logic Gates and its Types**	**Periods:09**	
Introduction to combinational circuits – Design procedures of Combinational circuits – Adders - Subtractors – Binary parallel Adder – BCD Adder – Carry look ahead adder – Decoder – Encoder – Priority Encoder – Multiplexer.			**CO2**
UNIT - III	**Sequential Logic Design**	**Periods:09**	
Introduction to Sequential Circuits – Latches - Types of Latches: SR Latch and D Latch – Flip-Flop- Types of Flip-Flops: RS, JK, D,T Flip-Flops – Excitation table of Flip-Flops - Counters : Asynchronous Counters – Synchronous counters – Mod counters - Shift registers – Types of Shift registers : SISO,SIPO,PISO,PIPO and Universal Shift registers – Ripple counter and Johnson counter.			**CO3**
UNIT - IV	**Fundamentals Of Computer Organization**	**Periods:09**	
Block diagram of Digital Computer, Organization and Design: Instruction codes, Registers, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, ALU design, Execution of a complete instruction-Multiple bus organization, Hardwired control Microprogrammed control, Pipelining: Basic concepts, Data hazards, Instruction hazards, Parallel and Vector Processors.			**CO4**
UNIT - V	**Memory And I/O Organization**	**Periods:09**	
Memory hierarchy - Main memory, Memory chip Organization, Auxiliary memory, Associate memory, Virtual memory, Cache memory, input-output interface, asynchronous data transfer, Modes of transfer, Priority interrupt, DMA - Buses Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB), Case study – Advanced Processors.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. M. Morris Mano and Michael Ciletti, Digital Design, Sixth Edition, Pearson India Education Services, Pvt. Ltd., 2018
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, 2012.
3. M.Moris Mano, Computer System Architecture, Third Edition, Pearson Education,2017: The Complete Reference", McGraw Hill, FourthEdition,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. John.F. Wakerly,"Digital Design Principles and Practices", Pearson Education,4th Edition, 2006.
3. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th edition, Tata McGraw Hill Education, 2011.
4. David A. Patterson and John L. Hennessey, “Computer Organization and Design”, 5th edition, Morgan Kauffman /Elsevier, 2014
5. Roger Tokhiem, "Schaum's Outline of Digital Principles", McGraw Hill publication,3rd Edition, 1994.

Web References

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://nptel.ac.in/courses/106/105/106105163/
4. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
5. http://www.ee.surrey.ac.uk/Projects/CAL/digital-logic/gatesfunc/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **HS**				End Semester Exam Type: **TE**		
Course Code	**U23ENBC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Communicative English-II**	**2**	**-**	**2**	**3**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Draft effective written communication in professional environment	**K2**
	CO2 Apply the mechanics of creative writing with precision and clarity	**K3**
	CO3 Acquire language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation	**K2**
	CO4 Develop language fluency and gain self-confidence	**K3**
	CO5 Express thoughts and ideas with clarity and focus	**K2**

UNIT - I	**Business Correspondence**	**Periods:10**
Business Writing: Circular, Agenda, Memoranda, Notice, Instruction, Minutes, Email Writing, Report Writing- Official and Demi Official Letters : Applying for Educational / Car / Home Loans / Joining Report, Leave Letter, Industrial Visit, Inplant Training, Letter to the Editor, Calling for a quotation, Placing Order, Letter of Complaints, Letter seeking Clarification, Resume', Job Application Letter, Bio-data, CV		**CO1**
UNIT - II	**Functional Writing Skills**	**Periods:10**
Four Modes of Writing, Sentence Structure , Art of condensation: Summary Writing and Note Making, Use of phrase and clause in sentence, Principles of paragraph writing, Techniques of Essay Writing, Jumbled Sentence, Paraphrasing		**CO2**
UNIT - III	**Etiquettes**	**Periods:10**
Etiquette: Meaning, Kinds: Corporate Etiquette, Meeting Etiquette, Telephone Etiquette, Email Etiquette, Social Media Etiquette, Dining Etiquette, Communication Etiquette		**CO3**
UNIT - IV	**Communication Practice-II**	**Periods:15**
List of Exercises **Listening:** Letter writing tips **Speaking:** Just a Minute, Impromptu Speech, Contemporary Issues **Reading:** Variety of examples for Modes of Writing **Writing:** Different types of letters		**CO4**
UNIT - V	**Interpersonal Communication-II**	**Periods:15**
List of Exercises **Listening:** Videos on different types of Etiquettes **Speaking:** Team Presentation, Negotiation Skills **Reading:** Phrases and Clauses **Writing:** Free writing on any given topic, Paraphrasing Practice		**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. PC Das, "Letter Writing including Official and Business Letters", New Central Book Agency, 2020.
2. Kumar, Sanjay, Pushpalatha," Communication Skills". Oxford University Press, 2018.
3. Raman, Meenakshi & Sangeetha Sharma," Communication Skills", New Delhi: OUP,2018.

Reference Books

1. Sahukar, Nimeran , Bhalla, Prem,, "The book of Etiquettes and Manners".PustakMahal Publisher, New Delhi; 1st Edition 2009.
2. Gerson Sharon J, Steven M. Gerson, "Technical Writing Process and Product", Pearson Education Pvt. Ltd. 3rd Edition, 2009.
3. Grussendorf, Marion, "English for Presentations". Oxford University Press, Oxford, 2007.
4. Seely John, "The Oxford Guide to Writing and Speaking", Oxford University Press, 2006.
5. R.C. Sharma, Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill &Co.Ltd., New Delhi, 2001.

Web References

1. https://www.indeed.com/career-advice/finding-a-job/how-to-write-an-application-letter
2. https://owlcation.com/humanities/Four-Types-of-Writing
3. https://targetstudy.com/languages/english/paragraph-writing.html
4. https://www.businessnewsdaily.com/8262-email-etiquette-tips.html
5. https://www.youtube.com/watch?v=UOceysteljo

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Theory

Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	10		5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical

Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		
Listening (L)*	10	Listening (L)*	10	40
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

- **LRW components of Practical can be evaluated through Language Lab Software**

Department	**Mechanical Engineering**	Programme: **B.Tech.**						
Semester	**I/II**	Course Category: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23ESPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design Thinking and IDEA Lab**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
(Common to ALL Branches)								
Prerequisite	Basic Knowledge of Science							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Demonstrate a comprehensive understanding of the tools and inventory associated with the IDEA Lab.	**K2**
	CO2 Develop proficiency in ideation techniques to generate creative and innovative solutions for various design challenges and problems	**K3**
	CO3 Acquire practical knowledge of mechanical and electronic fabrication processes, including hands-on experience with machinery, tools, and techniques used in the manufacturing and assembly of physical components.	**K3**
	CO4 Cultivate the skills necessary for developing innovative and desirable products, including the ability to integrate user needs, market trends, and technological advancements into the design process.	**K4**
	CO5 Apply iterative design methodologies to refine and improve solutions based on feedback, user testing, and evaluation of functional, aesthetic, and usability aspects	**K4**

Design process: Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs, Insight-leaving from the lives of others/standing on the shoes of others, Observation

Design team-Team formation, Conceptualization: Visual thinking, Drawing/sketching, New concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, Wooden model, Clay model, 3D printing; Experimenting/testing.

Sustainable product design, Ergonomics, Semantics, Entrepreneurship/business ideas, Product Data Specification, Establishing target specifications, Setting the final specifications. Design projects for teams.

List of Lab Activities and Experiments

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as softwood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10. Discussion and implementation of a mini project.
11. Documentation of the mini project (Report and video).

Lecture Periods:-	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Text Books

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.

Reference Books

1. Ulrich and Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
2. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018.
3. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan, Weldon Owen; 2017.
4. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press.
5. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill.
6. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education.
7. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill.
8. Venuvinod, PK., MA. W., Rapid Prototyping - Laser Based and Other Technologies, Kluwer
9. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and Distributors, 5th Edition,2002.

Web References

1. https://onlinecourses.nptel.ac.in/noc23_mg72

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech**						
Semester	**II**	Course Category: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ADPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Python Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to All Branches)								
Prerequisite	NIL							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe common Python functionality and features used for data science.	**K2**
	CO2 Query Data Frame structures for cleaning and processing.	**K2**
	CO3 Configure your programming environment	**K3**
	CO4 Experiment the concept using data visualization.	**K3**
	CO5 Analyze real time datasets,	**K3**

List of Exercises

1. Build a python program to implement Fibonacci series.
2. Build a python program to get a range of numbers from user and to separate even numbers and odd numbers respectively.
3. Build a function in Python to check duplicate letters. It must accept a string, i.e., a sentence. The function should return True if the sentence has any word with duplicate letters, else return False.
4. Build a program to perform arithmetic operations using lambda function.
5. Build a Python program that takes a list of numbers as input and returns a new list containing only the even numbers from the input list.
6. Build a python program to create a class called Car with attributes Company, model, and year. Implement a method that returns the age of the car in years.
7. Build a python program to create a base class called Shape that has a method called area which returns the area of the shape (set it to 0 for now). Then, create two derived classes Rectangle and Circle that inherit from the Shape class to calculate the area of derived classes.
8. Build a python program to implement aggregation using Numpy.
9. Build a python program to perform Indexing and Sorting.
10. Build a python program to perform Handling of missing data.
11. Build a python program to perform usage of Pivot table using Titanic datasets
12. Build a python program to perform use of eval () and query ()
13. Build a python program to perform Scatter Plot
14. Build a python program to perform 3D plotting
15. Implement an application to process a real time data.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Chirag Shah, “A Hands-On Introduction to Data Science”, Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystyanczuk, “Python Social Media Analytics”, Packt Publishing, 2017.
3. Jake VanderPlas, “Python Data Science Handbook - Essential Tools for Working with Data”, O’Reily Media Inc, 2016.
4. Zhang.Y, “An Introduction to Python and Computer Programming”, Springer Publications, 2016.
5. Wesley J Chun, “Core Python Programming”, Pearson Education, 2nd Edition, 2006.

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1. https://nptel.ac.in/courses/106/106/106106212/
2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II/III**	Course Category: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23CSPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS and FT)

Prerequisite	Basic Programming Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Analyse the algorithm's / program's efficiency in terms of time and space complexity.	**K3**
	CO2 Solve the given problem by identifying the appropriate Data Structure.	**K3**
	CO3 Solve the problems of searching and sorting techniques.	**K3**
	CO4 Solve problems in linear Data Structures.	**K4**
	CO5 Solve problems in non-linear Data Structures.	**K4**

List of Exercises:

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

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.
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. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.

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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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Digital Design and System Architecture Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE and IT)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Experiment simplifications of Boolean functions	**K3**
	CO2 Develop any combinational logic functions and design combinational circuit	**K3**
	CO3 Demonstrate the behavior of sequential circuits	**K3**
	CO4 Simulate basic knowledge of computer organizations	**K3**
	CO5 Design memory unit and simulate memory operations	**K3**

List of Exercises **Periods:30**

1. Design and Verification of the Logic Gates
2. Design and Verification of Half Adder and Full Adder
3. Design and Verification of Half Subtractor and Full Subtractor
4. Convert BCD to Excess 3 and Excess 3 to BCD
5. Design of 2-to-4 decoder
6. Design of 8-to-3 encoder
7. Design of flip flops: SR, JK and T flipflop
8. Design of a N- bit Register of Serial - in Serial - out and Serial in parallel out
9. Design of a N- bit Register of Parallel in Serial out and Parallel in Parallel Out.
10. 8-bit simple ALU design and CPU design

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. M.Morris Mano and Michael Ciletti , Digital Design, Sixth Edition, Pearson India Education Services Pvt. Ltd., 2018.
2. Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, Tata McGraw Hill Education Pvt. Ltd. Third Edition,2012
3. John F.Wakerly, ”Digital Design Principles and Practices”, Pearson Education, Fourth Edition,2018.
4. M K Gooroochurn,” Introduction to Digital Logic & Boolean Algebra”, Paperback, 2018.
5. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth edition, Tata McGraw Hill Education, 2011.

Web References

1. http://www.ee.surrey.ac.uk/Projects/CAL/digital-logic/gatesfunc/
2. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
3. https://www.tutorialspoint.com/digital_circuits/digital_circuits_flip_flops
4. https://www.geeksforgeeks.org/hardware-description-language/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	Viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **AEC**			End Semester Exam Type:**-**			
Course Code	**U23CSC2XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course – II**	**-**	**-**	**4**	**-**	**100**	**-**	**100**

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

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 50**	**Total Periods: 50**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **MC**			End Semester Exam Type: -			
Course Code	**U23CSM202**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Sports Yoga and NSS**	0	0	2	Non-Credit	100	-	100
Prerequisite	NIL							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility and relaxation.	**K2**
	CO2 Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.	**K2**
	CO3 Develop understanding of psychological problems associated with age and lifestyle.	**K2**
	CO4 Recognize the importance of national service in community development.	**K2**
	CO5 Convert existing skills into socially relevant life skills.	**K2**

UNIT - I	**Introduction to Physical Education**	**Periods: 06**	
Definition,Aims and Objectives of Physical Education-Changing trends in Physical Education **Physical Fitness, Wellness and Lifestyle:** Importance of Physical Fitness and Wellness -Components of Physical fitness - Components of Health related fitness -Components of wellness -Preventing Health Threats through Lifestyle Change -Concept of Positive Lifestyle.			**CO1**
UNIT - II	**Yoga and Lifestyle**	**Periods: 06**	
Importance of Yoga - Elements of Yoga -Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration and related Asanas (Sukhasana,Tadasana, Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra. Asanas as preventive measures – Hypertension – Obesity-Back Pain-Diabetes-Asthema.			**CO2**
UNIT - III	**Training and Planning In Sports**	**Periods: 06**	
Training-Warming up and limbering down-Skill, Technique and Style-Objectives of Planning – Tournament- Knock-Out, League/Round Robin and Combination. **Psychology and Sports-** Important of Psychology in Physical Education and Sports - Differentiate Between Growth and Development - Adolescent problems and their Management- Emotion: Concept, Type and Controlling of emotions - Concepts and Types of Aggressions in Sports- Psychological benefits of exercise - Anxiety and Fear and its effects on Sports Performance - Motivation, its type and techniques - Understanding Stress and Coping strategies			**CO3**
UNIT - IV	**Introduction to National Service Scheme**	**Periods: 06**	
Orientation of NSS volunteers: History, motto, symbol, awards, structure and activities of NSS - Days of National and International Importance- Sensitizing about the thrust areas and awareness activities-Importance of tree plantation and voluntary blood donation-The role of SHGs and NGOs in community development – CSR-Life skills and youth development-extension activities in HEIs- various clubs and schemes like RRC, ELC, YRC, UBA, SBA, etc.,			**CO4**
UNIT - V	**Community Issues and The Use Of Technology**	**Periods: 06**	
Common Problems of rural India- Technology development and its suitability – Sustainability- Value addition to agricultural products- Service learning and youth volunteering -Shramdaan-Campus cleaning- Field visit to nearby communities- village survey- Initiatives to clean and green environment- preservation of water bodies in adopted villages.			**CO5**

LecturePeriods:-	**Tutorial Periods: -**	**PracticalPeriods:30**	**Total Periods: 30**

Reference Books

1. Brar Ajmer Singh, Gill Jagtar Singh, Bains Jagdish, "Modern Textbook of Physical Education Health and Sports- I", Kalyani Publishers, 6th Edition, 2014.
2. B.K.S. Iyengar, "Light on Yoga: The Definitive Guide to Yoga Practice", Thorsons Publishers, Thorsons Classics edition, 2015.
3. Joseph, Siby K, Mahodaya, "Bharat Essays on Conflict Resolution", Institute of Gandhian Studies Publishers, 2007.
4. Barman Prateeti, Goswami, "Document on Peace Education", Triveni Akansha Publishing House, New Delhi, 2009.
5. Prof R.B.S. Verma, "Field Work Practicum in Social Work-Emerging Concerns", Rapid Publisher, Lucknow, 2020.
6. Sibereisen, K, Richard M, "Lerner Approaches to Positive Youth Development", Sage Publications, New Delhi, 2007.
7. Hoshiar Singh, "Administration of Rural Development in India", Sterling Publisher, the University of Michigan, 2009.

Web References

1. http://www.thebetterindia.com/140/national-service-scheme-nss
2. http://en.wikipedia.org/wiki/national-service-scheme 19=http://nss.nic.in/adminstruct
3. http://nss.nic. in
4. http://socialworknss.org/about.html
5. Young Journal on Youth published by SAGE: http://you.sagepub.com

Evaluation methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	**MCQ Test**	**Presentation / Activity / Assignment**	
Marks	10	30	60	100

SEMESTER III

Department	**Mathematics**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: **BS**			*End Semester Exam Type:**TE**	
Course Code	**U23MATC03**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Probability and Statistics**			**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to All Branches Except CSBS)										
Prerequisite	Basic Probability									
Course Outcome	**On completion of the course, the students will be able to**									BT Mapping (Highest Level)
	CO1	Understand the concept of probability.								**K3**
	CO2	Solve the problem on Random variables.								**K3**
	CO3	Understand the concepts of Analysis of variance.								**K3**
	CO4	Learn the applications of Large Samples.								**K3**
	CO5	Analyze the problems in small samples.								**K3**
UNIT – I	**Theory of Probability**						**Periods:12**			
Random Experiments - Sample Space - Exhaustive events- Axioms of probability – Conditional probability – Total probability – Bayes theorem.										**CO1**
UNIT – II	**Random Variables**						**Periods:12**			
Discrete Random Variable – Binomial distribution – Poisson distribution. Continuous Random Variable – Exponential distribution – Normal distribution (Excluding Derivation of Mean, Variance and MGF)										**CO2**
UNIT – III	**Statistics & Analysis of Variances**						**Periods:12**			
Correlation – Rank correlation and Regression. Analysis of variance: One-way classifications. and two-way classifications.										**CO3**
UNIT – IV	**Large Samples**						**Periods:12**			
Large Samples: Single Propositions – Difference of Proportions – Single Mean – Difference of Mean – Difference of Standard Deviations.										**CO4**
UNIT – V	**Small Samples**						**Periods:12**			
Test for Single and Difference Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.										**CO5**
Lecture Periods:45		**Tutorial Periods:15**		**Practical Periods: -**			**Total Periods:60**			

Text Books

1. T. Veerarajan, “Probability, Statistics and Random Processes”, Tata McGraw-Hill, 3rd Edition, 2008.
2. A. Singaravelu, “Probability and Statistics”, Meenakshi Agency, 2019.
3. S.C. Gupta, V.K. Kapur “Fundamental of Mathematical Statistics” Sultan Chand & sons, 12th Edition, 2022.

Reference Books

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna publishers, 3rd Edition,2017
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver: “Introduction to Probability & Statistics”, Cengage Learning, 15thEdition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund,” Probability and Statistics for Engineers”, Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, “An Introduction to Probability and Statistics”, Wiley, 3rd Edition 2008.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CST301**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Embedded Systems Architecture and Interfacing**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Digital Design and System Architecture	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the Basics of Embedded Systems.	**K2**
	CO2 Familiarize the basic concepts of 8086 instructions.	**K2**
	CO3 Learn the Interface modules using 8086.	**K3**
	CO4 Attain knowledge on 8051 microcontroller instructions and Interfacing.	**K2**
	CO5 Learn and apply the concepts of real time applications using RTOS.	**K3**

Unit- I	**Basics of Embedded Systems**	**Periods: 09**
Introduction to Embedded Systems - Processor in an Embedded System - Classification of Embedded Systems - Examples of Embedded Systems - Embedded hardware units and devices, Embedded software in a system - Complex systems design and processors - Embedded system design process.		**CO1**
Unit- II	**8086 Microprocessor**	**Periods: 09**
Introduction to 8086 - Microprocessor architecture - Addressing modes - Instruction set and assembler directives - Assembly language programming - Modular Programming - Linking and Relocation - Stacks - Procedures - Macros - Interrupts and interrupt service routines - Byte and String Manipulation.		**CO2**
Unit- III	**Interfacing with 8086**	**Periods: 09**
Introduction to Peripheral Devices - 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254 programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.		**CO3**
Unit- IV	**8051 Microcontroller**	**Periods: 09**
Architecture of 8051- I/O Pins Ports - Instruction set - Addressing modes - Assembly language programming: Programming 8051 Timers - Serial Port Programming - Interrupts Programming - LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.		**CO4**
Unit- V	**Real-Time Operating System (RTOS)**	**Periods: 09**
RTOS - Need of RTOS in Embedded System - Choosing RTOS - MicroC/OS-II - Integrated Development Environment - Simulators - Emulators - Debugging - Case Study: Washing Machine - Application specific Embedded System - Automotive - Domain specific Embedded system.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Dr D A Godse, A P Godse, “Microprocessors & Microcontrollers: 8086 and 8051 Architecture, Programming and Interfacing”, Technical Publications, 2020.
2. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 6th Edition 2019.
3. Raj Kamal, “Embedded systems Architecture, Programming and Design”, Tata McGraw - Hill, 2016.
4. Shibu K V," Introduction to Embedded Systems", McGraw Hill Education (India) Private Limited, 2014.
5. Wayne Wolf “Computers as components: Principles of Embedded Computing System Design”, The Morgan Kaufmann Series in Computer Architecture and Design, 2013.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, 2nd Edition, Pearson education, 2011.

Reference Books

1. Steve Heath, “Embedded Systems Design”, EDN Series, 2013.
2. Lyla B. Das," Embedded Systems an Integrated Approach", Pearson Education, 2013.
3. Krishna Kant, “Microprocessors and Microcontrollers - Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2014.
4. Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH 2012.
5. Marilyn Wolf, “Computers as Components – Principles of Embedded Computing System Design”, Third Edition – 2012.
6. Sriram V Iyer, Pankaj Gupta " Embedded Real Time Systems Programming", Tata McGraw- Hill, 2012.

Web References

1. Web based 8085 Microprocessor Simulator (web8085.appspot.com)
2. https://exploreembedded.com
3. https://www.udemy.com/course/8051-microcontroller-embedded-c-and-assembly-language/
4. https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/
5. https://developer.arm.com/products/architecture/cpu-architecture

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Computer Science and Engineering	Programme: **B.Tech.**						
Semester	III	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	U23CST302	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Software Engineering and Testing	3	-	-	3	25	75	100

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Perform Software engineering processes.	**K2**
	CO2 Make use of software design.	**K2**
	CO3 Apply different software testing strategies.	**K3**
	CO4 Illustrate different testing techniques.	**K3**
	CO5 Apply the different levels of testing.	**K3**

UNIT - I	**Software Engineering Processes**	**Periods:09**
Software engineering concepts – Development activities – Software development lifecycle models – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management – Project Planning – Empirical Estimation Techniques – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Software Requirements specification.		**CO1**

UNIT - II	**Software Design**	**Periods:09**
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.		**CO2**

UNIT - III	**Software Testing**	**Periods:09**
Introduction to Software testing – Psychology of Testing – Principles of Software Testing – Defects – Defect Prevention Strategies – Role of a tester – Software Testing Life Cycle.		**CO3**

UNIT - IV	**Testing Techniques and Testing Tools**	**Periods:09**
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.		**CO4**

UNIT - V	**Levels of Testing**	**Periods:09**
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.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

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

Reference Books

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **PC**				End Semester Exam Type: **TE**		
Course Code	**U23CSDC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Automata and Compiler Design**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
(Common to CSE and AI&DS)								
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the concept of Finite Automata, NFA and DFA.	**K2**
	CO2 Understand about Context Free Language and Normal Forms	**K2**
	CO3 Construct Push Down Automata and 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	**K3**

UNIT - I	**Finite Automata and Regular Expressions**	**Periods:09**
Introduction: Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Conversion from NFA to DFA – NFA with epsilon transition - Eliminating epsilon transition -Regular Expression- Conversion from Regular Expression to NFA- Conversion from Regular Expression to DFA (Direct / Indirect method) – Minimized DFA.		**CO1**
UNIT - II	**Context-Free Grammar and Normal Forms**	**Periods:09**
Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) – Derivations and Parse trees – Ambiguity in grammars – Normal Forms – Chomsky Normal Form – Greibach Normal Form.		**CO2**
UNIT - III	**Pushdown Automata and Turing Machines**	**Periods:09**
Push Down Automata (PDA): Definition of the Pushdown Automata - Languages of pushdown automata – CFG to PDA -Turing Machine - Turing machines for regular languages- Turing machine construction for Palindrome, Addition, Subtraction.		**CO3**
UNIT - IV	**Lexical Analysis and Syntax Analysis**	**Periods:09**
Compilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Parser: Top-Down Parser – Predictive Parser, Bottom up Parser – Shift Reduce Parser - Operator Precedence Parser-SLR Parser.		**CO4**
UNIT - V	**Intermediate Code Generation, Code Optimization and Code Generation**	**Periods:09**
Intermediate Code Generation: Intermediate Languages. Code Optimization: Principle sources of optimization – Loop Optimization. Code Generation: Issues in the design of code generator – Simple code generator – Basic blocks and flow graphs – The DAG representation of Basic Block - Generating code form DAGs - Peephole optimization.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

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.

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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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: **PC**			*End Semester Exam Type: **TE**	
Course Code	**U23CST303**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Computer Networks**			**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	Nil		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Describe the functions of each layer in OSI and TCP/IP model use to communicate over a network for network communications	**K2**
	CO2	Explain the techniques of Data-link layer for implementation of point-to-point flow and error control mechanism	**K2**
	CO3	Identify the various network layer techniques and analyse the packet flow on basis of routing algorithms	**K3**
	CO4	Demonstrate the transport layer protocols for reliable communications using end-to-end solution	**K3**
	CO5	Analyze the functional working of different protocols of application layer and Network Security	**K4**

UNIT-I	**Introduction and Physical Layer**	**Periods: 9**	
Introduction - Uses of Computer Networks - Network hardware - Network software - Reference Models: OSI, TCP/IP Reference models - Example Networks: ARPANET, Internet - Physical Layer: Guided Transmission media: Twisted pairs, coaxial cable, fiber optics - Wireless transmission.			**CO1**
UNIT-II	**Data Link Layer**	**Periods: 9**	
Design link layer design issues - Error detection and correction - Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel - Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat.			**CO2**
UNIT-III	**Network Layer**	**Periods: 9**	
Network Layer Design issues - Routing algorithms: Shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing - Congestion Control Algorithms -Internetworking - The Network layer in the internet: IPV4 vs IPV6.			**CO3**
UNIT-IV	**Transport Layer**	**Periods: 9**	
The Transport Service - Elements of Transport protocols – Connection management: The TCP Segment header, TCP Connection Establishment, TCP Connection release - UDP protocols: Remote Procedure call.			**CO4**
UNIT-V	**Application Layer and Network Security**	**Periods: 9**	
Domain name system - Electronic Mail – HTTP - World Wide Web – Cryptography -Public Key Algorithm: RSA			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Andrew S. Tanenbaum, Nickolas Feamster, " Computer Networks ", Pearson Education,2019.
2. Gifford, "Computer Networks", Crabtree Publishing Company,1st Edition,2015.
3. Larry L. Peterson and Bruce S.Davie, "Computer Networks "Elsevier Science,5th Edition,2011.
4. Andrew S. Tanenbaum, David.J. Wetherall, "Computer Networks", Prentice-Hall, 5th Edition, 2010
5. Behrouz A.Forouzan, "Data Communications and Networking",MCGraw-Hill,4th Edition,2007

Reference Books

1. Chwan-Hwa Wu, Irwin," Introduction to Computer Networks and Cyber Security", CRC publications, 2014.
2. Behrouz A. Forouzan, Firouz Mosharraf," Computer Networks", McGraw-Hill,2012
3. Douglas E. Comer," Internet working with TCP/IP", Prentice-Hall, 5thEdition,2011.
4. Peterson, Davie, Elsevier,"Computer Networks",5 thEdition,2011
5. Comer," Computer Networks and Internets with Internet Applications",4thEdition,2004.

Web References

1. http://computer.howstuffworks.com/computer-networking-channel.htm
2. https://www.geeksforgeeks.org/layers-osi-model/
3. https://www.wikilectures.eu/w/Computer_Network
4. https://technet.microsoft.com/en-us/network/default.aspx
5. http://www.freebookcentre.net/networking-books-download/Introduction-to-Computer Networks.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	-	3	-	-	-	-	-	-	-	-	3	-	2
2	-	1	-	2	-	-	-	-	-	-	-	-	3	-	1
3	-	-	1	2	3	-	-	-	-	-	-	-	3	-	1
4	-	1	-	2	-	-	-	-	-	-	-	-	3	-	2
5	1	1	-	2	2	-	-	-	-	-	-	-	3	1	2

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSBC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design and Analysis of Algorithms**	**2**	**-**	**2**	**3**	**50**	**50**	**100**

(COMMON TO CSE, CCE and AI&DS)

Prerequisite	Problem Solving Approaches	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Analyze and improve the efficiency of algorithms and estimate the performance of algorithm and Divide and Conquer.	**K2**
	CO2 Determine the Greedy paradigms, Dynamic Programming and explain when an algorithmic design situation calls for it.	**K3**
	CO3 Interpret the Backtracking paradigms, Branch and Bound, NP-Hard paradigms and explain when an algorithmic design situation calls for it.	**K3**
	CO4 Demonstrate programs using Divide and Conquer, Greedy paradigms.	**K3**
	CO5 Build the programs using Dynamic Programming, Backtracking and Branch and Bound.	**K2**

UNIT - I	**Introduction To Algorithm and Divide and Conquer**	**Periods:10**	
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. **Divide and Conquer method**: Binary search – Merge sort – Quick sort			**CO1**
UNIT - II	**Greedy Method and Dynamic Programming**	**Periods:10**	
Greedy method: General method – applications– Knapsack problem – Minimum cost spanning trees –Single source shortest path problem. **Dynamic Programming**: Applications – Multistage graphs – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem			**CO2**
UNIT - III	**Backtracking and Branch and Bound**	**Periods:10**	
Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle – 0/1 Knapsack Problem. **Branch and Bound**: General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution –FIFO Branch and Bound solution			**CO3**
UNIT - IV	**Laboratory Exercises**	**Periods:15**	
• Implementation of binary search using Divide-and-Conquer technique • Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique. • Implementation of Knapsack using Greedy technique. • Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique. • Implementation of Single-Source Shortest Paths algorithms using Greedy technique.			**CO4**
UNIT - V	**Laboratory Exercises**	**Periods:15**	
• Implementation of All Pairs Shortest Paths using Dynamic Programming technique. • Implementation of Traveling Salesman Problem using Dynamic Programming technique. • Implementation of 8 Queens Problem with the approach of Backtracking. • Implementation of sum of subsets with the approach of Backtracking. • Implementation of Traveling Salesman problem with Branch-and-Bound technique.			**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:60**

Text Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition,2019.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rdEdition,2009.

Reference Books

1. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
2. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
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 References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									#End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)	
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **HS**			*End Semester Exam Type: **P**			
Course Code	**U23ENPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**General Proficiency- I**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret meaning and apply reading strategies in technical and non-technical context	**K3**
	CO2 Develop interpersonal communication skills professionally	**K4**
	CO3 Demonstrate various forms of formal writing	**K3**
	CO4 Decode graphical data coherently	**K2**
	CO5 Apply the techniques of verbal aptitude in competitive exams	**K3**

UNIT- I	**Comprehension Analysis**	**Periods:6**	
Listening: Dialogue based on social contexts (IELTS based) - Speaking: Break the iceberg (IELTS based) Submitting Video Recording - Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 2 (IELTS Academic) - Vocabulary: Synonyms (IELTS)			**CO1**
UNIT- II	**Personality Development**	**Periods:6**	
Listening: Monologue about the everyday social issues (IELTS based) - Interview Videos - Speaking: Speak about the topic in the Flash Card (IELTS based) - Reading: British & American Vocabulary - Writing: SWOT Analysis - Vocabulary: Idioms and Phrases (IELTS)			**CO2**
UNIT- III	**Inferential Learning**	**Periods:6**	
Listening: Conversation between 4 people regarding education (IELTS based), Anecdotes - Speaking: Structure Discussion (IELTS based) - Reading: Distinguish between facts & opinions (IELTS based), - Writing: Writing Conversation to different context - Vocabulary: Phrasal Verbs (IELTS)			**CO3**
UNIT- IV	**Interpretation and Functional Writing**	**Periods:6**	
Listening: Monologue on an academic subject (IELTS based), Group Discussion videos - Speaking: Group Discussion Practice - Reading: Read and review (Books, Magazines) - Writing: Writing Task 1: (IELTS Academic: Graph/ chart/tables description) - Vocabulary: Collocations (IELTS)			**CO4**
UNIT-V	**Verbal Aptitude - I**	**Periods:6**	
Language Enhancement: Articles, Preposition, Conjunction **Verbal Ability Enhancement:** Ordering of sentences, Blood Relation, Completing Statements- Cloze test, Spotting Errors - Sentence Improvement, Word Analogy, Word Groups **(GATE)**			**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Lewis, Norman, "Word Power Made Easy".Goyal Publishers and Distributors Pvt.Ltd., Latest Edition, 2020.
2. Patterson, Kerry, Joseph Grenny,Ron McMillan, Al Switzler, "Crucial Conversation Tools for talking when Stakes are High", Kindle Publication,2nd Edition, 2011.
3. Comfort, Jeremy,et.al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.
4. Agarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Mathematics**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **BS**			*End Semester Exam Type: **LE**			
Course Code	**U23MAPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS)

Prerequisite	Matrices, Fourier Transforms, Laplace Transforms	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Perform and evaluate Matrix Operations	**K3**
	CO2 Solve Differential and Integral Equations	**K3**
	CO3 Construct Fourier series and Fourier Transforms of the given function	**K3**
	CO4 Find the Measures of Central tendency	**K3**
	CO5 Analyze Correlation and Regression lines	**K3**

List of Experiments:

1. Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix.
2. Solve the first order differential equation.
3. Find the integration of $\int_a^b f(x)dx$.
4. Find the Fourier series of f(x).
5. Find the Fourier Transform of f(x).
6. Find the Laplace Transform of f(x).
7. Find the Mean, Median and Mode.
8. Construct the Pie and Bar Diagram.
9. Find the Correlation coefficient.
10. Find the Regression lines.

Lecture Periods: - Nil	**Tutorial Periods: - Nil**	**Practical Periods: 30**	**Total Periods :30**

Reference Books

1. T. Veerarajan, "Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018.
2. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.
3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.

Web References

1. https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
2. https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf
3. https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410.

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23CSP301**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Embedded System Architecture and Interfacing Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Digital Design and System Architecture	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Acquire knowledge on operations of 8085 microprocessor set of instruction.	**K3**
	CO2 Familiarize the basic concepts of 8086 instructions.	**K3**
	CO3 Learn the Interface modules using assembly language program.	**K3**
	CO4 Attain knowledge on 8051 microcontroller instructions.	**K3**
	CO5 Apply the concepts on real time applications	**K4**

List of Exercises

Assembly Language Program Exercises Using 8086 Microprocessor Trainer Module.

1. Execute 16-bit Addition, Subtraction, Multiplication and Division using 8086 Trainer module.
2. Write a program to find the largest number in a data array using 8086 Trainer module.
3. Write a code to transfer a block of data without overlap using 8086 Trainer module.

Assembly Language Program for Interfacing Peripheral Devices Using 8086 Trainer Module.

4. To perform Bulk memory operations using DMA controller interfacing through 8086.
5. To perform interfacing with 8251 USART or RS232C.

Assembly Language Program Exercises Using 8051 Microcontroller Trainer Module

6. To perform Bit Manipulations using Boolean and Logical operations.
7. To find the largest / smallest number in an array of numbers.
8. Write a program to generate a delay using timer / counter.

Interfacing Exercises Using 8051 Microcontroller Trainer Kit and interfacing Modules

9. Interface ADC Module to 8051 Microcontroller Trainer kit.
10. Generate different waveforms (sine, square, Triangular, Ramp, etc.,) by interfacing DAC Module to 8051 **Microcontroller Trainer kit.**
11. Interface stepper motor / DC Motor Module with 8051 Microcontroller Trainer Kit.
12. Interface Traffic Light controller Module with 8051 Microcontroller Trainer Kit.

Programming / Interfacing using RTOS

13. Flashing of LEDs using RTOS.
14. Measure Temperature using sensor and write to display using RTOS.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. "Embedded Systems Architecture, Programming and Design", Rajkamal, TATA McGraw-Hill, 2nd edition 2015.
2. "Arduino for beginners: Essential Skills Every Maker Needs", John Baichtal, Person Education, Inc., 1st Edition, 2013.
3. "8085 Microprocessors Architecture Application and Programming", Ramesh S. Goankar, Penram International, 5th Edition.2002.
4. "Microcontroller Projects in C for the 8051", Dogan Ibrahim, Elsevier Science, 2000.
5. "The 8051 Microcontroller", Kenneth J. Ayala, Cangage learning, 3rd Edition, 1991.

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1. Web based 8085 Microprocessor Simulator (web8085.appspot.com)
2. https://exploreembedded.com
3. https://www.udemy.com/course/8051-microcontroller-embedded-c-and-assembly-language/
4. https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/
5. https://developer.arm.com/products/architecture/cpu-architecture

*TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSP302**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Software Engineering and Testing Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	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 Beautiful Soup.	**K3**
	CO4 Apply Unit testing on software module	**K3**
	CO5 Apply Integration testing on software modules	**K3**

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 the results for the given API using postman.
13. Introduction to Unit Testing Framework and Unit Testing.
14. Manipulate Unit tests and Integration Tests.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

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

Web References

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=87Gx3U0BDlo
6. https://www.guru99.com/unit-testing-guide.html
7. https://www.youtube.com/watch?v=4_Ik8eb2ln0

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **MC**			*End Semester Exam Type: **-**			
Course Code	**U23CSM303**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Climate Change**	**2**	**0**	**0**	**-**	**100**	**-**	**100**
Prerequisite	-							

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Inspect the characteristics and Temperature profile of the atmosphere	**K2**
	CO2	Analyze past climate, human influence on global warming, and predict future climates	**K3**
	CO3	Analyze the impact of climate change and the risk of Irreversible Changes	**K3**
	CO4	Outline the carbon credits and evidences of changes in Environment	**K2**
	CO5	Acquire knowledge on clean development mechanism and mitigation technologies	**K2**

UNIT- I	**ATMOSPHERE AND ITS COMPONENTS**	**Periods:06**	
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.			**CO1**
UNIT- II	**GLOBAL CLIMATE**	**Periods:06**	
Account of past climate - Environmental indicators and instrumental records - Human Footprints on global warming - Predicting future climates - Temperature regime - Extreme climate events.			**CO2**
UNIT- III	**IMPACTS OF CLIMATE CHANGE**	**Periods:06**	
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.			**CO3**
UNIT- IV	**OBSERVED CHANGES AND ITS CAUSES**	**Periods:06**	
Climate change and Carbon credits - Initiatives in India-Kyoto Protocol – Inter government 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.			**CO4**
UNIT- V	**CLIMATE CHANGE AND MITIGATION MEASURES**	**Periods:06**	
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.			**CO5**

Lecture Periods:30	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods:30**

Text Books

1. Joan Fitzgerald, “Greenovation: Urban Leadership on Climate Change”, Oxford University Press, 2020.
2. Andrew Dessler and Edward A. Parson, “The Science and Politics of Global Climate Change”, Cambridge University press, 3rd Edition, 2019.
3. J. David Neelin, “Climate change and climate modelling”, Cambridge University press, 2011.
4. Robin Moilveen, “Fundamentals of weather and climate”, Oxford University Press, 2nd Edition, 2010.
5. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007.

Reference Books

1. Bill McKibben, “The Global Warming Reader: A Century of writing about Climate Change”, Penguin, 2012.
2. Jason Smerdon, “Climate Change: The Science of Global Warming and our Energy Future”, Columbia University, 2009
3. Adaptation and mitigation of climate change-Scientific Technical Analysis, Cambridge University Press, 2006.
4. J.M. Wallace and P.V. Hobbs, “Atmospheric Science”, Elsevier/ Academic Press, 2006.
5. Jan C. van Dam, Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2003.

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

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

SEMESTER IV

Department	**Mathematics**			Programme : **B.Tech.**				
Semester	**IV**			Course Category Code: **BS**		*End Semester Exam Type: **TE**		
Course Code	**U23MATC05**			Periods/Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**DISCRETE MATHEMATICS AND GRAPH THEORY**			**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to CSE, IT, AI&DS and CCE)										
Prerequisite	Basic Mathematics									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)		
	CO1	Construct Mathematical arguments using logical connectives and truth tables.						**K3**		
	CO2	Verify the correctness of an argument predicate logic and quantifiers.						**K3**		
	CO3	Solve problems using counting techniques in Lattices.						**K3**		
	CO4	Familiarize the different types of Graphs.						**K3**		
	CO5	Understand the Applications of Shortest path algorithms.						**K3**		
UNIT – I	**LOGICS AND PROOFS**						**Periods:12**			
Introduction – Connectives – Statement formulae – Truth table – Tautologies – Equivalence of Statement formulae – NAND and NOR Connectives – Implications – Principal conjunctive and disjunctive normal forms.										**CO1**
UNIT – II	**PREDICATE AND QUANTIFIERS**						**Periods:12**			
Predicate and Quantifiers – Rules of Inference theory – Conditional proof – Indirect method of proof.										**CO2**
UNIT – III	**LATTICES**						**Periods:12**			
Partially Ordering – Posets – Hasse Diagram – Lattices as Posets – Properties of Lattices – Sub lattices – Complemented and Distributive lattices.										**CO3**
UNIT – IV	**GRAPH THEORY**						**Periods:12**			
Graphs and types of Graphs – Matrix representation of graphs – Isomorphism – Connected graphs – Euler graphs – Hamilton paths and circuits.										**CO4**
UNIT – V	**TREES**						**Periods:12**			
Trees – Properties of Trees – Algorithm – Kruskal's algorithm.										**CO5**
LecturePeriods:45		**TutorialPeriods:15**		**Practical Periods:-**			**TotalPeriods:60**			

Text Books

1. P. Tremblay and R. Manohar, "Discrete Mathematical structures with Applications to computer Science", 13th reprint, Tata McGraw - Hill publishers, 2002.
2. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publications New York, First Edition, 2016.
3. Dr G. Balaji "Discrete Mathematics", G. Balaji Publishers – 14th Edition 2021.

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, second edition, 2002.
4. Oscar Levin, "Discrete Mathematics An Open Introduction", 3rd Edition, 4th Printing: 2019 ISBN: 978-1792901690
5. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw - Hill PublishingCompany, Pvt. Ltd., New Delhi, Fifth edition, 2003.

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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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **ES**			*End Semester Exam Type: **TE**			
Course Code	**U23ITTC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Java**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to All Branches)								
Prerequisite	Programming Skills							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Articulate the concept of Java fundamentals, OOPs and Strings	**K2**
	CO2 Demonstrate the principles of inheritance, packages and interfaces with real time applications	**K2**
	CO3 Create real time applications using exception handling and thread programming.	**K3**
	CO4 Build distributed applications using Collections and IO streams	**K3**
	CO5 Design and build simple GUI programs using AWT, Swings and build database applications	**K3**

Unit- I	**Introduction**	**Periods: 09**
Introduction: Java: History – Features – JVM - JRE – JDK – Java Compilation and Execution – Data Types - Variables, Types, Expressions, Assignment Statements, Input/Output Statements: Scanner/System class, Type Casting (Primitives to Primitives), Conditional and Iterative Control Structures - Arrays **OOPs with Java:** Introduction to OOPs Concepts - Class – Objects – Methods - Access Modifiers – Creating Class and Objects, Object Life-Cycle - Garbage Collection-Constructors - this – static – Array of Objects – Nested Classes. **String**: String Class– Built-in Methods – StringBuilder - StringBuffer		**CO1**
Unit- II	**Inheritance, Interfaces and Packages**	**Periods: 09**
Inheritance: Types of Inheritance – is-a Relationship, has-a Relationship – super keyword – final keyword – Polymorphism - Method overloading and Method overriding – Abstract Class **Interfaces:** Define – Extend – Implement – Access - Interfaces vs Abstract classes, Type Conversions (Primitives to Objects vice-versa): Autoboxing and Auto unboxing. **Packages:** Define – Create – Access – Import.		**CO2**
Unit- III	**Exception Handling and Multithreading**	**Periods: 09**
Exception Handling: Exception Hierarchy – Checked and Unchecked Exceptions – try, catch, throws, throw and finally – User Defined Exceptions. **Multithreading:** Thread – Life cycle – Defining and Running – Implementation Types – Thread Priorities – Thread Synchronization - Inter-Thread Communication.		**CO3**
Unit- IV	**Collections and I/O Streams**	**Periods: 09**
Collections: List: ArrayList and LinkedList. Set: HashSet and TreeSet. Map: HashMap – Stack – Queue. Lambda Expressions. **I/O Streams:** Streams – Byte Streams and Character Streams – FileInputStream and FileOutputStream – FileReader and FileWriter. Object Serialization : ObjectInputStream and ObjectOutputStream.		**CO4**
Unit- V	**GUI and JDBC**	**Periods: 09**
AWT: Components – Controls – Event Handling **SWING**: Swing Components – Layout Management. **JDBC:** JDBC Architecture – JDBC Driver Types – Implementation of JDBC.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Allen B. Downey and Chris Mayeld, “Think Java - How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2020.
2. Herbert Schildt, “Java: The Complete Reference”, TMH Publishing Company Ltd, 11th Edition, 2018.
3. H.M.Dietel and P.J.Dietel, “Java How to Program”, 11th Edition, Pearson Education/PHI, 2017
4. Cay S. Horstmann, Gary Cornell, “Core Java Volume - I Fundamentals”, 9th Edition, Prentice Hall, 2013.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Poaul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
3. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
4. Steven Holzner, "Java 2 Black book", Dreamtech Press, 2011.

Web References

1. https://www.javatpoint.com/java-tutorial
2. https://docs.oracle.com/en/java/
3. https://www.studytonight.com/java/
4. https://onlinecourses.nptel.ac.in/

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC04**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Database Management Systems**	3	-	-	3	25	75	100

(Common to CSE, IT and CCE)

Prerequisite	**Computer Programming and Data Structures**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the concepts of Database Management System and develop Entity Relationship model and Relational Models for a given application	**K2**
	CO2 Manipulate and build database queries using Structured Query Language and relational algebra	**K3**
	CO3 Use data normalization principles to develop a normalized database for a given application	**K3**
	CO4 Illustrate various transactions and recovery techniques	**K2**
	CO5 Apply tools like NoSQL, MongoDB, Cassandra on real time applications	**K3**

UNIT - I	**Introduction**	**Periods:09**
Database Systems - Data Models – System Structure-Database System Architecture - Entity-Relationship Model - ER Diagram - Extended ER Model - ER into Relational Model - Relational Model: Structure of Relational Databases, Database Schema, Keys, Tables.		**CO1**
UNIT - II	**Database Languages**	**Periods:09**
Relational Algebra - Extended-Relational Algebra - Relational Calculus - SQL: Introduction - DDL - DML - Integrity Constraints - Set Operations - Joins - Nested Queries - View- Trigger - Stored Procedures.		**CO2**
UNIT - III	**Relational-Database Design and Data Storage**	**Periods:09**
Relational Database Design: Domain and Data Dependency - Lossless Design - Armstrong's axioms - Functional Dependencies - Normal Forms - 1NF, 2NF, 3NF, BCNF and 4NF. **Data Storage:** RAID - File Organization - Indexing: Types of Indexing.		**CO3**
UNIT - IV	**Transactions**	**Periods:09**
Transaction concepts and states- Concurrent Execution - Serializability -Query Processing- Concurrency Control: Lock based Protocol - Timestamp based Protocol - Recovery System: - Log-Based Recovery - Shadow Paging.		**CO4**
UNIT - V	**NoSQL Databases**	**Periods:09**
NoSQL - Document Database: MongoDB - Multi-dimensional: Cassandra.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 7th Edition - McGraw-Hill Higher Education, International Edition, 2019.
2. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems (7th edition), Publisher: Pearson,2016.
3. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

Reference Books

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

Web References

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

*

TE –

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

Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CSTC05**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Operating Systems**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to CSE and IT)

Prerequisite	Nil	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the various OS functionalities, structures, and layers	**K2**
	CO2 Usage of system calls related to OS management and interpreting different stages of various process states and process scheduling	**K4**
	CO3 Apply and explore the communication between inter process and Deadlock avoidance.	**K3**
	CO4 Implement page replacement algorithms, memory management problems and segmentation	**K2**
	CO5 Apply various disk scheduling algorithms and I/O Hardware	**K4**

Unit- I	**Introduction to Operating Systems**	**Periods: 09**
Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.		**CO1**

Unit- II	**Process Management and Scheduling Algorithms**	**Periods: 09**
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. **Process Scheduling**: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. **Scheduling algorithms**: Pre-emptive and non-pre-emptive, FCFS, SJF, RR.		**CO2**

Unit- III	**Process Synchronization, Threads and Deadlocks**	**Periods: 09**
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem. **Concurrent Programming**: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection, and recovery. **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. **Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention and **Deadlock Avoidance:** Banker's algorithm, Deadlock detection and Recovery.		**CO3**

Unit- IV	**Memory Management**	**Periods: 09**
Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction. **Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First In First Out (FIFO, Not Recently Used (NRU) and Least Recently Used (LRU).		**CO4**

Unit- V	**File, I/O and Device Management**	**Periods: 09**
File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. **I/O Hardware:** I/O devices, Device controllers, Direct Memory Access, Principles of I/O. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN.		**CO5**

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Abraham Silberschatz, Peter B. Galvin, "Greg Gagne-Operating System Concepts", Wiley, 10th Edition, 2019.
2. William Stallings, "Operating Systems: Internals and Design Principles", Pearson, 9th Edition, 2018.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition,2016.
4. Tanenbaum, Andrew S., and Albert S. Woodhull. "Operating systems: design and implementation", Vol. 68. Englewood Cliffs: Prentice Hall, 1997.

Reference Books

1. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, "Operating Systems: Three Easy Pieces", Arpaci-Dusseau Books, Inc 2015.
2. Thomas Anderson and Michael Dahlin, "Operating Systems principles and practicell", Wiley, 2nd Edition, 2014.
3. Gary Nutt," Operating System, A modern perspective", 3rd Edition, Addison Wesley, 2004.
4. B.L. Stuart, "Principles of Operating Systems Cengage learning", India Edition, 2004.
5. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes, "Operating systems", Delhi. Pearson Education: Dorling Kindersley, 2004.

Web References

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: B.Tech.						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSB401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Android Programming**	**2**	**-**	**2**	**3**	**50**	**50**	**100**

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 To Learn about Android Operating System and its tools	**K2**
	CO2 Discuss and analyze about various Android UI	**K2**
	CO3 Know the concepts of API Storing, sharing and retrieving data in Android applications using SQLite Database.	**K3**
	CO4 Create the designs for software development using Android SDK	**K4**
	CO5 Design software applications with files and database connectivity	**K4**

UNIT – I	**Introduction to Android Operating System**	**Periods:10**
Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Android Development Tools, Android Architecture.		**CO1**
UNIT - II	**User Interface Architecture**	**Periods:10**
Application context, intents, Activity life cycle, multiple screen sizes. **User Interface Design:** Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog		**CO2**
UNIT - III	**Android API and Database**	**Periods:10**
Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World. **DataBase:** Understanding of SQLite database, connecting with the database.		**CO3**
UNIT - IV	**Android Programming: List Of Experiments**	**Periods:15**
1. Create —Hello World‖ application. That will display —Hello World‖ in the middle of the screen in the emulator. Also display —Hello World in the middle of the screen in the Android Phone. 2. Create an application with login module. (Check username and password). 3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change. 4. Create a menu with 5 options and and selected option should appear in text box.		**CO4**
UNIT - V	**Android Programming: List Of Experiments**	**Periods:15**
1.Create a list of all courses in your college and on selecting a particular course teacher incharge of that course should appear at the bottom of the screen. 2 Create an application with three option buttons, on selecting a button colour of the screen will change. 3. Create and Login application as above. On successful login, pop up the message. 4. Create an application to Create, Insert, update, Delete and retrieve operation on the database		**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:60**

Text Books

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, Manning Publications Co., 2012.
2. Reto Meier, —Professional Android 2 Application Development‖, Wrox Wiley, 2010.

Reference Books

1. Android Notes for Professionals. GoalKicker.com, Free Programming Books.
2. The Android Developer’s Cookbook: Building Applications with the Android SDK by James Steele, Nelson To, Addison-Wesley Professional; 2010
3,Wei – Meng Lee, Beginning Android Application Development, Wiley publications

Web References

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.html
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									#End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)	
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**	Programme: **B.Tech.**						
Semester	**II/IV**	Course Category Code: **HS**			*End Semester Exam Type:**P**			
Course Code	**U23ENPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**General Proficiency- II**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to ALL Branches except CSBS)								
Prerequisite	Basics of English Language							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Infer ideas to attend international standardized test by broadening receptive and productive skills	**K2**
	CO2 Interpret the types of writing in different state of affairs	**K3**
	CO3 Acquire meticulous exposure in speaking and get rid of performance anxiety	**K2**
	CO4 Articulate the ideas and opinions effectively and coherently	**K2**
	CO5 Progress the skills to compete in various competitive exams like GATE, GRE, UPSC, etc.	**K4**

UNIT- I	**CAREER SKILLS**	**Periods:6**
Listening: Listening at specific contexts - Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps) - Reading: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) - Writing: Integrated Writing Task (TOEFL) - Vocabulary: Synonyms and Antonyms (IELTS)		**CO1**
UNIT- II	**CORPORATE SKILLS**	**Periods:6**
Listening: Listening English news and reproducing in own words - Speaking: Team Presentation - Reading: Short texts and Longer Passages (cloze reading) - Writing: Analytical Writing: Analyzing an issue and Argument task (GRE based) - Vocabulary: Prefix and Suffix		**CO2**
UNIT- III	**FUNCTIONAL SKILLS**	**Periods:6**
Listening: Listening TED Talks - Speaking: Brainstorming & Individual Presentation - Reading: Text Completion (GRE Based) - Writing: Picture Inference - Vocabulary: Word Formation		**CO3**
UNIT- IV	**TRANSFERRABLE SKILLS**	**Periods:6**
Listening: Listening Documentaries and making notes - Speaking: Mock Interview - Reading: Read texts on emerging trends - Writing: Agreeing & Disagreeing Essay (IELTS) - Vocabulary: Euphemism, Redundancy, Clichés and Intensifiers.		**CO4**
UNIT-V	**VERBAL APTITUDE - II**	**Periods:6**
Transformational Grammar: Tenses, Change of Voice, Concord **Verbal Ability Enhancement:** Letter Series, Coding &Decoding, Sentence Equivalence (GRE)Analytical Reasoning and Logical Reasoning (GATE), Syllogism, One-word Substitution, Jumbled Sentences		**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Cullen, Pauline, Amanda French, and Vanessa Jakeman**.** "The official Cambridge guide to IELTS for academic & general training", Cambridge, 2014.
2. Prasad, Hari Mohan, Sinha, Uma Rani, "Objective English for Competitive Examinations", Tata Mc Graw Hill: Noida,2010.
3. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
4. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford, 2007.
5. Murphy, Raymond English Grammar in Use with answers: Reference and Practice for Intermediate students, Cambridge: CUP,2004.

Web References

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

COs/POs/PSOs Mapping

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

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

Department	**Information Technology**	Programme: **B.Tech**						
Semester	**IV**	Course Category Code: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Java Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to All Branches)

Prerequisite	Programming Skills		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	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	Implement robust application programs in Java using exception handling and multithreading	**K3**
	CO4	Build java distributed applications using Collections and IO streams.	**K3**
	CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java.	**K3**

List of Exercises

1. Develop simple programs using java
2. Develop a java program that implements class and object.
3. Write a java program to find the frequency of a given character in a string
4. Write a java program to demonstrate inheritance and interfaces.
5. Develop a java program that implements the Packages.
6. Create java applications using Exception Handling for error handling.
7. Develop a simple real life application program to illustrate the use of Multi-Threads.
8. Implement simple applications using Collections.
9. Develop application using the concept of I/O Streams
10. Write a Java Program to demonstrate AWT and Swing Components
11. Develop a simple application and use JDBC to connect to a back-end database.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Allen B. Downey and Chris Mayeld, "Think Java - How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2020
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 2", Vol 2, Advanced Features, Pearson Education, 7th Edition, 2010

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

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

Evaluation Method

Assessment	**Continuous Assessment Marks (CAM)**					**End Semester Examination (ESE) Marks**	**Total Marks**
	Performance in practical classes			**Model Practical Examination**	**Attendance**		
	Conduction of practical	**Record work**	**viva**				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**					
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CSPC03**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Database Management Systems Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

Prerequisite	Data Structures and Algorithms	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement relational database systems using SQL statements.	**K3**
	CO2 Use typical data definitions and manipulation commands in various applications.	**K3**
	CO3 Demonstrate applications using Nested and Join Queries	**K3**
	CO4 Execute various advance SQL queries related to Transaction Processing.	**K3**
	CO5 Build commercial relational database systems using trigger and cursor concept.	**K3**

List of Exercises

Structured Query Language:

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

PL/SQL:

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

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Oracle Developer Handbook.
2. SQL/PL/SQL for Oracle by P.S. Deshpande, IIT Madras, Dream Tech Press.
3. Alan Beaulieu, Mastering SQL Fundamentals, 2nd Edition, O"Reilly,2009
4. Silberschatz, Korth, Sudarshan, Database System Concepts, 7thEdition - McGraw-Hill Higher Education, 2019

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC04**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**OPERATING SYSTEMS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE and IT)

Prerequisite: NIL

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	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 Disk Scheduling Algorithms.	**K4**

List of Exercises

1. Study of Basic commands to understand the system and working of Linux.
2. Shell scripting (I/O, decision making, looping)
3. Creating Child process (using fork), Zombie, Orphan. Displaying system information using C.
4. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority
5. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
6. IPC (Threads, Pipes)
7. Process synchronization (Producer Consumer / Reader Writer/Dining Philosopher using semaphores)
8. Dynamic Memory Allocation Algorithms (First fit, Best fit, Worst fit)
9. Page Replacement Algorithms. (FIFO, LRU, Optimal)
10. Disk Scheduling Algorithms.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.
3. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci- Dusseau Books, Inc, 2015.
4. Dhamdhere, Dhananjay M. Operating systems: a concept-based approach, 2E. Tata McGraw-Hill Education, 2006.
5. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes. Operating systems. Delhi. Pearson Education: Dorling Kindersley, 2004.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CSC4XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course – IV**	**-**	**-**	**4**	**-**	**100**	**-**	**100**

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.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 50**	**Total Periods: 50**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CSS402**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Aptitude – II**	**0**	**0**	**2**	**0**	**-**	**-**	**100**

Prerequisite	NIL

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.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **MC**			End Semester Exam Type:**TE**			
Course Code	**U23CSM404**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Right to Information and Good Governance**	**2**	**-**	**-**	**-**	**100**	**-**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	-	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe and analyze concept and legislative provisions related to RTI	**K2**
	CO2 Develop critical thinking skills to identify instances where public authorities have failed to meet their obligations	**K3**
	CO3 Critically assess the challenges and limitations faced by Central and State Information Commissions	**K2**
	CO4 Analyze the structure and functioning of the judiciary at different levels - local, regional, national.	**K2**
	CO5 Analyze the impact of the RTI Act on promoting transparency, accountability, and citizen empowerment in India	**K2**

UNIT-I	**Introduction**	**Periods:06**	
Conceptual background – Right to know – Open Government – Transparency in governance and accountability – Right to information under the Indian Constitution – Article 19(1)(a) and Article 21 of the Constitution – Role of NGOs and movement for right to information – Right to Information Act, 2005- Scope and objectives.			**CO1**
UNIT-II	**Obligation of Public Authorities**	**Periods:06**	
Obligations of public authorities: Section 4 - Designation of Public Information Officers: Section 5 - Disposal of request: Section 7 - Exemption from disclosure of information: Section 8 - Grounds for rejection to access in certain cases: Section 9 - Severability: Section 10 - Third party information: Section 11			**CO2**
UNIT-III	**Central and State Information Commission**	**Periods:06**	
Constitution of Central and State Information Commissions - Terms of office and conditions of service - Removal of Chief Information Commissioner or Information Commissioner - Powers and functions of Information Commissions.			**CO3**
UNIT-IV	**Judiciary and Right to Information Act**	**Periods:06**	
Protection of right to access the information- Role of the Supreme Court and High Courts – Recent attempts of dilution of the right to information Law			**CO4**
UNIT-V	**Right to Information Act, 2005 and its relevance to other laws**	**Periods:06**	
Public Records Act, 1993 - Whistle Blowers Protection Act, 2014 - Official Secrets Act, 1923			**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods:**	**Total Periods:30**

Text Books

1. Virender Negi, Monika Negi," Right to Information: Key to Good Governance", Indu Book Services Pvt. Limited, 2019
2. R. M. Pal, Somen Chakraborty "Human Rights Education in India" Indian Social Institute, 2000
3. Sairam Bhat," Right to Information and Good Governance - Volume 3 of NLSIU book series" National Law School of India University, 2016

Reference Books

1. Sairam Bhat [ed], Right to Information and Good Governance, NLSIU Book Series-3, 2016. [ISBN-9789383363452]
2. Sairam Bhat, Right to Information, Eastern Book House, 2012. [ISBN-978838021553]
3. Praveen Dala; Consumer Protection and Right to Information; Central Information Commission, 2007.

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1. https://archive.nptel.ac.in/courses/129/106/129106001/
2. https://onlinecourses.nptel.ac.in/noc20_lw01/preview
3. https://www.classcentral.com/course/swayam-right-to-information-and-good-governance-19988

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	-	-	-	-	-	100
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical				
Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		
Listening (L)*	10	Listening (L)*	10	
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

- **LRW components of Practical can be evaluated through Language Lab Software**

PROFESSIONAL ELECTIVES

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: PE				End Semester Exam Type: **TE**		
Course Code	**U23CSE401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C++**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	Basics of C Programs	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Basic concepts of C++, concepts of control structures and looping, arrays and functions.	**K2**
	CO2 Illustrate the concepts of OOPS	**K2**
	CO3 Implement Inheritance and Polymorphism example program.	**K3**
	CO4 Demonstrate File management Operations.	**K3**
	CO5 Build the programs using Templates and STL Containers.	**K3**

UNIT - I	**Introduction to C++**	**Periods:09**
Introduction to C++ - Basic components of a C++, Data types- Compiling and Executing C++ Program- Expression - Program and program structure - Control statements - Iteration statements in C++ - Introduction to Arrays - Types of Arrays – Passing Array as Data - Type casting - Functions.		**CO1**
UNIT - II	**Principles of Object-Oriented Programming and Constructors**	**Periods:09**
Basic Concepts of Object-Oriented Programming: Benefits of OOP - Applications of OOP - Classes and Objects: Data members - - Member functions – THIS Pointer -Constructors and Destructors - Friends Functions - Static variables and Functions in class - Operator Overloading in C++.		**CO2**
UNIT - III	**Inheritance and Polymorphism**	**Periods:09**
Introduction to Inheritance in C++ – Types of Inheritance - Single and Multiple - Multilevel Inheritance - Hybrid – Hierarchical Inheritance - Pointers - Objects and Pointers - Virtual Functions - Polymorphism - Function overloading - Abstract classes.		**CO3**
UNIT - IV	**Files and Streams**	**Periods:09**
Introduction to Exception Handling: Exception – Basics - Exception Handling Mechanism – Throwing Mechanism – Catching - Standard input and output operations: C++ iostream hierarchy - Standard Input/output Stream Library – Organization Elements of the iostream - Programming using Streams – Basic Stream Concepts. File input and output: Reading a File - Managing I/O Streams – Opening a File – Different Methods.		**CO4**
UNIT - V	**Templates and STL**	**Periods:09**
Introduction to Templates - Class Template – Function Templates – Function Templates Argument – Template Function Overloading. Standard Template Library (STL) – Components of STL – STL Containers – Simple programs in Template and STL.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Yashavant Kanetkar , " Let Us C++ ",BPB Publications, 2020.
2. E.Balagurusamy,"ObjectOrientedProgrammingwithC++",McGrawHill,7thEdition,2018.
3. HerbertSchildt,"C++-TheCompleteReference",McGrawHillEducation,4thedition,2017.

Reference Books

1. BjarneStroustrup,"A Tour of C++ ",Addison-Wesley Professional; 2ndEdition,2018.
2. Scott Meyers "Effective Modern C++", Shroff/O'Reilly; First Edition,2014.
3. Stanley Lippman, JoséeLajoie , Barbara Moo , "C++ Primer", 5thEdition, 2012.
4. BjarneStroustrup, "The Design and Evolution of C++", Addison-Wesley , 2005.
5. Alexanderscu "Modern C++ Design" Pearson; 1stEdition, 2004.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: PE				End Semester Exam Type: **TE**		
Course Code	**U23CSTE402**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Computer Graphics**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Comprehend the basics of Computer Graphics.	**K2**
	CO2 Understand the Line Drawing and Circle Drawing algorithms.	**K2**
	CO3 Illustrate Two Dimensional and Three-Dimensional Transformations.	**K3**
	CO4 Demonstrate Line Clipping Algorithms.	**K3**
	CO5 Realize Hidden Surface Removal algorithms.	**K3**

UNIT - I	**Basics of Computer Graphics**	**Periods:09**
Introduction to Computer Graphics - Area of Computer Graphics - Design and Drawing - Animation Multimedia applications - Difficulties for displaying pictures - Cathode Ray Tube, Quality of Phosphors, CRTs for Color Display, Beam Penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, Tablets, The light Pen, Three Dimensional Devices.		**CO1**
UNIT - II	**Line Drawing and Circle Drawing algorithms**	**Periods:09**
Point Plotting Techniques - Qualities of good line drawing algorithms, The Digital Differential Analyzer (DDA) Algorithm, Bresenham's line drawing Algorithm, Circle Drawing Algorithms.		**CO2**
UNIT - III	**Transformations**	**Periods:09**
Introduction to 2D Transformations - Translation - Rotation - Scaling - Shearing - Reflection - Homogeneous Coordinates - Matrix Representation - Composite Transformations. Introduction to 3D Transformations - Translation - Rotation - Scaling - Shearing - Reflection - Perspective Projection - Parallel Projection - Euler Angles - Quaternion Rotation - Homogeneous Coordinates - Matrix Representation - Composite Transformations.		**CO3**
UNIT - IV	**Line Clipping Algorithms**	**Periods:09**
Introduction to Line clipping - Cohen-Sutherland algorithm - Liang-Barsky algorithm - Cyrus-Beck algorithm - Sutherland-Hodgman algorithm - Weiler-Atherton algorithm.		**CO4**
UNIT - V	**Hidden Surface Removal algorithms**	**Periods:09**
Introduction to Hidden Surface Removal - Z-buffering (depth buffering) - Painter's algorithm - Binary space partitioning (BSP) trees - Scanline algorithm.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Peter Shirley, Steve Marschner, "Fundamentals of Computer Graphics", CRC Press, 2019.
2. Edward Angel and Dave Shreiner, "Interactive Computer Graphics: A Top-Down Approach with OpenGL", Pearson, 2018
3. Tomas Akenine-Möller, Eric Haines, and Naty Hoffman, "Real-Time Rendering", CRC Press, 2018.
4. Donald Hearn and M. Pauline Baker, "Computer Graphics: C Version", Pearson, 2013.
5. Foley, van Dam, Feiner, Hughes, "Computer Graphics: Principles and Practice", Addison-Wesley, 2013.

Reference Books

1. Edward Angel and Dave Shreiner, "Interactive Computer Graphics: A Top-Down Approach with OpenGL", Pearson, 2024.
2. Tomas Akenine-Möller, Eric Haines, and Naty Hoffman, "Real-Time Rendering", CRC Press, 2023.
3. John M. Hughes, Andries van Dam, Morgan McGuire, "Computer Graphics: Principles and Practice", Addison-Wesley, 4. 2022.
5. avid F. Rogers, "Procedural Elements for Computer Graphics", McGraw-Hill, 2021.
6. Peter Shirley, Steve Marschner, "Fundamentals of Computer Graphics", CRC Press, 2020.

Web References

1. Computer Graphics Tutorial - javatpoint
2. Visual Effects | Computer Graphics World | 3D Modeling | Animation | CGI (cgw.com)
3. Introduction to Computer Graphics - Open Textbook Library (umn.edu)

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

C o r r e

lation Level: 1 - Low, 2 - Medium, 3 – High Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: PE				End Semester Exam Type: **TE**		
Course Code	**U23CSE403**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Distributed Systems**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the Architecture to design distributed System.	**K2**
	CO2 Understand various Interprocess communication techniques.	**K2**
	CO3 Understand and Build Various File system.	**K3**
	CO4 Design distributed system using various communication models	**K4**
	CO5 Design application using various distributed algorithm.	**K4**

UNIT - I	**Basic Concepts**	**Periods:09**
Definition of a distributed systems, Examples, Resource sharing and the Web, Challenges, System models, Architectural and fundamental models, Networking Interprocess communication, External data representation and marshalling, Client-server, and Group communication.		**CO1**
UNIT - II	**Communication in Distributed System**	**Periods:09**
System Model – Inter process Communication – the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation and Objects: Remote Invocation – Introduction – Request-reply protocols – Remote procedure call – Remote method invocation. Case study: Java RMI – Group communication – Publish-subscribe systems – Message queues – Shared memory approaches -Distributed objects.		**CO2**
UNIT - III	**File System and Peer to Peer Service**	**Periods:09**
Distributed file systems - File service architecture – Andrew File system. File System: Features-File model -File accessing models – File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP- Peer-to-peer Systems – Introduction – Napster and its legacy – Peer-to-peer – Middleware – Routing overlays. Overlay case studies: Pastry, Tapestry		**CO3**
UNIT - IV	**Synchronization and Replication**	**Periods:09**
Introduction – Clocks, events and process states – Synchronizing physical clocks- Logical time and logical clocks – Global states – Coordination and Agreement – Introduction – Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control – Timestamp ordering – Atomic Commit protocols - Distributed deadlocks – Replication – Case study – Coda.		**CO4**
UNIT - V	**Process& Resource Management**	**Periods:09**
Process Management: Process Migration: Features, Mechanism – Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
2. Andrew S. Tanenbaum, Maartenvan Steen, “Distributed Systems Principles and Paradigms”, 2nd ed., Pearson Education, 2006.
3. Nancy A. Lynch, “Distributed Algorithms”, Hardcourt Asia Pvt. Ltd., Morgan Kaufmann, 2000.
4. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

Reference Books

1. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010
2. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
3. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
4. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.

Web References

1. https://www.geeksforgeeks.org/distributed systems
2. www.tutorialspoint.com/distributed systems
3. www.splunk.com

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE404**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IoT Design Protocols**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the Architectural Overview of IoT.	**K2**
	CO2 Recognize the IoT Reference Architecture and Real-World Design Constraints	**K2**
	CO3 Understand the various IoT Protocols.	**K3**
	CO4 Design application using various IoT Protocols.	**K4**
	CO5 Solve the various Real-World Design Constraints	**K4**

UNIT - I	**IoT-An Architectural Overview**	**Periods:09**
Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.		**CO1**
UNIT - II	**Reference Architecture**	**Periods:09**
IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints hardware is popular again, Data representation and visualization, Interaction and remote control.		**CO2**
UNIT - III	**IOT Data Link Layer & Network Layer Protocols**	**Periods:09**
PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP.		**CO3**
UNIT - IV	**Transport & Session Layer Protocols**	**Periods:09**
Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP,. MQTT.		**CO4**
UNIT - V	**Service Layer Protocols & Security**	**Periods:09**
Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.
2. Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press,2014.
4. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM –MUMBAI.

Reference Books

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e ISBN 978-3-642-19157-2, Springer.
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications.

Web References

1. https://www.javatpoint.com/iot-internet-of-things
2. https://www.tutorialspoint.com/iot-network-protocols
3. https://www.tutorialspoint.com/iot-network-protocols
4. https://techvidvan.com/tutorials/iot-protocols/
5. http://www.steves-internet-guide.com/iot-messaging-protocols/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: PE				End Semester Exam Type: **TE**		
Course Code	**U23CSE405**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**UI / UX Development**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Prerequisite	NIL		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Build UI for user Applications.	**K2**
	CO2	Evaluate UX design of any product or application.	**K2**
	CO3	Demonstrate UX Skills in product development.	**K3**
	CO4	Demonstrate UX Skills in product development models.	**K4**
	CO5	Create Wireframe and Prototype.	**K4**

UNIT - I	**Foundations of Design**	**Periods:09**	
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.			**CO1**
UNIT - II	**Foundations of UI Design**	**Periods:09**	
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.			**CO2**
UNIT - III	**Foundations of UX Design**	**Periods:09**	
Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.			**CO3**
UNIT - IV	**Wireframing, Prototyping and Testing**	**Periods:09**	
Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.			**CO4**
UNIT - V	**Research, Designing, Ideating, & Information Architecture**	**Periods:09**	
Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

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

Reference Books

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3rd Edition, O’Reilly 2020.
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018.
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme : **B.Tech**						
Semester	**V**	Course Category Code: **HS**			*End Semester Exam Type:**TE**			
Course Code	**U23HSTC02**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**RESEARCH METHODOLOGY**	2	-	-	2	25	75	100
(Common to all branches)								
Prerequisite	**Nil**							

Course Outcomes		***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1	Students will be able to differentiate between various types of research and apply appropriate research methods to solve engineering problems.	**K2**
	CO2	Students will develop the ability to identify research problems, perform comprehensive literature reviews, and use various tools and services for effective information retrieval.	**K2**
	CO3	Students will gain proficiency in designing experiments, analyzing data, and interpreting results using both numerical and graphical methods.	**K4**
	CO4	Students will be able to structure and write research papers and dissertations effectively, following ethical guidelines and avoiding common pitfalls like plagiarism.	**K3**
	CO5	Students will understand the fundamentals of intellectual property rights, including how to protect and enforce them, which is crucial for innovation and entrepreneurship in engineering.	**K3**

UNIT-I	**Introduction to Research**	**Periods: 06**
Meaning and Importance of Research, Types of Research: Overview of Basic, Applied, and Developmental Research, Overview of the Research Process, Defining a Research Problem: Key Considerations, Setting Research Objectives and Research Questions, Introduction to Research Design: Basic Concepts, Approaches to Research: Quantitative vs. Qualitative.		**CO1**
UNIT-II	**Problem Formulation and Literature Review**	**Periods: 06**
Identifying and Formulating Research Problems, conducting a Literature Review: Essential Steps, Referencing and Citation Methods: Basic Techniques. Sources of Information: Overview of Libraries and Online Databases.		**CO2**
UNIT-III	**Research Methods and Data Analysis**	**Periods: 06**
Introduction to Experimental Research, Developing Hypotheses: Basic Approach. Data Collection Methods: Sampling and Surveys, Basics of Data Analysis: Numerical and Graphical Analysis, Introduction to Inferential Statistics.		**CO3**
UNIT-IV	**Writing and Presenting Research**	**Periods: 06**
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview. Ethical Considerations in Research: Introduction to Scientific Misconduct.		**CO4**
UNIT-V	**Introduction to Intellectual Property Rights (IPR)**	**Periods: 06**
Basics of Intellectual Property Rights - Introduction to Patents, Copyrights, and Trademarks - Overview of the Registration Process.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Books

1. Kumar, R. Research Methodology: A Step-by-Step Guide for Beginners, 5th Edition, SAGE Publications, 2019.
2. Creswell, J. W., and Creswell, J. D. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, SAGE Publications, 2018.

Reference Books

1. Saunders, M. N. K., Lewis, P., and Thornhill, A. Research Methods for Business Students, 8th Edition, Pearson, 2019.
2. Sekaran, U., and Bougie, R. Research Methods for Business: A Skill-Building Approach, 8th Edition, Wiley, 2020.
3. Bhattacherjee, A. Social Science Research: Principles, Methods, and Practices, 2nd Edition, CreateSpace Independent Publishing, 2012.

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1. https://conjointly.com/kb/
2. https://owl.purdue.edu/owl/research_and_citation/conducting_research/writing_a_literature_review.html
3. https://files.eric.ed.gov/fulltext/ED536788.pdf
4. https://researcheracademy.elsevier.com/
5. https://www.wipo.int/

COs/POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1	1	3
CO2	2	3	2	2	2	1	1	1	2	2	1	3
CO3	3	3	3	3	2	1	1	1	1	1	2	2
CO4	2	2	1	2	1	1	1	3	2	3	1	2
CO5	2	2	2	2	1	2	2	3	2	2	3	3

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

Evaluation Method

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CST504**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**CLOUD COMPUTING**	3	-	-	3	25	75	100
CSE								
Prerequisite	Basics of Networks							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
CO1	Articulate the Architecture and Deployment models of Cloud computing.	**K2**
CO2	Understand virtualization concepts in Cloud	**K2**
CO3	Explore AWS Cloud	**K3**
CO4	Analyze Cloud Deployment tools	**K2**
CO5	Identify the security issues and analyze it.	**K3**

UNIT - I	**Introduction to Cloud Computing and Architecture**	**Periods:09**	
Cloud Computing: Overview - History Characteristics -Models - Benefits and Challenges - Parallel and Distributed Computing in the Cloud, Architecture: Components of Cloud Architecture - Service-Oriented Architecture (SOA) in Cloud - Cloud Deployment Models: Public Cloud - Private Cloud - Hybrid Cloud - Community Cloud			**CO1**
UNIT - II	**Virtualization in Cloud Computing**	**Periods:09**	
Virtualization: Introduction- Concepts - Architectures - Processor Virtualization - Memory Virtualization -Storage Virtualization - Virtualization in Cloud Environments: Role of Virtualization in Cloud Computing - Virtualized Data Centers - Advanced Virtualization: Virtualization Security -, Performance and Management in Virtualized Clouds.			**CO2**
UNIT - III	**AWS Cloud Computing Basics**	**Periods:09**	
Introduction to AWS Cloud: Overview of Cloud Computing - AWS Global Infrastructure - Core AWS Services: Compute Services - Storage Services - AWS Networking and Security: AWS Networking - AWS Identity and Access Management (IAM) - AWS Security.			**CO3**
UNIT - IV	**Cloud Deployment Tools**	**Periods:09**	
Google App Engine: Overview of Google App Engine (GAE) - Key features and services - App hosting, scaling, and managed services – Microsoft Azure: Overview - Azure architecture - Virtual Machines, Azure Functions – OpenStack: Overview - OpenStack architecture - Core services: Nova – Swift – Neutron – Glance – Keystone.			**CO4**
UNIT - V	**Cloud Security**	**Periods:09**	
Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi "Mastering Cloud Computing: Foundations and Applications Programming" 2023 ediiton
2. Anthony T. Velte "Cloud Computing: Concepts and Technologies" – 2023
3. Einar Høst "Cloud Security Handbook: Securely Deploy, Manage, and Operate in the Cloud" 2023
4. Cornelia Davis "Cloud Native Patterns: Designing Change-Tolerant Software" - 2023
5. 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. Erick M. Francisco "Cloud Computing: Concepts and Technologies for Architects" – 2023
2. Jeroen Mulder "Multi-Cloud Strategy for Cloud Architects" -2023
3. Ian Foster and Dennis B. Gannon "Cloud Computing for Science and Engineering" – 2022
4. Vikram Dhillon "Cloud Computing Basics: A Non-Technical Introduction" -2021
5. Nikos Antonopoulos, Spiros Zervas "Cloud Data Management: From Infrastructure to Data Integration" -2021

Web References

1. https://cic.gsa.gov › basics › cloud-basics
2. https://cloud.google.com/learn/what-is-cloud-computing
3. https://www.ibm.com/cloud-security
4. https://aws.amazon.com/getting-started/
5. https://www.geeksforgeeks.org/cloud-deployment-models/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC06**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**ARTIFICIAL INTELLIGENCE**	**3**	**-**	**-**	3	25	75	100
(Common CSE, IT and CCE)								
Prerequisite	Basics of Algorithms and Probability							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand AI fundamentals and apply search strategies to solve complex problems	**K2**
	CO2 Understand the fundamentals of knowledge representation	**K3**
	CO3 Understand and Apply Fuzzy logic and Predicate logic.	**K3**
	CO4 Design model and manage uncertainty using probabilistic reasoning techniques.	**K3**
	CO5 Explore the benefits of AI in different fields	**K3**

UNIT - I	**Introduction to AI and Problem Solving**	**Periods:09**
Overview of AI - Foundations of AI - History of AI - Agents Structure and its types. Problem Solving by Searching: Uninformed search - BFS - DFS - Informed search - Greedy Best First Search - A* Search - AO* Search - Constraint Satisfaction Problem(CSP) - Backtracking search for CSP.		**CO1**
UNIT - II	**Knowledge Representation**	**Periods:09**
Introduction to Knowledge Representation: Types - Approaches - Knowledge representation using Semantic Network – Extended semantic networks - Frames – Conceptual dependencies – Scripts.		**CO2**
UNIT - III	**Fuzzy and Predicate Logic**	**Periods:09**
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.		**CO3**
UNIT - IV	**Probabilistic Reasoning**	**Periods:09**
Probabilistic Notations - Bayes rule - Bayesian Network - Probabilistic reasoning over time: Time and Uncertainty - Understanding Partially Observable Environments - Inference in Temporal Models - Hidden Markov Models - Kalman Filters - Dempster and Shafer Theory.		**CO4**
UNIT - V	**Applications of AI**	**Periods:09**
AI in healthcare: Disease Diagnosis and Prediction.AI In Finance: Automated trading and Portfolio Management – AI in Education: Adaptive Learning and Assessment – AI in Customer service: Chatbot and Virtual Assistance.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 4th Edition, Pearson, 2020.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, “Artificial Intelligence”, 3rd Edition, McGraw Hill, 2017.
3. S. Rajasekaran,G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications”,15th Edition, PHI Learning Private Limited,2011

Reference Books

1. Cherry Bhargava,”Artificial Intelligence Fundamentals and Applications”, First Edition,CRC Press,2021.
2. S. Kanimozhi Suguna, M.Dhivya,Sra Paiva,”Artificial Intelligence Recent Trends and Applications, First Edition, ”CRC Press,2021.
3. Wolfgang Ertel,”Introduction to Artificial Intelligence,”2nd Edition,Springer,2018.
4. David Poole and Alan Mackworth,” Artificial Intelligence: Foundations of Computational Agents”, 2nd Edition, Cambridge University Press, 2017.
5. Chris Thornton, Benedict Du Boulay, ”Artificial Intelligence through Search”,4th Edition, Springer Netherlands,2012.

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/
4. https://towardsdatascience.com/
5. https://www.coursera.org/

* TE – Theory Exam, LE – Lab Exam

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**		Programme: **B. Tech**					
Semester	**V**		Course Category: **PC**			End Semester Exam Type: **TE**		
Course Code	**U23CSTC07**		Periods/Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**WEB DESIGNING**		3	-	-	3	25	75	100
(Common to CSE and AI&DS)									
Prerequisite	Basic knowledge in Programming and Database								
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)	
	CO1	Understand HTML and CSS						**K2**	
	CO2	Implement client-side programming using JavaScript.						**K3**	
	CO3	Understand the concepts of PHP and PHP Forms.						**K2**	
	CO4	Connect PHP scripts with databases.						**K4**	
	CO5	Implement the web hosting processes.						**K3**	

UNIT - I	**Web Basics, Html and CSS**	**Periods:09**	
Web Basics: The Internet – World wide web – DNS – URI and URL – HTTP – web client and web server. Introduction to HTML: HTML Syntax – Structure of HTML Documents – HTML Elements: Headings – Links – Images – Lists – Tables – Forms. Introduction to CSS: CSS Syntax – Location of Styles – Selectors – Box Model – Text Styling – CSS Layout: Positioning Elements – Floating Elements.			**CO1**
UNIT - II	**Javascript**	**Periods:09**	
JavaScript Introduction: Syntax – Variables – Operators – Data Types – Functions – Objects – String Methods – Number Methods – Arrays – Array Methods – Conditions – Loops – Popup Alert – Events – Event Listener. JavaScript Objects: Object Definitions – Object Properties –Object Methods– Object Display.			**CO2**
UNIT - III	**Introduction to PHP and Forms**	**Periods:09**	
Introduction to PHP: Variables – Data Types – Constants – Echo / Print. Operators: Arithmetic – Comparison – Logical – String – If...Else...Elseif – Switch – Loops – Arrays – Functions – Super globals – RegEx. PHP Form: Form Handling – GET/POST – Using Bootstarp – Form Validation – Form Required – Form Submission. Data: Date and Time – File Upload – Cookies – Sessions – Include – Exceptions.			**CO3**
UNIT - IV	**PHP with Database Connectivity**	**Periods:09**	
Introduction to Database: Essential SQL – Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records – Sorting the Data.			**CO4**
UNIT - V	**Web Hosting**	**Periods:09**	
Introduction to Web Hosting: Creating the website – Working on the site – Sending email and access other websites – Registering domains – Themes Publishing web sites – Maintaining a website.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Randy Connolly and Ricardo Hoar, “Fundamentals of Web Development”, Pearson Education Inc, Third Edition, 2022.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education, 3rd Edition, 2020.
3. Jon Dukett, “JavaScript and JQuery: Interactive Front–End Web Development”, Paperback, 2018.

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press,1st edition, 2018.
2. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web", BPB Publications, First edition, 2016.
3. Alex Libby, Gaurav Gupta, Asoj Talesra, “Responsive Web Design with HTML5 and CSS3 Essentials”, Packt Publishing, 2nd edition, 2016
4. Bassett, Lindsay, “Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
5. Nixon Robin, “Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5”, O’Reilly Media, 5th edition, 2018.

Web References

1. https://developer.mozilla.org/en-US/docs/Learn
2. https://www.w3schools.com/sql/default.asp
3. https://www.smashingmagazine.com/2021/03/complete-guide-accessible-front-end-components/
4. https://alistapart.com/article/mobile-first-css-is-it-time-for-a-rethink/
5. https://css-tricks.com/tag/view-transitions/
6. https://www.tutorialspoint.com/php/php_introduction.html

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSP503**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CLOUD COMPUTING LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
CSE								

Prerequisite	NIL		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Configure various virtualization tools such as Virtual Box, VMware workstation.	**K3**
	CO2	Design and deploy a web application in a PaaS environment.	**K3**
	CO3	Simulate a cloud environment to implement new schedulers.	**K3**
	CO4	Learn the installation and use a generic cloud environment that can be used as a private cloud.	**K3**
	CO5	Learn about Hadoop	**K2**

List of Exercises

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Write a procedure to transfer the files from one virtual machine to another virtual machine.
7. Write a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. AWS: The Complete Beginner's Guide by Stephen Baron was published in 2020.
2. Learn the secrets of AWS, AZURE, GCP, and K8S by written Todd Koff and published in 2017.
3. Cloud Computing: Methodology, Systems, and Applications by Lizhe Wang, Rajiv Ranjan, Jinjun Chen, and Boualem Benatallah were released by CRC Press in 2017**.**
4. Cloud Computing: A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti was published by the latter in 2014.
5. Understanding the Fundamentals of Cloud Computing in Theory and Practice by Derrick Rountree and Ileana Castrillo was published in 2013 by Syngress.

Web References

1. https://aws.amazon.com
2. https://codered.eccouncil.org/course/a-practical-introduction-to-cloud-computing
3. https://www.kyndryl.com/in/en/services/
4. https://www.tutorialspoint.com/a-practical-introduction-to-cloud-computing/
5. https://www.ibm.com/topics/cloud-computing

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	**Continuous Assessment Marks (CAM)**					**End Semester Examination (ESE) Marks**	**Total Marks**
	Performance in practical classes			**Model Practical Examination**	**Attendance**		
	Conduction of practical	**Record work**	**viva**				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC05**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ARTIFICIAL INTELLIGENCE LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

Prerequisite	Basics of Algorithms and Probability	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply Search Algorithms to implement and compare heuristic-based search algorithms like Greedy Best First Search, A*, and AO* to solve pathfinding and graph-based problems.	**K3**
	CO2 Solve CSPs with Backtracking to model and solve complex Constraint Satisfaction Problems (CSPs) such as N-Queens or Sudoku using backtracking techniques.	**K3**
	CO3 Design Inference Engines: Students will develop forward and backward chaining inference engines, leveraging First-Order Logic for AI decision-making tasks.	**K3**
	CO4 Perform Probabilistic Reasoning: to construct and use Bayesian Networks, Hidden Markov Models, and Kalman Filters for probabilistic reasoning and sequence prediction tasks.	**K3**
	CO5 Explore the benefits of AI in different applications.	**K3**

List of Exercises

1. Implement Greedy Best First Search and A* Search for pathfinding problems (e.g., solving a grid-based puzzle).
2. Model a classic Constraint Satisfaction Problem (e.g., N-Queens problem or Sudoku) and solve using backtracking.
3. Implement AO* search for a graph-based problem.
4. Develop an inference engine using forward chaining and backward chaining to deduce conclusions from a given set of facts and rules.
5. Implement basic inference techniques in First-Order Logic using forward and backward chaining for an AI-based decision-making task.
6. Construct a Bayesian Network for a real-world problem (e.g., medical diagnosis) and perform inference using conditional probabilities.
7. Implement a Hidden Markov Model for sequence prediction (e.g., weather prediction or speech recognition).
8. Simulate a Kalman Filter for a tracking or navigation problem (e.g., predicting object positions over time).
9. Implement basic belief functions and apply Dempster-Shafer theory for uncertainty modeling in a decision-making problem.
10. Develop a model to predict stock price movements using historical data.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Cherry Bhargava,"Artificial Intelligence Fundamentals and Applications", First Edition,CRC Press,2021.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020.
3. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill, 2017.
4. Chris Thornton, Benedict Du Boulay, "Artificial Intelligence through Search",4th Edition, Springer Netherlands,2012.
5. S.Rajasekaran,G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications",15th Edition, PHI Learning Private Limited,2011

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.html
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC06**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**WEB DESIGNING LABORATORY**	**-**	**-**	**2**	**1**	**50**	**50**	**100**

(CSE and AI&DS)

Prerequisite	Basic knowledge in Programming and Database	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Construct and display webpage with HTML and CSS elements	**K3**
	CO2 Implement JavaScript programming for website creation	**K3**
	CO3 Design PHP Forms	**K3**
	CO4 Implement Database Connectivity using PHP	**K3**
	CO5 Web hosting PHP applications	**K3**

List of Exercises

1. (a) Design a home page which displays information about your college department using headings, HTML entities and paragraphs.
   (b) Create a webpage for any clinic using marquee and HTML formatting tags.
2. Design a timetable and display it in tabular format.
3. Design an admission form for any course in your college with text, password fields, drop-down list, check-boxes, radio buttons, submit and reset button etc.
4. Design a web page of your home town with an attractive background color, text color, an image, font face by using Inline CSS formatting.
5. (a) Design a web page by using different CSS border styles.
   (b) Demonstrate the use of CSS Box Model.
6. Write a JavaScript program to remove a character at the specified position of a given string and return the new string.
7. Develop and demonstrate a HTML file that includes JavaScript script for taking a number n as input using prompt and display first n Fibonacci numbers in a paragraph.
8. Design HTML form for keeping student record, apply JavaScript validation in it for restriction of mandatory fields, numeric field, email-address field, specific value in a field etc.
9. Write a program in PHP for processing a simple form (use controls like checkbox, radio buttons and options).
10. Write a program in PHP for a simple POST and GET functions
11. Design a login form using cookies, bootstrap, PHP, Database.
12. Design a student form with add, update, delete, display all and search option using student database.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS and Javascript Web", BPB Publications, First edition, 2016.
2. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press, 1st Edition, 2018.
3. Keith Wald, Jason Lengstorf, “Pro PHP and jQuery”, Paperback, 2016.
4. Steven Suehring, Janet Valade, “PHP, MySQL, JavaScript & HTML5 All-in-One”, John Wiley and Sons Inc, 2013.
5. Leon Atkinson," Core PHP Programming: Using PHP to Build Dynamic Web Sites”, Paperback, 2000.

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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
5. https://www.w3schools.com/html/default.asp

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B. Tech.**						
Semester	**V**	Course Category Code: **PA**				*End Semester Exam Type: **-**		
Course Code	**U23CSW501**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MICRO PROJECT**	**-**	**-**	**2**	**1**	**100**	**-**	**100**
CSE								
Prerequisite	Programming Languages, Databases							

Course Outcomes			BT Mapping (Highest Level)
	On completion of the course, the students will be able to		
	CO1	Identify the problem statement for the micro project work through the literature survey	**K2**
	CO2	Choose the proper components as per the requirements of the design/ system.	**K2**
	CO3	Apply the acquainted skills to develop final model/system	**K3**

There shall be a Micro Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the micro project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Micro-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Micro Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Micro Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Review 1			Review 2				Total Marks
	Novelty	Presentation	Viva	Presentation	Demonstration	Viva	Report	
Marks	10	20	10	20	20	10	10	100

Department	**Computer Science and Engineering**	Programme : **B. Tech**						
Semester	**V**	Course Category Code: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CSC5XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE –V**	**-**	**-**	**4**	**-**	**100**	**-**	**100**

CSE

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**					
Semester	**V**	Course Category Code: **MC**			*End Semester Exam Type: **-**		
Course Code	**U23CSM505**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	**2**	**0**	**0**	**-**	**100**	**-**	**100**
Common to ALL Branches								
Prerequisite	**-**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Familiarize with the philosophy of Indian culture	**K1**
	CO2 Distinguish the Indian languages and literature	**K2**
	CO3 Learn the philosophy of ancient, medieval and modern India	**K1**
	CO4 Acquire the information about the fine arts in India	**K1**
	CO5 Know the contribution of scientists of different eras	**K1**

UNIT- I	**Introduction To Culture**	**Periods:06**
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.		**CO1**
UNIT- II	**Indian Languages, Culture and Literature**	**Periods:06**
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.		**CO2**
UNIT- III	**Religion and Philosophy**	**Periods:06**
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only).		**CO3**
UNIT- IV	**Fine Arts in India (Art, Technology and Engineering)**	**Periods:06**
Indian Painting, Indian handicrafts, Music, divisions of Indian classical 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.		**CO4**
UNIT-V	**Education System in India**	**Periods:06**
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.		**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:30**

Reference Books

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

Web References

1. https://nptel.ac.in/courses/109/104/109104102/
2. https://nptel.ac.in/courses/101/104/101104065/
3. https://nptel.ac.in/courses/109/108/109108158/
4. https://nptel.ac.in/courses/109/106/109106059/
5. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**			**Total Marks**
	Attendance	**MCQ Test**	**Presentation / Activity / Assignment**	
Marks	10	30	60	100

PROFESSIONAL ELECTIVE COURSES

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE506**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**PROGRAMMING IN C#**	3	-	-	3	25	75	100
CSE								
Prerequisite	Basic knowledge of OOPS concepts							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the concept of .Net framework.	**K2**
	CO2 Learn the fundamental concepts using C#.	**K3**
	CO3 Understand the Programming Constructs using C#.	**K3**
	CO4 Develop the Graphical User Interface using C#.	**K2**
	CO5 Explore the Database Connectivity using ADO.NET.	**K3**

UNIT - I	**C# Language Fundamentals**	**Periods:09**
Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assembly and its types – Namespaces – Command line compiler. C# Basics: Literals- Variables- Data Types- Expressions- Operators- Program control statements- Program: conversion of temperature - simple calculator program.		**CO1**
UNIT - II	**Object Oriented Programming**	**Periods:09**
Classes – Objects – Arrays – Strings – Methods- Operator overloading – Constructors - Encapsulation – Inheritance – Polymorphism - Program: count duplicate elements in an array - Compare two strings without using a string library- Create a nested struct that store two data for an employee.		**CO2**
UNIT - III	**Programming Constructs**	**Periods:09**
Programming Constructs – Value Types and Reference Types- Interface – Structures –Generics - Collection- Enumeration- Iterator - Exceptions Handling - Multithreading – Delegates and Events - File I/O – Program: Divide two numbers and handle an exception when the user enters non-numeric values - Read a file path from the user and tries to open the file and handle exceptions if the file does not exist - Create a blank file on the disk if the same file already exists.		**CO3**
UNIT - IV	**Graphics & Window Forms**	**Periods:09**
Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run Time – Graphics Programming GDI+ - Develop an application to implement multiple tools for designing graphical interfaces.		**CO4**
UNIT - V	**Database Programming**	**Periods:09**
Data Access with ADO.NET – Architecture – Data reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML Based Data Sets. Enterprise Edition Overview – Multi-Tier Architecture – Best Practices – Comparison between J2EE and .NET - Develop an interactive application to connect database through ADO.NET.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Fiodar sazanavets,"Implementing C# 11 and .Net 7.0" BPB Publications, 2023.
2. Mark Michaelis, "Essential C#2.0", Pearson Education.
3. Christian Nagel, Bill Evjen, Jay Glynn, "Professional C# 2008", Wiley India Pvt Ltd.
4. E.Balagurusamy, "Programming in C# Primer", TataMcGraw-Hill Education Pvt Ltd, Edition 2011.

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.
6. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2002.

Web References
1. https://www.mheducation.co.in/programming-in-c-9789351343189-india 2. https://www.amazon.in/Programming-Primer-Balagurusamy-SECOND-636363/dp/B0C74FB9NJ 3. https://www.w3schools.com/cs/index.php

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ECEC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DIGITAL IMAGE PROCESSING**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
Prerequisite	Students should have an introduction to signal processing or an equivalent course.							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand fundamentals, visual perception, and pixel relationships.	**K2**
	CO2 Correlate the various image processing technique with the help of mathematical preliminaries	**K3**
	CO3 Apply different types of image enhancement and restoration techniques in various applications	**K3**
	CO4 Illustrate the significance of Colour Image Processing and Image Segmentation techniques	**K4**
	CO5 explore image compression techniques, coding methods, and pattern recognition based on matching.	**K4**

UNIT- I	**Digital image Fundamentals**	**Periods: 09**
Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels., simple image formation model, Brightness, contrast, hue, saturation, Mach band effect		**CO1**
UNIT- II	**Image Transform**	**Periods: 09**
Two-dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT- Image transforms – 1D DFT, 2D DFT, Discrete Cosine transform, Discrete Sine transform, Hadamard transform, Haar transform, Slant transform, KL transform, SVD transform, Wavelet transform.		**CO2**
UNIT- III	**Image Enhancement and Image Restoration**	**Periods: 09**
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.		**CO3**
UNIT - IV	**Colour Image Processing and Image Segmentation**	**Periods: 09**
Colour fundamentals – Colour models – HIS to RGB and RGB to HIS. Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation. Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.		**CO4**
UNIT - V	**Image Compression and Recognition**	**Periods: 09**
Need for compression – Coding Redundancy - Interpixel Redundancy - Psycho visual Redundancy - Bit plane coding - Variable length coding – Adaptive coding – Arithmetic coding – LZW coding – Hybrid coding – Wavelet – JPEG – MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, 2017, 4th edition, Pearson Education, USA
2. Anil K. Jain, Fundamentals of Digital Image Processing, 2015, 1st edition, Pearson India, India
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.

Reference Books

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
4. John C. Russ, F. Brent Neal-The Image Processing Handbook, Seventh Edition, The Kindle edition (2016), CRC Press,Taylor & Francis Group.
5. P.Ramesh Babu, Digital Image Processing, Scitech Publications., 2003

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1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html
3. https://nptel.ac.in/courses/117/105/117105079/
4. https://nptel.ac.in/courses/117/105/117105135/
5. https://www.csie.nuk.edu.tw/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* **Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CSE507**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**NETWORK SECURITY**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
CSE								

Prerequisite	Basic knowledge in Networks		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the need of Security Services and Techniques.	**K2**
	CO2	Apply the different cryptographic operations using public and private key cryptography	**K3**
	CO3	Summarize solutions for effective key management distribution and maintain message integrity	**K2**
	CO4	Identify and use appropriate algorithms for assuring System security and authentication.	**K3**
	CO5	Outline the security requirements and solutions for wireless networks and distributed systems	**K2**

UNIT-I	**Introduction**	**Periods: 9**	
Security Attack - Non-cryptographic Protocol Vulnerabilities - Software Vulnerabilities - The need for security - Security services - Security Mechanisms- Classical encryption: Classical Techniques.			**CO1**
UNIT-II	**Symmetric and Asymmetric Cipher**	**Periods: 9**	
Symmetric Ciphers: Symmetric and asymmetric cryptography- Key size and Key Range- DES - Triple DES -AES - Blowfish - RC5- Pseudorandom Number Generators - Asymmetric Ciphers: RSA Algorithms - Security of RSA - Knapsack Algorithm - Differential and Linear Cryptanalysis-Number Theory.			**CO2**
UNIT-III	**Key Management and Data Integrity Algorithms**	**Periods: 9**	
Diffie Hellman key exchange -Elgamal Cryptographic System - Elliptic Curve Arithmetic - Elliptic Curve Cryptography - Cryptographic Hash Functions: Secure Hash Algorithm (SHA-1) -Message authentication codes: HMAC.			**CO3**
UNIT-IV	**Authentication**	**Periods: 9**	
Digital Signatures -Elgamal Digital Signature Scheme - NIST Digital Signature Algorithm - Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature - Biometric Authentication – Kerberos - X.509 Authentication Service - Public Key Infrastructure			**CO4**
UNIT-V	**Network and Wireless Security's**	**Periods: 9**	
Email Security: Pretty good privacy – S/MIME-IP Security - Web Security: SSL/ Transport Layer Security - Secure electronic transaction (SET) –System Security- Firewalls design principles. Intrusion detection System - Virtual Private Networks - Wireless security: IEEE 802.11 overview and its security – WEP - WPA. **Case Studies:** Snort and Stenographic tools - Bit coin and Crypto currency system.			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. William Stallings, "Cryptography & Network Security- Principles and Practices",Pearson Publishers, Seventh Edition, 2017.
2. AtulKahate, ''Cryptography and Network Security",McGraw Hill, 3rd Edition, 2011.
3. William Stallings, "Network Security Essentials: Applications and Standards",Prentice Hall, Fourth Edition 2007.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger , "Security in computing", Prentice Hall of India,Fifth Edition,2015.
2. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: PRIVATE Communication in a PUBLIC World", Prentice Hall, ISBN 0-13-046019-2
3. Wenbo Mao, "Modern Cryptography: Theory and Practice",Prentice Hall PTR, First Edition,2003.
4. William Stallings, "Network Security Essentials: Applications and Standards",Prentice Hall, Fourth Edition 2007.
5. Douglas R. Stinson, "Cryptography: Theory and Practice",CRC press, Third Edition,2006.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE508**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Open Source Programming for IOT**	3	-	-	3	25	75	100

Prerequisite	Basic knowledge in Programming and Networks	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify key IoT platforms and languages.	**K2**
	CO2 Develop real-time IoT applications with Python/MicroPython	**K2**
	CO3 Build IoT applications and dashboards using Node.js.	**K2**
	CO4 Develop analytics systems with Julia.	**K2**
	CO5 Implement secure, scalable IoT solutions with Rust/Go.	**K3**

UNIT - I	**Open Source IOT Platforms and Programming Languages**	**Periods:09**
Introduction to IoT – Basic Concepts – Importance of Open Source in IoT – Popular Open Source IoT Platforms – Arduino – Raspberry Pi – ESP8266 – ESP32 – Programming Languages for IoT – C – C++ – Python – MicroPython – JavaScript (Node.js). Basic Real-Time Concepts –Latency – Throughput and Response Time – Case Study – Getting Started with Arduino and C/C++ – Weather Station Project.		**CO1**
UNIT - II	**Python and Micropython for IOT Applications**	**Periods:09**
Introduction to Python in IoT – Basics of Python and its role in IoT development – Overview of MicroPython – Use in IoT and difference from standard Python – Setting Up Python and MicroPython – Installing Python on Raspberry Pi – Setting up MicroPython on ESP8266 and ESP32– Requirements for real-time data processing – Connecting and reading data from sensors – Visualizing data using Python libraries – Case Study – Develop a real-time light monitoring system using the BH1750 ambient light sensor with ESP32/ESP8266.		**CO2**
UNIT - III	**Real-Time IoT with Node.js**	**Periods:09**
Overview of JavaScript and Node.js for IoT – Setting Up Node.js for IoT – Installing Node.js on IoT platforms – Configuring the development environment – Using Node.js with IoT Devices – Integrating sensors and actuators – Handling asynchronous I/O Real-Time Data Communication with Node.js – Case Study – Create a real-time dashboard to monitor and visualize sensor dat using Node.js.		**CO3**
UNIT - IV	**IoT Data Processing using Julia**	**Periods:09**
Overview of Julia – Key features and benefits for IoT – Basic syntax and programming constructs – Setting Up Julia for IoT – Installing Julia on IoT platforms like Raspberry Pi – Configuring the Julia environment – Real-Time Data Processing with Julia – Implementing multi-threading and asynchronous processing – Advanced data visualization techniques using Julia – Implementing real-time machine learning models for IoT applications – Case Study – Develop an IoT data analytics system using Julia.		**CO4**
UNIT - V	**RUST AND GO FOR IoT Security**	**Periods:09**
Introduction to Rust – Overview of Rust and its benefits – Key features-Rust's role in IoT security and embedded systems – Rust for IoT Development – Basics – Advantages of Rust in IoT – Secure communication protocols. Introduction to Go (Golang) – Overview of Go and its suitability for real-time applications – Key features – Go's role in scalable IoT solutions – Network Programming with Rust and Go – Implementing secure communication protocols with Rust – Network programming techniques with Go for real-time data transmission – Case Study – Develop a secure, real-time IoT monitoring system using Rust or Go.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things: A Hands-On Approach, Second Edition, McGraw-Hill Education, 2021.
2. Pratik Desai, Python Programming for Arduino, Packt Publishing, 2018.
3. Patrick Mulder and Kelsey Breseman, Node.js for Embedded Systems: Using Web Technologies to Build Connected Devices, Apress, 2021.
4. Malcolm Sherrington, Mastering Julia: A Comprehensive Guide for Advanced Users, Packt Publishing, 2022.
5. Jim Blandy and Jason Orendorff, Programming Rust: Fast, Safe Systems Development, O'Reilly Media, 2018.
6. Mihalis Tsoukalos, Mastering Go: Harness the Power of Go to Build Professional Utilities and Concurrent Servers and Services, Packt Publishing, 2020.

Reference Books

1. Michael Margolis, Arduino Cookbook, Third Edition, O'Reilly Media, 2020.
2. Nicholas H. Tollervey, Programming with MicroPython: Get MicroPython Working for You on the Raspberry Pi Pico, ESP32, and Other Microcontrollers, No Starch Press, 2021.
3. Patrick Mulder and Kelsey Breseman, Node.js for Embedded Systems: Using Web Technologies to Build Connected Devices, Apress, 2021.
4. Chris Rackauckas and Shalabh Bhatnagar, Julia Programming for Operations Research: A Primer on Computing, Springer, 2018.

5. Claus Matzinger, Rust Programming By Example, Packt Publishing, 2018.
6. Alan A. A. Donovan and Brian W. Kernighan, The Go Programming Language, Addison-Wesley Professional, 2015.

Web References

1. https://www.arduino.cc
2. https://docs.micropython.org/en/latest/
3. https://www.w3schools.com/nodejs/
4. https://julialang.org/
5. https://www.rust-lang.org
6. https://go.dev

* TE – Theory Exam, LE – Lab Exam

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE509**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**SOFTWARE PROJECT MANAGEMENT**	3	-	-	3	25	75	100
CSE								
Prerequisite	-							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand Project Management and planning strategies	**K2**
	CO2 Obtain adequate knowledge about software process models and software effort estimation techniques	**K2**
	CO3 Estimate the risks involved in various project activities	**K2**
	CO4 Understand project monitoring and control strategies	**K2**
	CO5 Staff selection process and the issues related to people management	**K2**

UNIT - I	**Project Evaluation and Planning**	**Periods:09**
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		**CO1**
UNIT - II	**Project Life Cycle and Effort Estimation**	**Periods:09**
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		**CO2**
UNIT - III	**Activity Planning, Scheduling and Risk Management**	**Periods:09**
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.		**CO3**
UNIT - IV	**Monitoring and Control**	**Periods:09**
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		**CO4**
UNIT - V	**Managing Peoples and Organizing Teams**	**Periods:09**
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.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Kalpesh Ashar, "Project Management Essentials You Always Wanted To Know", Vibrant Publishers, 2020.
2. Bob Hughes, Mike Cotterell and Rajib Mall: "Software Project Management" – Fifth Edition, Tata McGraw Hill, New Delhi, 2017.
3. Maneesh Dutt, Mind Maps for Effective Project Management, 1st edition , Notion Press, 2015.

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.

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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/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

OPEN ELECTIVES

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **OE**			End Semester Exam Type: **TE**			
Course Code	**U23CSOC01**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**STRUCTURED QUERY LANGUAGE**	3	-	-	3	25	75	100

(Offered to ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS)

Prerequisite	Basic Computer Knowledge		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Explain and utilize core concepts of SQL Queries.	**K2**
	CO2	Implement DDL and DML Commands.	**K3**
	CO3	Implement DCL, DQL and TCL.	**K3**
	CO4	Implement Joins and Subqueries	**K4**
	CO5	Implement DCL and TCL commands.	**K3**

UNIT - I	**SQL Basics**	**Periods:09**	
Introduction to database – History- Installation - Syntax -Data Types - Select – Select distinct – Where – And – Or – Not – Constraints and its types.			**CO1**
UNIT - II	**DDL and DML**	**Periods:09**	
Data Definition Language (DDL): Create – Alter: Add – Modify – Rename –Truncate - Drop. **Data Manipulation Language (DML):** Insert – Types of Insertion Method - Update – Delete.			**CO2**
UNIT - III	**DQL, Order by and Group by**	**Periods:09**	
DQL: Select **-** Types of Selection – Aggregate Functions - Pattern Matching. **Order by:** asc – desc. Group by function.			**CO3**
UNIT - IV	**Joins, Subquery and Views**	**Periods:09**	
Joins : Inner Join – Outer Join. Subquery – Set Operations – Views.			**CO4**
UNIT - V	**DCL and TCL**	**Periods:09**	
DCL: Grant – Revoke, **TCL:** Commit – Rollback – Savepoint - Built-in Functions.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan," Database System Concepts", McGraw-Hill Education,2020.
2. James R. Groff and Paul N. Weinberg, "SQL: The Complete Reference", McGraw-Hill Education,2010.
3. Markus Winand, "SQL Performance Explained", Markus Winand Publishing,2012.

Reference Books

1. Renee M. P. Teate, "SQL for Data Scientists: A Beginner's Guide for Building Datasets for Analysis",Wiley,2021.
2. Anthony DeBarros, "Practical SQL: A Beginner's Guide to Storytelling with Data", No Starch Press,2022 (2nd Edition).
3. Peter Carter, "Pro SQL Server 2022 Administration: A Guide for the Modern DBA",Apress,2022.
4. Alan Beaulieu, "Mastering SQL Fundamentals", Second Edition, O'Reilly,2009
5. Kristina Chodorow; Shannon Bradshaw, "MongoDB: The Definitive Guide", 3rd Edition, O'Reilly Media, Inc., 2018.

Web References

1. https://www.digitalocean.com/community/conceptual-articles/an-introduction-to-databases.
2. https://www.techopedia.com/6/28832/enterprise/databases/introduction-to-databases.
3. https://www.bmc.com/blogs/dbms-database-management-systems/.
4. https://www.coursera.org/learn/introduction-to-databases.
5. https://maharatech.gov.eg/course/view.php?id=740.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Evaluation Methods

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **OE**			*End Semester Exam Type: **TE**			
Course Code	**U23CSOC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CLOUD TECHNOLOGIES**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to all the Core Branches)

Prerequisite	• **Basic programming knowledge** in Python, C/C++, and scripting (Shell/Git). • **Familiarity with cloud concepts**, software development lifecycle (Agile), and data handling (SQL, JSON) • **Understanding of core AI/ML concepts**, including supervised learning, and basic cybersecurity principles.

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (HighestLevel)
	CO1	Understand the basic concept of Cloud Computing	**K3**
	CO2	Gain knowledge on technologies used to build cloud computing	**K3**
	CO3	Thorough knowledge on various services in cloud.	**K3**
	CO4	Understand to manage resources and to maintain security.	**K3**
	CO5	Illustrate the various cloud technologies and latest advancement.	**K3**

UNIT I	**CLOUD BASICS AND PRODUCT ENGINEERING**	**Periods: 09**	
Introduction to Cloud Computing (IaaS / PaaS / SaaS) - Cloud Product Development Lifecycle - Basics of Requirement Analysis and PRD (Product Requirement Document) - Introduction to Agile and Scrum (Roles, Sprint Planning, Backlog) - Basics of Cloud Platform Characteristics: Scalability, Reliability, Availability - Introduction to Application Deployment on Cloud (Conceptual).			**CO1**
UNIT II	**CLOUD PLATFORM ENGINEERING**	**Periods: 09**	
Introduction to Application Architecture: Frontend vs Backend - Monolithic vs Microservices (Concept only, no deep patterns) - Basics of API and REST Communication - Introduction to Containers and Docker (Simple container creation demonstration) - Introduction to CI/CD: Basic workflow understanding (Code → Build → Test → Deploy) - Version Control using Git (clone, commit, push, pull).			**CO2**
UNIT III	**DATA ENGINEERING**	**Periods: 09**	
Data Types: Structured / Unstructured / Semi-structured - Working with CSV, JSON and Simple Data Cleaning - Basics of Database Storage (Relational vs NoSQL concepts) - SQL Basics (SELECT, INSERT, UPDATE, DELETE) - Introduction to Data Visualization (Bar charts / line charts / dashboards) - Overview of Cloud Storage (S3 / Blob / GCS) at a conceptual level.			**CO3**
UNIT IV	**INTRODUCTION TO AI, ML & GENERATIVE AI**	**Periods: 09**	
AI vs ML vs Deep Learning (Concept and real-world applications) - Supervised Learning Basics (Regression / Classification – concept level) - Model Evaluation (Accuracy, Precision, Recall in simple explanation) - Introduction to NLP (Tokenization & Stop words) - Generative AI: How LLMs like ChatGPT work conceptually - Introduction to Prompt Engineering (simple prompt → improved prompt exercise)			**CO4**
UNIT V	**SECURITY IN CLOUD AND ITS APPLICATIONS**	**Periods: 09**	
Importance of Security -Real security incidents - Basics of Authentication and Authorization - Introduction to Cryptography (Encryption & Hashing conceptually) - Common Vulnerabilities (SQL Injection, Password Leak, Misconfigurations) - Cloud Security Basics: IAM, Access Roles, Secure Password Policies - Secure Coding Best Practices (Input validation, least privilege).			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", Pearson, 2nd Edition, 2023.
2. Kelsey Hightower, Brendan Burns, Joe Beda "Kubernetes: Up and Running", O'Reilly, 3rd Edition, 2023.
3. Joe Reis, Matt Housley, "Fundamentals of Data Engineering", O'Reilly, 1st Edition, 2022.
4. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow", O'Reilly, 3rd Edition, 2023.
5. William Stallings, "Cryptography and Network Security", Pearson, 8th Edition, 2022.

Reference Books

1. Douglas E. Comer, “The Cloud Computing Book: The Future of Computing Explained”, Routledge, 1st Edition, 2023.

2. Camille Fournier, Ian Nowland, Andrew Harmel-Law, and Richard Li, “Platform Engineering: A Guide for Technical, Product, and People Leaders”, O’Reilly Media, 1st Edition, 2023.

3. Andreas Kretz, “Data Engineering with Python: Work with Massive Datasets to Design Data Models and Automate Data Pipelines”, Packt Publishing, 2nd Edition, 2023.

4. Miroslaw Staroń, “Engineering Generative AI-Based Software”, Elsevier, 1st Edition, 2026.

5. Nikhil Abraham, “Cloud Security Handbook: A Practical Guide to Securing Cloud Infrastructure”, Packt Publishing, 1st Edition, 2024.

TE – Theory Exam, LE – Lab Exam

Web References

1. https://www.cloudskillsboost.google
2. https://learn.microsoft.com/en-us/training/
3. https://huggingface.co/learn
4. https://owasp.org/www-project-embedded-application-security/
5. scikit-learn Tutorials — scikit-learn 1.4.2 documentation

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Evaluation Methods

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
Course Code	**U23ITTC03**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MACHINE LEARNING**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to CSE, IT and CCE

Prerequisite	Mathematics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the basic concepts of machine learning	**K2**
	CO2 Apply supervised algorithms for different classification problems	**K3**
	CO3 Explain the need for ensemble methods	**K2**
	CO4 Apply unsupervised and reinforcement learning techniques to various problems	**K3**
	CO5 Apply dimensionality reduction and optimization techniques	**K3**

Unit- I	**Introduction**	**Periods: 09**	
Introduction: Machine learning; Examples of Machine Learning Applications: Learning associations – Classification – Regression – Unsupervised learning – Reinforcement learning; Preliminaries: Weight space – Curse of dimensionality – Testing machine learning algorithms – Turning data into probabilities – Basic statistics – Bias-variance tradeoff.			**CO1**
Unit- II	**Supervised Learning**	**Periods: 09**	
Neural Networks and Linear Discriminants: Brain and the Neuron – Neural networks – Perceptron – Linear separability – Linear regression; Multi-layer Perceptron: Forward and Backward propagation; Support Vector Machines.			**CO2**
Unit- III	**Probabilistic Learning, Learning with Trees**	**Periods: 09**	
Probabilistic Learning: Gaussian mixture models – Nearest neighbor methods; Learning with Trees: Constructing decision trees – Classification and Regression trees – Classification example; Ensemble Learning: Boosting – Bagging – Random forests.			**CO3**
Unit- IV	**Unsupervised Learning, Reinforcement Learning**	**Periods: 09**	
Unsupervised: K-means algorithm; Reinforcement learning: State and action space – Reward function – Discounting – Action selection – Policy – Markov decision process – Values – SARSA and Q-learning.			**CO4**
Unit- V	**Dimensionality Reduction, Optimization Techniques**	**Periods: 09**	
Dimensionality Reduction Techniques: Linear Discriminant analysis, Principal Component Analysis; Optimization and Search: Least-squares optimization – Conjugate gradients – Search approaches – Exploitation and exploration.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, The MIT Press, 2014
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2015
3. Oliver Theobald, "Machine Learning for Absolute Beginners",3rd Edition, 2021

Reference Books

1. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", 1st Edition, Wiley, 2014.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st Edition, Cambridge University Press, 2012.
3. Richert, Willi, "Building machine learning systems with Python", Packt Publishing, 2013.
4. Tom M Mitchell, "Machine Learning", McGraw-Hill Education (India), 2013.
5. Y S Abu-Mostafa, M Magdon-Ismail, H T Lin, "Learning from Data", AML Book Publishers, 2012

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1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CST605**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DESIGNING AND BUILDING OF BOTS**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
CSE								
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 To provide insights on robotic process automation (RPA) technology and automation anywhere	**K2**
	CO2 To understand the feature of Web Control Room	**K3**
	CO3 To design and develop bot using bot Creator	**K3**
	CO4 To understand Metabot functionality	**K3**
	CO5 To develop and Train IQ Bots	**K3**

UNIT - I	**Introduction to Robotic Process Automation & Bot Creation**	**Periods:09**
Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform (Control Room, Bot Creator, and Bot Runner)- RPA Components-RPA Lifecycle– RPA features and capabilities – Ways to create Bots		**CO1**
UNIT - II	**Web Control Room and Client**	**Periods:09**
Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials) - Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – introduction to client and Workbench-Recorders		**CO2**
UNIT - III	**Bot Creator**	**Periods:09**
Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command - Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer - Best Practices		**CO3**
UNIT - IV	**Meta Bot and Bot Insight**	**Periods:09**
Introduction to MetaBot - MetaBot With Screen - MetaBot with DLL- Introduction to Bot Insight - Transactional Analytics - Operational Analytics.		**CO4**
UNIT - V	**IQ Bots**	**Periods:09**
Introduction to IQ Bots-Overview of Cognitive Automation-Setting up and Training IQ Bot- Invoice Processing with IQ Bots – Performance and Monitoring- Integrating IQ Bots with Other Automation Anywhere Bots.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Kelly Bocci, "RPA Implementation Guide: A Practical Approach to Implementing Automation Anywhere", Independently Published, 2022
2. Will Neimat, "Mastering RPA with Automation Anywhere: Expert Guide for Bot Developers", Apress, 2021.
3. Alok Mani Tripathi, "Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool - Automation Anywhere", Packt Publishing, 2018.

Reference Books

1. Chris Skinner, "Cognitive Automation and Robotic Process Automation: AI and Digital Transformation in Financial Services", Marshall Cavendish International, 2020
2. Rajesh K, "Robotic Process Automation with Automation Anywhere: Learn the Nuts and Bolts of RPA and How to Design, Develop, and Implement RPA Bots", BPB Publications, 2020.
3. Gerardus Blokdyk, "Robotic Process Automation: A Guide to Implementing RPA Systems", 5STARCooks, 2020.
4. Richard Murdoch, "Hands-On Robotic Process Automation (RPA): Automate Repetitive Tasks in the Workplace with UiPath and Automation Anywhere", Apress, 2020.
5. Pascal Bornet, Ian Barkin, Jochen Wirtz, "Intelligent Automation: Welcome to the World of Hyperautomation", World Scientific Publishing, 2020.

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1. https://www.automationanywhere.com
2. https://www.ibm.com/topics/rpa
3. https://university.automationanywhere.com
4. https://www.edureka.co/blog/automation-anywhere-tutorial

5. https://www.simplilearn.com/tutorials/automation-anywhere-tutorial

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CST606**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**ANIMATION AND VISUAL EFFECTS**	3	-	-	3	25	75	100
CSE								
Prerequisite	Basics of Animation							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the concepts of VFX and Animation	**K2**
	CO2 Design Animation Effects using After Effects.	**K4**
	CO3 Design Animation Effects using Premier Pro**.**	**K4**
	CO4 Understand Blender tools and Design character design.	**K4**
	CO5 Design and modeling using Blender.	**K4**

UNIT - I	**Vfx And Animation**	**Periods:09**	
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.			**CO1**
UNIT - II	**Learning After Effects**	**Periods:09**	
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.			**CO2**
UNIT - III	**Learning Premiere Pro**	**Periods:09**	
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.			**CO3**
UNIT - IV	**Introduction to Blender & Tools**	**Periods:09**	
Basics of Blender – Understanding Blender Interface & Tools – The Blender Scene - Project overview & Character Design – Using Other Design Methods.			**CO4**
UNIT - V	**Blender Works**	**Periods:09**	
Modeling & its Tools in Blender – Character Modelling – Unwrapping, Painting & Shaders – Character Rigging & Animation – The Render Page – Lighting & Composition.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Lisa Fridsma, Brie Gyncild, “Adobe After Effects Classroom in a Book”, Adobe Press, 2023.
2. Maxim Jago, "Adobe Premiere Pro Classroom in a Book" Pearson Education, 2022.
3. Jason van Gumster, “Blender For Dummies” John Wiley & Sons, 2011.

Reference Books

1. Chad Perkins ,"The After Effects Illusionist: All the Effects in One Complete Guide", Focal Press, 2009.
2. Joe Dockery, Conrad Chavez,”Learn Adobe After Effects CC for Visual Effects and Motion Graphics”, Peachpit Press, 2019.
3. Trotter Burt," Mastering Adobe Premiere Pro 2024: Complete Step-by-Step Video Editing Course for Beginners & Veterans ", Adobe Press, 2024.
4. Maxim Jago, “Adobe Premiere Pro Classroom in a Book”, Adobe Press, 2024.
5. Oscar Baechler and Xury Greer, "Blender 3D By Example", Packt Publishing,2020.

Web References

1. https://www.bloopanimation.com/animation-for-beginners/
2. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
3. https://www.premiumbeat.com/blog/text-effect-premiere-pro/
4. https://conceptartempire.com/blender-animation-tutorials/
5. https://www.visualeffectssociety.com/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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	-	-	-	-	-	-	-
5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment *	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSB602**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**BLOCKCHAIN CONCEPTS AND APPLICATIONS**	2	-	2	3	50	50	100
CSE								
Prerequisite	-							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
CO1	Understand the fundamentals of Blockchain.	**K2**
CO2	Understand the concepts of Cryptography.	**K3**
CO3	Analyze real-world case studies.	**K3**
CO4	Implement Blockchain concepts.	**K2**
CO5	Explore applications of Blockchain.	**K2**

UNIT - I	**Introduction to Blockchain**	**Periods:10**	
Introduction to blockchain – History – CAP theorem and blockchain-Blockchain Network-Mining Mechanism-Life of Blockchain application-Soft & Hard Fork- Private and Public blockchain. Distributed Consensus: Nakamoto Consensus-Proof of Work-Proof of Stake Difficulty Level-Sybil Attack-Energy utilization and alternate.			**CO1**
UNIT - II	**Foundation to Cryptography**	**Periods:10**	
Introduction of Cryptography: Hash function, Digital Signature – ECDSA- Memory Hard Algorithm- Zero Knowledge Proof. Symmetric Key Encryption Simple DES, Linear and Differential cryptanalysis- DES- Modes of operation- Triple DES, AES – Public Key Cryptography - Factorization problem and RSA-Diffie Hellman Key Exchange- Elliptic curve cryptography-Authentication Algorithms: Message Digest- SHA-1- MD5.			**CO2**
UNIT - III	**Blockchain Applications**	**Periods:10**	
Bitcoin - Introduction – Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin installation – Bitcoin programming and the command-line interface –Cryptocurrency Exchange-Bitmap Indices. Transaction Management: Serializability – Recoverability – Transaction Isolation Levels –Smart Contracts: Automated contract.			**CO3**
UNIT - IV	**Laboratory Exercises**	**Periods:15**	
1. Implementation of constructing a Merkle tree with blockchain principles. 2. Implementation of Block construction using blockchain Principles 3. Implementation of blockchain using Java programming language 4. Implementing the running of the blockchain node 5. Implementation of several consensus techniques (such Proof of Work and Proof of Stake) and see how they affect the functionality of the network. 6. Implementation of a blockchain token (e.g., ERC-20) and explore its functionality.			**CO4**
UNIT - V	**Laboratory Exercises**	**Periods:15**	
7. Implementation of Blockchain-based peer-to-peer network. 8. implementing block chain ideas to the development of a cryptocurrency wallet 9. Implement and configure Go Ethereum and the Mist browser. Develop and test a sample application 10. Implement the set-up interoperability between different blockchains (e.g., Polkadot, Cosmos). 11. Implement the blockchain reentrancy attacks and learn how to prevent them 12. Implement and deploy a simple smart contract on a blockchain platform like Ethereum or Binance Smart Chain.			**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: -30**	**Total Periods:60**

Text Books

1. Andreas M. Antonopoulos ,"Mastering Bitcoin: Unlocking Digital Cryptocurrencies" , O'Reilly Media 2nd Edition, 2023.
2. Don Tapscott and Alex Tapscott ,"Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World" Penguin, Updated Edition, 2023.
3. Antony Lewis ,"The Basics of Bitcoins and Blockchains" Independently Published, Edition: 2nd Edition, 2022.
4. William Stallings, "Cryptography and Network Security: Principles and Practice" , Pearson 8th Edition, 2022.

Reference Books

1. Wattenhofer, “The Science of the Blockchain”,2016
2. Daniel Drescher, "Blockchain Basics: A Non-Technical Introduction in 25 Steps" , Apress, 2nd Edition, 2019.
3. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, 1st Edition, 2015.
4. DR. Gavin Wood, ``ETHEREUM: A Secure Decentralized Transaction Ledger,'' Yellow paper.2014.
5. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts, 2016.

Web References

1. https://www.thew3university.io/
2. https://cryptozombies.io/
3. https://decrypt.co/
4. https://unchainedcrypto.com/

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									#End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)	
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC03**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MACHINE LEARNING LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Common to CSE, IT and CCE								
Prerequisite	Mathematics							

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Apply python packages and libraries for various problems	**K3**
	CO2	Apply supervised learning techniques for various problems	**K3**
	CO3	Develop an open-ended solution with data privacy and ethical concerns, for a given real-world problem.	**K3**
	CO4	Apply unsupervised and reinforcement learning techniques for various problems	**K3**
	CO5	Apply ensemble techniques to solve the problems and demonstrate the working of dimensionality reduction methods	**K3**

List of Exercises

1. Working with Python packages - Numpy, Scipy, Scikit-learn, Matplotlib
2. Loan amount prediction using linear regression and visualize the interpretation
3. Handwritten character recognition using neural networks
4. Classification of Email spam and MNIST data using Support Vector Machines.
5. Predicting Diabetes using decision tree
6. Applications of Random Forest and AdaBoost ensemble techniques
7. K-means clustering for Euclidean distance metric
8. k-Nearest Neighbor algorithm
9. Applications of dimensionality reduction techniques on any dataset
10. Analyze any two supervised / unsupervised machine learning algorithms for any of the following real-time applications: (a) Text processing (b) Image processing (c) IoT systems

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Jason Bell, “Machine learning – Hands on for Developers and Technical Professionals”, 1st Edition, Wiley, 2014.
2. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, 1st Edition, Cambridge University Press, 2012.
3. Richert, Willi, “Building machine learning systems with Python”, Packt Publishing, 2013.
4. Tom M Mitchell, “Machine Learning”, McGraw-Hill Education (India), 2013.
5. Y S Abu-Mostafa, M Magdon-Ismail, H T Lin, “Learning from Data”, AML Book Publishers, 2012

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1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category: **PC**				End Semester Exam Type: **PE**		
Course Code	**U23CSP604**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DESIGNING AND BUILDING OF BOTS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
CSE								
Prerequisite	Nil							

Cours Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement basic operations on Task Bot.	**K3**
	CO2 Create a bot to Automate extraction of data	**K3**
	CO3 Design and apply Automation for web	**K3**
	CO4 Applying metabot for workload automation	**K3**
	CO5 Designing IQ bot for automation	**K3**

List of Exercises

1. Set up Automation Anywhere, explore the Control Room, and create your first basic Task Bot.
2. Create a Task bot to Automate data entry tasks
   (opening a Notepad, typing a simple text, and saving the file)
3. Create a bot to Automate extraction of data from an Excel file and copies to another application
4. Create a bot to automate the submission of a simple web form.
5. Automate the process of sending an email using a bot.
6. Create a bot to automatically launch a website every day at a specific time, such as opening a news website every morning.
7. Automate the process of assigning customer support tickets (stored in an Excel file) to different agents using queues.
8. Automate the process of logging into a web-based email account, checking for new messages, and logging out.
9. Create a bot to download files from an FTP server and loop through them to rename each file based on a specific pattern.
10. Developing BOT to Create and deliver invoices.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Nandan Mullakara, Arun Kumar Asokan, Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere ,First Edition, Packt Publishing Ltd., 2020.
2. Alok Mani Tripathi, Robotic Process Automation (RPA) - A Practical Guide to Implementing RPA in Your Organization, Bpb Publications, 2020.
3. Sandeep Kumar, Robotic Process Automation: Guide to Building Software Robots, Apress, 2020
4. Ritesh Modi, Learning Robotic Process Automation, Packt Publishing, 2017.

Web References

1. https://university.automationanywhere.com/
2. https://www.youtube.com/c/AutomationAnywhere
3. https://www.guru99.com/robotic-process-automation-tutorial.html
4. https://www.automationanywhere.com/community
5. https://www.freecodecamp.org/news/robotic-process-automation-tutorial/

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSP605**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ANIMATION AND VISUAL EFFECTS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
CSE								
Prerequisite	Basics of Animation							

	On completion of the course, the students will be able to		BT Mapping (Highest Level)
Course Outcomes	**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. Introduction to After Effects
   b. Interface Introduction
   c. Layers, Timeline Panels, Compositions, Links Panel
   d. Animation Principles
   e. Key frames
2. Simple Video Editing & Animation
3. Easing & Time Stretching & Imports\Exports\Footage Replacements
4. Presets & Masking & Text Animation
5. Working with Media Encoder
6. Vfx & Rendering

PREMIEREPRO

1. Basic start
   a. Timeline & New Sequence
   b. Selection & Track Selection tools
   c. Rolling & Ripple Edit
   d. Make Slow Motion
   e. Split\Cut video clip
   f. Transitions
2. Motion Effects control & Animae layers\ Chroma keys
3. Masking and Duplication \ Effects & Adjustments Layer
4. Colour Splash\ Imports & Exports

ANIMATION BLENDER

1. Introduction & fundamentals
2. Viewport Navigation & Transform & Add\Del
3. Modeling Instructions & Creating Meshes
4. Extrude & Loop cut
5. Bevel Tool & Knife Tool & Shading
6. Shading Editor & Texture
7. Rigging & parenting
8. Creating Landscapes & Environments
9. Rain effects & Abstract creation
10. 3D Environment

Lecture Periods:-	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Lisa Fridsma, Brie Gyncild, “Adobe After Effects Classroom in a Book”, Adobe Press, 2023.
2. Maxim Jago, "Adobe Premiere Pro Classroom in a Book" Pearson Education, 2022.
3. Jason van Gumster, “Blender For Dummies” John Wiley & Sons, 2011.
4. Joe Dockery, Conrad Chavez,”Learn Adobe After Effects CC for Visual Effects and Motion Graphics”, Peachpit Press, 2019.
5. Trotter Burt," Mastering Adobe Premiere Pro 2024: Complete Step-by-Step Video Editing Course for Beginners & Veterans ", Adobe Press, 2024.

Web References

1. https://www.pdfdrive.com/3d-art-essentials-the-fundamentals-of-3d-modeling-texturing-and-animatione157006123.html
2. https://www.pdfdrive.com/aim-awards-suite-of-games-animation-and-vfx-skills-qualifications-e50802091.html
3. https://www.bloopanimation.com/animation-for-beginners/
4. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
5. https://www.premiumbeat.com/blog/text-effect-premiere-pro

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category Code: **PA**				*End Semester Exam Type: **-**		
Course Code	**U23EEW602**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MINI PROJECT**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
CSE								
Prerequisite	Programming Languages, Databases							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Identify the problem statement for the mini project work through the literature survey	**K2**
	CO2	Choose the proper components as per the requirements of the design/ system**.**	**K2**
	CO3	Apply the acquainted skills to develop final model/system	**K3**

There shall be a Mini Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the mini project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Mini-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Mini Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Mini Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	**Review 1**			**Review 2**				**Total Marks**
	Novelty	**Presentation**	**Viva**	**Presentation**	**Demonstration**	**Viva**	**Report**	
Marks	10	20	10	20	20	10	10	100

Department	**Computer Science and Engineering**	Programme : **B. Tech**						
Semester	**VI**	Course Category Code: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CSC6XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course –VI**	**-**	**-**	**4**	**-**	**100**	**-**	**100**
CSE								
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Method

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

Department	**Computer Science and Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **MC**			End Semester Exam Type: **-**			
Course Code	**U23CSM606**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**GENDER EQUALITY**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

CSE

Prerequisite	**-**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the general identity, social construction of gender roles.	**K2**
	CO2 Illustrate the causes and issues of gender discrimination in Indian society.	**K2**
	CO3 Describe the workplace discrimination, media influences on gender and culture.	**K2**
	CO4 Familiarize with international and Indian frameworks on gender equality.	**K2**
	CO5 Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.	**K2**

UNIT – I	**Introduction to Gender Equality**	**Periods:06**
Gender equality – exploring gender identity and expression, Understanding the social construction of general roles and norms, historical perspectives on gender roles, Analyzing key milestones in the fight for gender equality.		**CO1**
UNIT – II	**Gender Inequality and Its Manifestations**	**Periods:06**
Gender discrimination in Indian society – causes of gender inequality – Illiteracy, patriarchal set up, lack of awareness, social beliefs, practice and custom – Issues of gender discrimination – Child marriage, child domestic work, poor education and health, violence and exploitation in workplace.		**CO2**
UNIT – III	**Gender and Culture**	**Periods:06**
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.		**CO3**
UNIT – IV	**Promoting Gender Equality**	**Periods:06**
Gender Equality and Human Rights – International frameworks and Conventions on Gender Equality – Equality under the Indian Constitution – Policies and initiatives for gender mainstreaming – Strategies for promoting Gender Equality in various contexts.		**CO4**
UNIT – V	**Contemporary Challenges and Future Directions**	**Periods:06**
Current challenges and emerging issues in gender equality – Glass ceiling – role of technology in continuing or challenging gender inequality – Exploring possibilities for transformative change and envisioning a gender-equal future.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Books

1. "Gender and Society" by Raewyn Connell – This book provides a comprehensive overview of gender roles, power dynamics, and the social construction of gender.
2. "The Second Sex" by Simone de Beauvoir – A historical and philosophical examination of women's oppression and gender inequality.
3. "Women and Gender in the Indian Society" by Neera Desai and Usha Thakkar – Focuses on the context of gender roles, inequality, and feminist movements in India.

Reference Books

1. Woman in early Indian societies, New Delhi: Manohar Publications. Sita A. Raman (2009).
2. A social and Cultural history, Volume1. Connecticut: Oxford: Praeger. Sita Raman (2009).
3. A social and Cultural history, Volume2. Connecticut: Oxford: Praeger.
4. Iftikhar R. (2016). Indian Feminism: Class, Gender and Identity in Medieval Ages. Chennai: Notion Press. Iftikhar, R. (2012).

Web References

1. https://www.unwomen.org
2. https://ncw.nic.in
3. https://en.unesco.org/themes/gender-equality
4. https://www.weforum.org/reports

https://wcd.nic.in

PROFESSIONAL ELECTIVE COURSES

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE6110**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**HASKELL PROGRAMMING**	3	-	-	3	25	75	100

CSE

Prerequisite	Basic knowledge in Programming	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 List and define the fundamental concepts of functional programming.	**K1**
	CO2 Utilize the process lists using higher-order functions and folding techniques in Haskell.	**K3**
	CO3 Describe the required data types and construct the features of the Haskell.	**K3**
	CO4 Apply fragmenting and wrapping using Monads	**K2**
	CO5 Apply the reasoning and proofs on programs in functional programming.	**K2**

UNIT - I	**Introduction To Haskell**	**Periods:09**
Introduction to Haskell program – Compilers and Interpreters –. Functional Programming – Expressions and Values, Evaluations, Functions. Basic concepts – Basic datatypes - List types - Tuples types – Polymorphic types – Overloaded types – Operators – Decision Making – String – string concatenation. Type classes: Eq, Ord, Enum, Show, Read, functor. Program: Reads multiple lines of input from the user and concatenates them into a single string – Generate student mark list using basic operators.		**CO1**
UNIT - II	**List and folding Lists**	**Periods:09**
Lists – Pattern matching on lists – Lambda Expressions – Using ranges to construct lists – Extracting portions of lists – List comprehensions – Guards – Transforming lists – Filtering lists – Zipping lists. Folding lists: Folds – Recursive patterns – Fold right – Fold left - How to write fold functions – Scans – Combinatorial functions. Program: Sum and Average of a List - List Operations Using Folding.		**CO2**
UNIT - III	**Tuple, Arrays and Recursive Functions**	**Periods:09**
Tuple – Types – map (), where (), filter () functions. Arrays – Creating arrays – Extracting and updating values – Recovering information from an array – Matrix multiplication. Recursive on lists, Multiple arguments and recursion, Mutual recursion. Program: Sorting an Array – Perform Binary Search using recursive functions-Tuple Operations.		**CO3**
UNIT - IV	**Monads**	**Periods:09**
Functors – Applicative – Monads. Monadic parsing: Parsers as functions - Sequencing parsers – common Monads: Maybe, either, IO. Monad operations: return, >>=, >>, do notation. Program: Building a Simple REPL.		**CO4**
UNIT - V	**Input/output and File concept**	**Periods:09**
Input/Output: IO operations – Actions – Composing actions – Sequencing actions – Promoting values to actions: return – Composing actions recursively – Exception handling – File handling: Reading and writing files. Program: create a file and perform a basic file operation.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Chris Allen, Julie Moronuki, “Haskell Programming from First Principles” First published January 1,2017.
2. Graham Hutton, "Programming in Haskell", Cambridge University Press, Second edition, 2016.
3. Bird, Richard, "Thinking Functionally with Haskell", Cambridge University Press, First edition, 2015.

Reference Books

1. Rebecca Skinner, “Effective Haskell: Solving Real-World Problems with Strongly Typed Functional Programming”, First edition, Pragmatic Bookshelf, 2023.
2. Will Kurt, "Get Programming with Haskell", Manning Publications, 2018.
3. Miran Lipovaca, “Learn You a Haskell for Great Good! A Beginner’s Guide”, No Starch Press, 2011.
4. Bryan O'Sullivan, Don Stewart, and John Goerzen, "Real World Haskell", O'Reilly Media, 2008
5. Simon Thompson, “Haskell: The Craft of Functional Programming”, Addison Wesley, Second Edition, 1999.

Web References

1. https://www.tutorialspoint.com/haskell/index.htm
2. https://onlinecourses.nptel.ac.in/noc19_cs80/preview
3. https://www.geeksforgeeks.org/what-is-haskell-programming-language/
4. https://www.futurelearn.com/courses/functional-programming-haskell
5. https://www.cmi.ac.in/~spsuresh/teaching/prgh15/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1	2	1	1	1	2	3	2	2	2	3	1	2
2	1	2	3	2	3	1	1	2	3	2	2	2	3	1	2
3	2	3	3	3	3	2	2	2	2	3	2	1	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 Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE611**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**GAME DESIGN AND DEVELOPMENT**	**3**	**0**	**0**	**3**	25	75	100
CSE								
Prerequisite	Basic knowledge in Programming							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the Basic concepts of Mechanics and Prototyping Techniques.	**K3**
	CO2 Illustrate the Game World.	**K2**
	CO3 Design the systems and Feedback for game.	**K3**
	CO4 Understand the characters and Game world incorporated with unity.	**K3**
	CO5 Evaluate the Iteration in Game Development.	**K4**

UNIT - I	**Core Mechanics and Prototyping Techniques**	**Periods:09**
Designing Core Mechanics - Designing Playtests - Collecting Feedback - Evaluating Prototype Performance.		**CO1**
UNIT - II	**Narrative and Game Worlds**	**Periods:09**
Crafting Engaging Stories - Aligning Story and Gameplay - Creating Game Worlds - Character Archetypes - Using Environment to Convey Story.		**CO2**
UNIT - III	**Systems and Feedback**	**Periods:09**
System Design Principles - Types of Feedback Loops - Collecting Player Feedback - Understanding Dynamic Systems - System Tuning and Balancing.		**CO3**
UNIT - IV	**Game Worlds and characters with Unity**	**Periods:09**
Worldbuilding - Designing Memorable Characters - Crafting Game Environments - Player Interaction with World - Character Evolution- Unity – Unity Models – Unity used in real-time.		**CO4**
UNIT - V	**Iteration and Evaluation**	**Periods:09**
Iterative Design Process - Creating Effective Playtests - Methods for Analyzing Feedback - Techniques for Refining Gameplay - Evaluation Criteria.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Tracy Fullerton, "Game Design Workshop: A Playcentric Approach to Creating Innovative Games" CRC Press, 2023.
2. Katie Salen, Eric Zimmerman, "Rules of Play: Game Design Fundamentals" 2023.
3. Richard Rouse, "Game Design: Theory and Practice" CRC Press, 2022.
4. David M. Perry, Michael J. Perry, "Game Design and Development: An Introduction", Addison-Wesley, 2023.
5. Ernest Adams, Andrew Rollings, "Fundamentals of Game Design", Addison-Wesley, 2024.

Reference Books

1. Jason Gregory, "Game Engine Architecture", CRC Press, 2023.
2. Steve Rabin, "Game Programming Gems", CRC Press, 2024.
3. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", CRC Press, 2023.
4. Michael E. Moore, "The Art of Game Design: A Book of Lenses", CRC Press, 2023.
5. Brian Schrank, "Designing Games: A Guide to Engineering Experiences", MIT Press, 2023.

Web References

1. https://learn.unity.com/tutorials
2. https://dev.epicgames.com/documentation/en-us/unreal-engine/unreal-engine-5-4-documentation
3. https://www.gamedev.net/
4. https://www.codecademy.com/catalog/subject/game-development
5. https://www.geeksforgeeks.org/how-to-get-started-with-game-development/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	3	3	2	3	3	-	2	3	-	3	2	3
2	2	2	3	3	-	3	-	3	-	2	-	2	2	2	-
3	3	2	3	3	3	2	3	3	-	3	3	-	3	3	3
4	3	2	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 Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE612**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**NOSQL DATABASE**	3	-	-	3	25	75	100
CSE								
Prerequisite	Basic Knowledge in Database							

	On completion of the course, the students will be able to		BT Mapping (Highest Level)
Course Outcomes	**CO1**	Illustrate the detailed Architecture, Database properties and Storage Requirements.	**K2**
	CO2	Differentiate and identify right Database models for Real-time Applications.	**K3**
	CO3	Interact with NOSQL Data Stores.	**K2**
	CO4	Outline the Non-Relational Databases.	**K3**
	CO5	Illustrate the Indexing on MongoDB & Usage of Indexes in MongoDB	**K4**

UNIT - I	**Introduction to NoSQL**	**Periods:09**	
Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, speeding Performance by strategic use of RAM, SSD, and disk- achieving horizontal scalability with Database sharing, Brewers CAP theorem.			**CO1**
UNIT - II	**NoSQL Data Architecture Patterns**	**Periods:09**	
NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.			**CO2**
UNIT - III	**Interacting with NoSQL Data Stores**	**Periods:09**	
Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Database. Document, Collection, Naming, CRUD operation, Creating Records, Accessing Data, Updating and Deleting Data -querying, indexing, Replication, Sharing.			**CO3**
UNIT - IV	**NoSQL Storage Architecture**	**Periods:09**	
Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores in Memcached and Redis, Eventually Consistent Non-Relational Databases.			**CO4**
UNIT - V	**Indexing and Ordering Data Sets**	**Periods:09**	
Indexing and Ordering Data Sets: Essential Concepts Behind a Database Index, Indexing and Ordering in Mongodb, Creating and Using Indexes in Mongodb, Indexing and Ordering in Couchdb, Indexing in Apache Cassandra.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Andreas Meier and Michael Kaufmann “SQL and NoSQL Databases: Modeling, Languages, Security and Architectures for Big Data Management”, 2023.
2. Dan Sullivan Sullivan, “NoSQL for Mere Mortals”, Addison-Wesley, 2015.
3. Daniel Abadi, Peter Boncz and Stavros Harizopoulas, “The Design and Implementation of Modern Column-Oriented Database Systems”, Now Publishers,2013.
4. Christopher D.Manning, Prabhakar Raghavan, Hinrich Schtze, “An introduction to Information Retrieval”, Cambridge University Press,2008.

Reference Books

1. Sadalage P & Fowler, “NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence”, Wiley Publications, 1st Edition, 2019.
2. Andreas Meier, Michael Kaufmann, “SQL & Nosql Databases”,Repro Books, 2019.
3. Perkins, Eric Redmond, Jim Wilson, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 2nd Edition, Pragmatic Bookshelf, 2018.
4. Guy Harrison, “Next Generation Database: NoSQL and big data”, Apress, 2015.
5. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson Education 2013.

Web References

1. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
2. https://www.geeksforgeeks.org/introduction-to-nosql/
3. https://www.javatpoint.com/nosql-databa
4. https://intellipaat.com/nosql-cassandra-hbase-training/
5. https://www.udemy.com/nosql/online-course

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**		Programme: **B.Tech**					
Semester	**VI**		Course Category: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CSE613**		Periods/Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**IOT CHALLENGES AND FUTURE**		3	-	-	3	25	75	100
CSE								
Prerequisite	-							
Course Outcomes	**On completion of the course, the students will be able to**						BT Mapping (Highest Level)	
	CO1	Recognize and understand the fundamentals of IoT Architecture and layer					**K2**	
	CO2	Explain about data processing and analytics					**K3**	
	CO3	Describes about IoT Privacy and Security Systems					**K3**	
	CO4	Understand working Principle of IIoT					**K2**	
	CO5	Design a Real Time Applications					**K2**	

UNIT - I	**Introduction to IOT**	**Periods:09**
Introduction - Definitions & Characteristics of IoT- IoT Architectures, Physical& Logical Design of IoT- Enabling Technologies in IoT- History of IoT- About Things in IoT- The Identifiers in IoT- About the Internet in IoT- IoT frameworks- IoT and M2M.		**CO1**
UNIT - II	**Data Acquiring, Organizing, Processing and Analytics**	**Periods:09**
Data Acquiring and storage - Organizing the Data - Transactions – Business processes – Integration and Enterprise Systems - Analytics –Knowledge Acquiring, Managing and Storing Processes- Knowledge Management Reference Architecture.		**CO2**
UNIT - III	**IOT Privacy, Security and Vulnerabilities Solutions**	**Periods:09**
Introduction-Vulnerabilities – Security Requirements and Threat analysis –use case and misuse cases – IoT security Tomography – Layered Attacker Model- Identity Management and Establishment – Access control – Secure Message Communication – Security Models and Protocols for IoT.		**CO3**
UNIT - IV	**Industrial IOT**	**Periods:09**
IIoT: Introduction- Business Model and Reference Architecture - Layers -IIoT Sensing - IIoT Processing - IIoT Communication- IIoT Networking-Wireless Medium Access issues-MAC protocol Survey-Survey Routing Protocols.		**CO4**
UNIT - V	**Applications of IOT**	**Periods:09**
Home Automation- Smart Cities- Energy- Smart Water-Retail Management- Logistics-Agriculture- Health and Lifestyle- Industrial IoT- Legal challenges- IoT design Ethics- IoT in Environmental Protection-Case studies with architectural analysis of IoT Applications.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, J. Henry; IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1st Edition, Pearson India Pvt. Ltd., 2018.
2. Raj Kamal – "INTERNET OF THINGS (IOT): Architecture and Design Principles",|2nd Edition, McGraw Hill Education(India) Private Limited,2nd Edition,2017.
3. Alasdair Gilchrist," Industry 4.0:The Industrial Internet of Things",by (Apress),2017.
4. HakimaChaouchi, — "The Internet of Things Connecting Objects to the Web" ISBN :978-1- 84821-140-7, Wiley Publications.
5. Internet of Things-A Hands-on Approach, By Arshdeep Bahga and Vijiay Madisetti Universities,2015 Pr,IBN:9788173719547.

Reference Books

1. Y. Kanetkar, S. Korde; 21 Internet of Things (IOT) Experiments: Learn IoT, the programmer's way, 1st Edition, BPB Publications, 2018.
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015.
3. "Industrial Internet of Things:Cyber Manufacturing Systems" by Sabina Jeschke,Christian Brecher ,Houbing Song,Danda B.Rawat (Springer),2017
4. Hands-on Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri,Antonio Capasso,Packt,2018.
5. Adrian McEwen,Designing the Internet of Things,Wiley,2013.

Web References

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://www.tutorialspoint.com/internet_of_things/index.htm
3. https://www.javatpoint.com/iot-internet-of-things
4. https://www.digi.com/blog/category/iot-trends
5. https://archive.nptel.ac.in/courses/106/105/106105166/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE614**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**SERVER-SIDE SCRIPTING LANGUAGES**	3	-	-	3	25	75	100
CSE								
Prerequisite	A basic understanding of Client-Server Architecture & what a web server is.							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basics of scripting languages.	**K2**
	CO2 Obtain knowledge about scripting with respective to reactive web Pages	**K3**
	CO3 Implement the basic functionality using Pearl scripting.	**K3**
	CO4 Implement the basic functionality using Ruby scripting.	**K2**
	CO5 Understand the in-depth knowledge of programming features of Angular JS	**K2**

UNIT - I	**Introduction to scripts and scripting languages**	**Periods:09**
Introduction to Scripts and Scripting Languages – Scripts and Programs, Uses for Scripting Languages, Web Scripting. JavaScript: Variables, Data Types, Operators, Conditional statements, Loops, Arrays, Functions, Objects- Predefined objects, Accessing objects, Object Methods.		**CO1**
UNIT - II	**JavaScript for reactive web pages elements**	**Periods:09**
JavaScript programming of reactive web pages elements: JavaScript Events- Mouse events, Keyboard events, Form events, window events, Event handlers, Frames, Form object, JavaScript Form Validation		**CO2**
UNIT - III	**PEARL**	**Periods:09**
Data Types, Variables, Scalars, Operators, Conditional statements, Loops, Arrays, Strings, Hashes, Lists, Built-in Functions, Pattern matching and regular expression operators.		**CO3**
UNIT - IV	**RUBY**	**Periods:09**
Data types, Variables, Operators, Conditional statements, Loops, Methods, Blocks, Modules, Arrays, Strings, Hashes, File I/O, Ruby Form handling.		**CO4**
UNIT - V	**AngularJS**	**Periods:09**
AngularJS Development Environment, Expressions in AngularJS, AngularJS Directives, Data Binding, AngularJS Model Modes, One Way Binding, Two Way Binding, AngularJS Controller, AngularJS Scope, AngularJS Filters, AngularJS Forms.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. David Flanagan," JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language, 7th Edition "Greyscale Indian Edition, Paperback., O'Reilly Publications 2020.
2. David Barron, "The World of Scripting Languages", Wiley Publications.2000.
3. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites 3rdEdition, O'Reilly Publications,2014.
4. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant," Programming Perl, 4th Edition" O'Reilly Media,2012.

Reference Books

1. David Flanagan and Yukihiro Matsumoto," The Ruby Programming Language", O'Reilly Publications.
2. Russ Ferguson, Christian Heilmann "Beginning JavaScript with Dom scripting and AJAX," Apress.
3. J. Lee and B. Ware "OpenSource Web Development with LAMP using Linux Apache, MySQL, Perl and PHP", (Addison Wesley) Pearson Education.

Web References

1. https://www.ruby-lang.org/en/
2. https://www.geeksforgeeks.org/ruby-programming-language/
3. https://www.javatpoint.com/perl-tutorial
4. https://www.tutorialspoint.com/perl/index.htm
5. https://www.perl.org/learn.html
6. https://www.w3schools.com/angular/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Management Studies**	**Programme : B.Tech**						
Semester	**V/VI**	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	**U23HSOC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTELLECTUAL PROPERTY RIGHTS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to ALL Branches

Prerequisite: **Nil**

Course Outcomes		***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1	Describe the Concept and Importance of Intellectual Property Rights (IPR).	**K2**
	CO2	Describe the procedures for patent registration, including recognizing legal remedies for infringement.	**K3**
	CO3	Apply copyright laws to hypothetical scenarios involving academic integrity and plagiarism.	**K3**
	CO4	Infer the different types of trademarks and understand the registration process and infringement issues.	**K4**
	CO5	Explain the legalities surrounding industrial designs, geographical indications, and their protection mechanisms.	**K2**

UNIT-I	**Overview of Intellectual Property**	**Periods: 9**
Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Trade Secret – International protection of IPR- Major International conventions and agreements: WTO/TRIPS Agreement, Paris Convention, The Berne Convention, Universal Copyright Convention, WIPO Convention, Madrid Agreement, Nice Agreement and TRIPS Agreement		**CO1**
UNIT-II	**Law of Patents**	**Periods: 9**
Meaning and Nature of Patent - Subject matter of Patent - Registration Procedure, Patentable and Non-patentable Inventions - Process and product Patent, Legal Requirements for Patents – Patent document: Specification and Claims - Granting of Patents - Transfer of Patent rights - Infringement of Patents and Remedies - Evergreening of Patents		**CO2**
UNIT-III	**Law of Copyrights**	**Periods: 9**
Meaning and Nature of Copyright - Subject matter of copyright - Law of Copyrights - Authorship and Ownership of copyright, Registration Procedure, Assignment and Licensing of copyright - Infringement of Copyrights and Remedies - Emerging new trends in Copyrights - Related Rights: Celebrity Rights, Academic Integrity or Plagiarism: An Intellectual Theft - Copyrights with special reference to software.		**CO3**
UNIT-IV	**Law of Trademarks**	**Periods: 9**
Meaning and Nature of Trademarks - Different kinds of Trademarks - Registrable and Non-Registrable Trademarks - Registration of Trademarks - Grounds for refusal of Registration: Absolute Ground and Relative Ground - Assignment and Licensing of trademarks - Infringement, Remedies and Penalties - Offenses relating to Trademarks - Passing off action – Deceptive similarity - Defenses - Emerging New trends in trademarks		**CO4**
UNIT-V	**Other Forms of IPR**	**Periods: 9**
Meaning and nature of Industrial Design - Subject Matter - Procedure for registration - Infringement of Copyrights in designs - Remedies for Infringement - Trade secret Law-Determination of Trade Secret Status - Liability for misappropriations of Trade Secrets- Protection for submission-Trade Secret litigation - Meaning and Nature of Geographical Indication (GI) - Procedure for registration - Infringement of Geographical indication - Remedies for Infringement.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 45**

Text Books

1. Nithyananda, K. V. Intellectual Property Rights: Protection and Management, 2nd edition, Cengage Learning India Private Limited, 2019.
2. Neeraj, P., and Khusdeep, D. Intellectual Property Rights, 2nd edition, PHI Learning Private Limited, 2018.

Reference Books

1. Ahuja, V. K. Law Relating to Intellectual Property Rights, 2nd edition, Lexis Nexis, 2017.
2. Bouchoux, Deborah E. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 4th edition., Cengage Learning, 2013.
3. Ganguli P. Intellectual Property Rights: Unleashing the Knowledge Economy. Tata McGraw-Hill Publishing Company; 2022.
4. Jyoti Rattan. Intellectual Property Rights, 2nd edition, Bharat Law House, 2024.

5. Surendra Malik and Sudeep Malik, Supreme Court on Intellectual Property, Eastern Book Company, 2022.
Web References
1. https://www.wipo.int/about-ip/en/
2. https://www.uspto.gov/patents/basics/general-information-patents
3. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
4. https://www.epo.org/about-us/annual-reports-statistics/annual-report.html
5. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India
6. https://www.inta.org/trademarks/trademark-basics/.

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Management Studies**	Programme: **B. Tech**						
Semester	**V/VI**	Course Category Code: **OE**			*End Semester Exam Type: **TE**			
Course Code	**U23HSOC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**NEW PRODUCT DEVELOPMENT**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to ALL Branches

Prerequisite			
Course Outcomes	***On completion of the course, the students will be able to***		**BT Mapping (Highest Level)**
	CO1	Explain the stages and importance of new product development (NPD) in modern business contexts.	**K2**
	CO2	Apply market research to identify customer needs and translate them into product specifications.	**K3**
	CO3	Illustrate the product concepts using screening and scoring techniques to select the most viable option.	**K3**
	CO4	Examine product prototype that incorporates principles of product architecture and design for manufacturing.	**K3**
	CO5	Analyze a business plan and market strategy for the successful launch of a new product.	**K4**

UNIT-I	**Introduction to New Product Development**	**Periods: 9**
Introduction to New Product Development (NPD) - Product Development vs New Product Development - Stages of NPD - Role of Innovation and Creativity in NPD - Reverse Engineering and its Application in NPD - Business Models for New Products - Risk Management in New Product Development - Sustainability and Ethical Considerations in NPD		**CO1**
UNIT-II	**Market Research and Customer Needs**	**Periods: 9**
Identifying Market Opportunities for New Products - Conducting Market Research for NPD - Translating Customer Needs into Product Specifications - Establishing and Refining Product Specifications - Competitive Analysis and Benchmarking in NPD - Tools for Understanding Consumer Behaviour: Surveys, Focus Groups, and Ethnography		**CO2**
UNIT-III	**Concept Generation and Evaluation**	**Periods: 9**
Concept Generation Process: Continuous and External Idea Sources - Clarifying the Problem and Brainstorming Solutions - Design Thinking for New Products - Techniques for Concept Generation - Systematic Exploration of Concepts - Screening and Scoring Product Concepts - Concept Evaluation and Selection Methods - Prototyping Techniques		**CO3**
UNIT-IV	**Product Design and Development**	**Periods: 9**
Product Architecture and its role in NPD - Modular vs. Integral Product Architecture - Design for Sustainability - Environmental Considerations - Organizing Product Development Teams - Stages of team Development - Collaboration and Cross - Functional Teams in Product Development - Tools for Effective Product Design - Agile Product Development Methodologies		**CO4**
UNIT-V	**Launch, Strategy and Commercialization**	**Periods: 9**
Developing a New Product Strategy - Building Market Demand and Entry Strategies for New Products - Developing a New Product Business Plan - Preparing for Market Launch - Post - Launch Evaluation - Product Life Cycle - Continuous Improvement and Future Product Enhancements		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Ulrich KT, Eppinger SD. Product design and development. 7th edition. McGraw-Hill Education; 2020.
2. Crawford CM, Di Benedetto A. New products management. 11th edition. McGraw-Hill Education; 2014.
3. Cooper RG. Winning at new products: Creating value through innovation. 5th edition. Basic Books; 2017.

Reference Books

1. Trott, P. Innovation management and new product development 6th edition. Pearson Education. 2017
2. Thomke, S. Experimentation works: The surprising power of business experiments. Harvard Business Review Press. 2020
3. Blank, S. G., & Dorf, B. The startup owner's manual: The step-by-step guide for building a great company. Wiley. 2020
4. Brown, T. Change by design: How design thinking transforms organizations and inspires innovation. Harper Business. 2009
5. Kelley, T., & Littman, J. The ten faces of innovation: IDEO's strategies for beating the devil's advocate and driving creativity throughout your organization. Currency/Doubleday. 2006

Web References	
1.	https://conjointly.com/kb/
2.	https://www.entrepreneur.com/article/281999
3.	https://www.mindtools.com/pages/article/newSTR_66.htm
4.	https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy
5.	https://www.productplan.com/glossary/product-architecture/
6.	https://hbr.org/2019/09/why-design-thinking-works
7.	https://www.smartsheet.com/new-product-development.
8.	https://www.ptc.com/en/blogs/cad/best-practices-for-developing-new-products

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Management Studies**	Programme : B.Tech						
Semester	**V/VI**	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	**U23HSOC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**FINANCE FOR ENGINEERS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to ALL Branches

Prerequisite	**Nil**	
Course Outcomes	***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1 Explain the objectives, scope, and role of financial management in engineering, and differentiate between profit maximization and wealth maximization.	**K2**
	CO2 Apply the concepts of the time value of money to engineering projects and use investment appraisal techniques such as NPV, IRR, and Payback Period for decision-making.	**K3**
	CO3 Demonstrate the steps in the capital budgeting process and apply techniques like cost-benefit and sensitivity analysis for evaluating engineering projects.	**K3**
	CO4 Analyze financial statements, including balance sheets and income statements, from an engineering perspective, and evaluate financial ratios to assess the financial performance of engineering projects.	**K4**
	CO5 Analyze different types of costs, such as fixed, variable, and marginal costs, and evaluate cost-benefit analysis and break-even analysis for engineering decision-making.	**K4**

UNIT-I-	**Introduction to Financial Management**	**Periods: 9**
Overview of Financial Management: Objectives, Scope, and Role in Engineering - Financial Planning and Strategy: Short-Term and Long-Term Planning - Basic Concepts: Profit Maximization vs Wealth Maximization - Role of Engineering Managers in Financial Decision - Making, Relationship between Finance and Other Engineering Disciplines.		**CO1**
UNIT-II	**Time Value of Money and Investment Decisions**	**Periods: 9**
Time Value of Money: Concept, Importance and Applications in Engineering Project, Present Value and Future Value Calculations - Investment Appraisal Techniques: Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR) (Theory only) and Profitability Index (PI) - Risk Analysis in Investment Decision Making.		**CO2**
UNIT-III	**Capital Budgeting for Engineering Projects**	**Periods: 9**
Capital Budgeting Process: Steps and Key considerations, Techniques for Evaluating Engineering Project, Cash-Flow Estimation for Project, Cost - Benefit Analysis in Engineering Project, Sensitivity Analysis, and Decision Trees for Project Evaluation.		**CO3**
UNIT-IV	**Financial Statements and Ratio Analysis**	**Periods: 9**
Introduction to Financial Statements: Balance Sheet, Income Statement, and an Engineering Perspective on Financial Statement Interpretation - Financial Ratios: Liquidity, Profitability - Engineering Case Studies on Financial Performance Evaluation - Limitations of Ratio Analysis in Engineering Projects.		**CO4**
UNIT-V	**Cost Estimation and Engineering Economic Analysis**	**Periods: 9**
Introduction to Cost Estimation in Engineering - Types of Costs: Fixed, Variable, Marginal, and Sunk Costs, Cost-Benefit Analysis in Engineering Projects, Break-Even Analysis and Its Application in Engineering Decision Making - Engineering Economic Analysis: Replacement Analysis.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 45**

Text Books

1. Sullivan WG, Wicks EM, Koelling CP. Engineering Economy. 17th edition. Pearson; 2020.
2. Brealey RA, Myers SC, Allen F. Principles of Corporate Finance. 19th edition. McGraw-Hill Education; 2022.
3. Brigham EF, Houston JF. Fundamentals of Financial Management. 15th edition. Cengage Learning; 2019.

Reference Books

1. Ranganath BJ, Sinha KK. Financial Management for Engineers. 4th edition. Vikas Publishing House; 2018.
2. Crundwell F. Finance for Engineers: Evaluation and Funding of Capital Projects. Springer; 2017.

Web References

1. https://www.netsuite.com/portal/resource/articles/financial-management/financial-management.shtml
2. https://www.investopedia.com/ask/answers/033015/why-time-value-money-tvm-important-concept-investors.asp

3.	https://omnicard.in/blogs/capital-budgeting-24042024
4.	https://www.linkedin.com/pulse/role-capital-budgeting-process-engineering-studies-ashraf
5.	https://corporatefinanceinstitute.com/resources/accounting/financial-ratios/
6.	https://www.dau.edu/acquipedia-article/engineering-cost-estimation-method

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Management Studies**	Programme: **B. Tech**						
Semester	**V/VI**	Course Category Code**: OE**			*End Semester Exam Type: **TE**			
Course Code	**U23HSOC04**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ECONOMICS FOR ENGINEERS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to ALL Branches

Prerequisite	**Basics of Economics**	
Course Outcomes	***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1 Interpret principles of managerial economics to real-world scenarios, utilizing demand analysis and forecasting techniques.	**K2**
	CO2 Discuss production functions and cost structures to evaluate their impact on managerial decision-making and market strategies.	**K2**
	CO3 Examine various market structures and pricing strategies, synthesizing their effects on market behavior and competitive dynamics.	**K3**
	CO4 Apply macroeconomic policies and their implications on business cycles, investment decisions, and economic stability.	**K3**
	CO5 Analyze recent economic trends, such as technological advancements and income inequality.	**K4**

UNIT-I	**Introduction to Managerial Economics**	**Periods: 9**
Managerial Economics: Meaning, Scope, and Importance - Functions of a Managerial Economist - Demand Analysis: Law of Demand, Elasticity of Demand, Law of Supply, Elasticity of supply and Market Equilibrium - Comparative statistics: Shift of a curve and movement along with the curve - Demand Forecasting: Criteria for Effective Forecasting - Qualitative Methods - Quantitative Methods.		**CO1**
UNIT-II	**Production Function and Cost Concepts**	**Periods: 9**
Production Function: Meaning, Types, Applications in Managerial Decision Making - Law of variable proportion and law of returns to scale - ISO Quants - Producer Surplus: Price ceiling and price floor - Cost concept: Types of Costs - Total, average and marginal cost - Revenue Concepts: Total Revenue (TR) - Marginal Revenue (MR) and Average Revenue (AR).		**CO2**
UNIT-III	**Market Structure**	**Periods: 9**
Market structure: Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly and Duopoly - Pricing policies: Cost-Based Pricing, Demand - Based Pricing, Competition - Based Pricing, Psychological Pricing, Geographical Pricing, Dynamic Pricing, Bundle Pricing, Price Discrimination, Premium Pricing and practices.		**CO3**
UNIT-IV	**Macroeconomics**	**Periods: 9**
Globalization and Economic Policies - National Income Concepts: Methods of measuring national income - circular flow of income - Monetary policy and Fiscal Policy - Business Cycles concepts - Inflation, deflation and its types - Foreign Direct Investment (FDI) - Foreign Institutional Investment (FII).		**CO4**
UNIT-V	**Recent Trends in Economics**	**Periods: 9**
Digital Economy : E-commerce, Fintech, and Online Services - Role of Technology : Big Data, Artificial Intelligence and Automation in Economic Decision-Making - Gig Economy : Growth of Freelance and Contract Work - Impact on Global Economies - Income In - equality : Causes, Effects, and Socio - political Impact		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Samuelson, William F., and Marks, Stephen G. Managerial Economics: Theory, Applications, and Cases, 10th edition, Wiley, 2020.
2. Ahuja, H. L. Principles of Managerial Economics, 7th edition, Tata McGraw-Hill, 2017
3. Mithani, D. M. Managerial Economics, 3rd edition., Himalaya Publishing House,2021.

Reference Books

1. Varian, Hal R. Intermediate Microeconomics: A Modern Approach, 9th edition., W.W. Norton & Company, 2014.
2. Brickley, James A., Smith Jr., Clifford W., and Zimmerman, Jerold L. Managerial Economics and Organizational Architecture, 7th edition., McGraw-Hill Education, 2016.
3. Samuelson, Paul, and Nordhaus, William. Economics, 20th edition., McGraw-Hill Education, 2019.
4. Schiff, Peter, and Schotter, Andrew J. Introduction to Microeconomics, 3rd edition., Cengage Learning, 2012.

5.	Moore, James C. Economic Theory and Operations Analysis, 2nd edition., Academic Press, 1970.
Web References	
1.	https://www.jaroeducation.com/blog/nature-and-types-of-managerial-economics/
2.	https://psu.pb.unizin.org/introductiontomicroeconomics/chapter/chapter-6-costs-and-production/
3.	https://corporatefinanceinstitute.com/resources/economics/market-structure.
4.	https://www.britannica.com/money/macroeconomics
5.	https://www2.deloitte.com/us/en/insights/economy/global-economic-outlook/weekly-update.html

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Computer Science and Engineering		Programme: B. Tech						
Semester	Management Studies		Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC05		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	MARKETING MANAGEMENT		3	0	0	3	25	75	100
Common to ALL Branches									
Prerequisite									
Course Outcomes	*On completion of the course, the students will be able to*						BT Mapping (Highest Level)		
	CO1	Explain the importance of marketing and differentiate between marketing and selling.					K2		
	CO2	Apply the consumer decision-making process and differentiate between industrial and consumer buying behavior.					K3		
	CO3	Examine product life cycle management strategies and demonstrate the steps involved in new product development.					K3		
	CO4	Illustrate the role of distribution channels and design an effective channel distribution strategy for both consumer and industrial goods.					K3		
	CO5	Analyze emerging trends in marketing, including Customer Relationship Management and experiential marketing strategies.					K4		

UNIT-I	Introduction to Marketing	Periods: 9
Marketing - Importance of Marketing - Difference between Marketing and Selling - Marketing Environment: The Macro and Micro Environment factors, Importance of environment analysis – Strategic Marketing planning: Introduction, Need, Framework of Strategic planning process and Steps in strategic planning - Ethical and Social Responsibility of Marketing - 4 Ps of Marketing		CO1
UNIT-II	**Consumer Behaviour and Marketing Strategy**	**Periods: 9**
Role of buyer - Types of Buying behavior - Factors influencing buying decisions - Consumer decision making process: Meaning and Steps in Consumer decision making Process – Organizational buying behaviour: Classification of organizational markets, Characteristics, Difference between Industrial and Consumer buying - Market Segmentation - Needs, Classification and Significance – Targeting, Positioning and Competitive Strategies.		CO2
UNIT-III	**Product and Pricing Mix**	**Periods: 9**
Product classifications - Product Life cycle - Strategies for managing Product Life cycle – Categories of New product, Importance and Steps in New Product Development – Packaging: Need for packaging, Essential qualities of packaging, kinds of packaging and advantages of packaging – Labelling: Functions, Types of labelling, advantages and disadvantages of labelling – Pricing objectives – Pricing strategies		CO3
UNIT-IV	**Place and Promotion Mix**	**Periods: 9**
Distribution Channel and Physical distribution: Meaning and Importance of distribution channel - Channel design decisions – Channels of distribution for consumer and industrial goods – Physical Distribution: Meaning, Objectives and components of physical distribution - Promotion: Objectives, Types of sales promotion: Consumer, Salesperson and Dealer sales promotion – Introduction to Integrated Marketing Communication		CO4
UNIT-V	**Trends in Marketing**	**Periods: 9**
Emerging trends in Marketing - Customer Relationship Management: Definition, features, Types and importance - Experiential Marketing: Meaning, strategies and benefits - Mobile Marketing: Definition and types of mobile marketing - Digital Marketing: Meaning, types of digital marketing – Inbound marketing: Meaning, fundamentals and difference between inbound and outbound marketing - Marketing Analytics: Meaning, importance, metrices of marketing analytics – An overview of Sustainable Marketing		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods:	Total Periods: 45

Text Books

1. Keller, Philip and Kevin Lane Kotler “Marketing Management” 16th Edition, Pearson Education Limited, 2022.
2. V.S.Ramaswamy, S.Namakumari, 6th Edition, Sage Publications India Pvt Ltd, 2018

Reference Books	
1.	Prachi Gupta, Ashita Aggarwal, et al. “Marketing Management: Indian Cases” Pearson Education Limited, 2024
2.	Arunkumar, Meenakshi.N, “Marketing Management” 3rd Edition, Vikas Publishing House, 2016
3.	Rajan Saxena, “Marketing Management” 5th Edition, MacGraw Hill Publications, 2017
Web References	
1.	https://www.ama.org/
2.	https://www.marketingprofs.com/
3.	https://indianjournalofmarketing.com/
4.	http://www.publishingindia.com/ijamm/
5.	https://onlinecourses.swayam2.ac.in/imb20_mg36/preview

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	**5**	**5**	**5**	**5**	**5**	**75**	**100**

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus`

SEMESTER VII

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CST707**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTERNET OF THINGS AND ITS APPLICATIONS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
	CSE							
Prerequisite	Basic knowledge of Sensors and Networks							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Explain the basic concepts, architecture, and applications of IoT.	**K2**
	CO2 Identify and utilize various IoT communication protocols.	**K3**
	CO3 Interface sensors, actuators, and microcontrollers for IoT applications.	**K5**
	CO4 Analyze security challenges and solutions in IoT.	**K1**
	CO5 Design and implement real-world IoT solutions.	**K2**

Unit- I	**Introduction to IoT**	**Periods: 09**
Introduction to IoT - Characteristics of IoT - IoT Functional Blocks - IoT vs. Traditional Networks - Applications of IoT in Various Domains - IoT Architecture - Sensors, Actuators, and Edge Devices - Role of Cloud Computing in IoT - Challenges in IoT Deployment - Future Trends in IoT.		**CO1**
Unit- II	**IoT Communication Technologies**	**Periods: 09**
Wireless Communication Protocols for IoT - Wi-Fi, Bluetooth, and Zigbee - LoRa and LPWAN - 6LoWPAN and Thread - MQTT and CoAP Protocols - HTTP and WebSocket Communication - RFID and NFC - Edge Computing and Fog Computing - Data Acquisition and Processing - Message Queueing in IoT.		**CO2**
Unit- III	**IoT Hardware and Programming**	**Periods: 09**
Overview of IoT Development Boards (Arduino, Raspberry Pi, ESP8266) - Sensors and Actuators Interfacing - Introduction to Embedded C and Python for IoT - IoT Data Collection and Processing - Connectivity with Cloud Services - IoT System Debugging - Energy Efficiency in IoT Devices - Real-time Monitoring and Control - IoT Development Frameworks - Hands-on: Building a Simple IoT Prototype.		**CO3**
Unit- IV	**IoT Security and Privacy**	**Periods: 09**
IoT Security Threats and Vulnerabilities - Cryptographic Techniques in IoT - Secure Communication Protocols - Authentication and Access Control - Blockchain for IoT Security - Intrusion Detection in IoT Networks - Data Privacy Challenges - GDPR and IoT Compliance - Secure IoT Device Management - Case Studies on IoT Security Attacks.		**CO4**
Unit- V	**IoT Applications and Case Studies**	**Periods: 09**
Smart Home and Building Automation - Smart Healthcare and Wearables - Smart Cities and Transportation - Industrial IoT (IIoT) and Smart Manufacturing - IoT in Agriculture - IoT in Environmental Monitoring - IoT in Supply Chain and Retail - Predictive Maintenance using IoT - AI and Machine Learning in IoT - Future Trends and Research Directions.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. S. Misra, A. Mukherjee, A. Roy, A. Obaid, "Introduction to Internet of Things (IoT)", River Publishers, 1st Edition, 2023.
2. S. Misra, M. S. Obaidat, A. V. Vasilakos, "Security Challenges and Approaches in Internet of Things", Springer, 1st Edition, 2023.
3. Fotios Chantzis, Ioannis Stais, Paulino Calderon, Evangelos Deirmentzoglou, Beau Woods, "Practical IoT Hacking: The Definitive Guide to Attacking the Internet of Things", No Starch Press, 1st Edition, 2021.
4. Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", Packt Publishing, 1st Edition, 2018.
5. Rajkumar Buyya, Amir Vahid Dastjerdi, “Internet of Things: Principles and Paradigms”, Morgan Kaufmann, Latest Edition, 2016.

Reference Books

1. Ovidiu Vermesan, Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, 1st Edition, 2013.
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 1st Edition, 2013.
3. Samuel Greengard, "The Internet of Things", MIT Press, 1st Edition, 2015.
4. Klaus Schwab, "The Fourth Industrial Revolution", Crown Business, 1st Edition, 2016.
5. Cuno Pfister, "Getting Started with the Internet of Things", O'Reilly Media, 1st Edition, 2011.

Web References

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/IoT/
4. https://www.i-scoop.eu/internet-of-things-guide/iot/
5. https:\\www.abouttheInternetofThings.com

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

- Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **PC**				End Semester Exam Type: **TE**		
Course Code	**U23CST708**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Data Analytics**	3	-	-	3	25	75	100
CSE								
Prerequisite	NIL							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Demonstrate a comprehensive understanding of data analytics concepts and methodologies.	**K2**
	CO2 Effectively preprocess and visualize data using appropriate tools.	**K3**
	CO3 Apply statistical techniques to draw meaningful insights from data.	**K2**
	CO4 Implement machine learning models for classification and regression tasks.	**K3**
	CO5 Utilize programming languages like Python and R for data analysis projects.	**K4**

UNIT - I	**Introduction to Data Analytics**	**Periods:09**	
Definition and scope of data analytics - Types of data: structured, semi-structured, unstructured - Data collection methods and sources - Data quality and preprocessing - Exploratory data analysis (EDA) - Descriptive statistics - Data visualization principles - Introduction to data ethics and privacy - Overview of data analytics applications in various industries.			**CO1**
UNIT - II	**Data Manipulation and Visualization**	**Periods:09**	
Data cleaning and transformation techniques - Handling missing data and outliers - Data integration and aggregation - Introduction to data visualization tools (e.g., Tableau, Power BI) - Creating effective charts and graphs - Dashboard design principles - Geospatial data visualization - Interactive data visualization techniques - Storytelling with data - Best practices for data presentation.			**CO2**
UNIT - III	**Statistical Analysis for Data Analytics**	**Periods:09**	
Probability theory and distributions - Inferential statistics: hypothesis testing, confidence intervals - Correlation and regression analysis - ANOVA and chi-square tests - Time series analysis Reddit - Introduction to Bayesian statistics - Non-parametric methods - Resampling techniques: bootstrapping and permutation tests - Multivariate statistical methods - Statistical software tools (e.g., SPSS, SAS)			**CO3**
UNIT - IV	**Machine Learning for Data Analytics**	**Periods:09**	
Supervised vs. unsupervised learning - Linear and logistic regression - Decision trees and random forests - Support vector machines - Clustering techniques: k-means, hierarchical clustering - Association rule mining - Dimensionality reduction methods: PCA, LDA - Model evaluation and validation techniques - Overfitting and regularization - Introduction to deep learning.			**CO4**
UNIT - V	**Data Analytics Tools and Programming**	**Periods:09**	
Introduction to Python for data analytics - Data manipulation with Pandas - Data visualization with Matplotlib and Seaborn - Introduction to R programming for data analysis - Data wrangling and visualization in R - SQL for data querying and manipulation - NoSQL databases and big data technologies - Introduction to cloud-based data analytics platforms - Developing reproducible data analysis workflows - Collaborative tools for data science projects.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Wes McKinney, "Python for Data Analysis", O'Reilly Media, 3rd Edition, 2022.
2. Ivo D. Dinov, "Data Science and Predictive Analytics: Biomedical and Health Applications Using R", Springer, 2nd Edition, 2023.
3. Joseph M. Manzo, "Data Analytics Using Excel Microsoft 365: With Accounting and Finance Datasets", FlatWorld, Latest Edition, 2023.
4. Foster Provost and Tom Fawcett, "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking", O'Reilly Media, Latest Edition, 2013.
5. Peter Bruce and Andrew Bruce, "Practical Statistics for Data Scientists: 50 Essential Concepts", O'Reilly Media, 2nd Edition, 2020.

Reference Books

1. Anil Maheshwari, Data Analytics Made Accessible, Amazon Digital Services, Latest Edition, 2020.
2. Phil Simon, Too Big to Ignore: The Business Case for Big Data, Wiley, Latest Edition, 2013.
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, Latest Edition, 2006.
4. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer, 2nd Edition, 2009.
5. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Manning Publications, Latest Edition, 2016.

Web References

1. https://www.ibm.com/topics/data-analytics
2. https://www.datacamp.com/courses/data-manipulation-with-pandas
3. https://www.khanacademy.org/math/statistics-probability
4. https://ai.google/education/
5. https://www.w3schools.com/sql

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CST709**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Neural Networks and Deep Learning**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
CSE								
Prerequisite	Artificial Intelligence							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Demonstrate a comprehensive understanding of neural network architectures and their components	**K2**
	CO2 Implement and train neural networks using appropriate algorithms and optimization techniques	**K3**
	CO3 Evaluate the performance of deep learning models and apply regularization methods to mitigate overfitting	**K4**
	CO4 Design and analyze advanced neural network models, such as convolutional and recurrent networks, for specific applications	**K4**
	CO5 Utilize deep learning frameworks to address complex problems in areas like computer vision and natural language processing	**K4**

Unit - I	**Introduction to Neural Networks**	**Periods: 09**
Biological inspiration of neural networks - Artificial neurons and perceptrons - Activation functions and their properties - Feedforward neural networks - Backpropagation algorithm - Loss functions and performance metrics - Gradient descent and its variants - Overfitting and underfitting in neural networks.		**CO1**
Unit - II	**Deep Learning Fundamentals**	**Periods: 09**
Introduction to deep learning and its significance - Deep feedforward networks - Regularization techniques: dropout, batch normalization - Optimization algorithms: Adam, RMSprop - Hyperparameter tuning and model selection - Data preprocessing and augmentation - Transfer learning concepts - Evaluation strategies for deep learning models		**CO2**
Unit - III	**Convolutional Neural Networks (CNNs)**	**Periods: 09**
Concept and architecture of CNNs - Convolution and pooling layers - Popular CNN architectures: LeNet, AlexNet, VGG - Applications of CNNs in image processing - Techniques to prevent overfitting in CNNs - Visualization and interpretation of CNN features - Object detection and segmentation basics - Recent advancements in CNN architectures		**CO3**
Unit - IV	**Recurrent Neural Networks (RNNs) and Sequence Modeling**	**Periods: 09**
Structure and functioning of RNNs - Backpropagation through time (BPTT) - Long Short-Term Memory (LSTM) networks - Gated Recurrent Units (GRUs) - Applications in natural language processing - Sequence-to-sequence models and attention mechanisms - Challenges in training RNNs and solutions - Bidirectional RNNs and their applications		**CO4**
Unit - V	**Advanced Deep Learning Algorithms**	**Periods: 09**
Generative Adversarial Networks (GANs) - Autoencoders and variational autoencoders - Deep reinforcement learning fundamentals - Capsule networks and their applications - Deep learning for graph data: Graph Neural Networks (GNNs) - Ethical considerations in deep learning - Emerging trends and future directions in deep learning.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook," Springer, 2nd Edition, 2023.
2. Michael Nielsen, "Neural Networks and Deep Learning," Determination Press, 2015.
3. François Chollet, "Deep Learning with Python," Manning Publications, 2nd Edition, 2021.
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning," MIT Press, 2016.
5. Simon Haykin, "Neural Networks and Learning Machines," Pearson, 3rd Edition, 2008

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1. Yoshua Bengio, "Learning Deep Architectures for AI," Now Publishers Inc., 2009.
2. Li Deng and Dong Yu, "Deep Learning: Methods and Applications," Now Publishers Inc., 2014.
3. Bishop, C. M., "Pattern Recognition and Machine Learning," Springer, 2006.
4. Zhang, C., et al., "Dive into Deep Learning," 2020.
5. Aurelien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow," O'Reilly Media, 2nd Edition, 2019.Michael A. Arbib, "The Handbook of Brain Theory and Neural Networks", The MIT Press, 2022.

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2. https://www.deeplearningbook.org/
3. https://www.tensorflow.org/tutorials
4. https://pytorch.org/tutorials/
5. https://www.kaggle.com/learn/intro-to-deep-learning

COs/POs/PSOs Mapping

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PC**				End Semester Exam Type: **LE**		
Course Code	**U23CSP706**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTERNET OF THINGS AND ITS APPLICATIONS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Prerequisite	Basic knowledge of programming, microcontrollers and network communication							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Analyze the performances of IOT devices	**K2**
	CO2 Design IoT applications in different domain	**K5**
	CO3 Implement basic IoT applications on embedded platform	**K5**
	CO4 Use of the cloud tool kits	**K3**
	CO5 Design and Implement applications on the Cloud.	**K5**

List of Exercises

Use Raspberry Pi or ESP32

Section 1: Fundamentals of IoT

1. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
2. Retrieve Sensor data and practice conditional processing of the data.
3. Familiarizing Sensors, Actuators and practicing the initialization and interfacing of the kit with different components.
4. Establish and understand communication protocols (MQTT and HTTP) to a IoT cloud server.
5. Bluetooth Low Energy (BLE) Communication. (Send and receive data using a smartphone BLE app (e.g., nRF Connect)).
6. Utilize Data visualization tools (ThingsBoard, Grafana, or Google Sheets) and present a real-time graph of the data and alert user based on sensor thresholds.

Section 2: Advanced IoT Applications

7. Implement IoT-based automation to control actuators using a mobile app (Blynk app)
8. Develop an IoT system monitoring industry environmental parameters to generate alerts and predict machine maintenance.
9. Build a heart monitor using pulse sensor and visualize the data to end-device via Bluetooth.
10. Implement IoT security measures by understanding and identifying threats, authenticated and authorized users and communicate with encryption.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

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.
5. Colin Dow, “Mastering IoT: How to Architect IoT Solutions with Edge and Cloud”, Packet Publishing, 2019.

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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/
5. https:\\www.abouttheInternetofThings.com

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSP707**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Analytics Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Prerequisite								

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	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. Categorize given datasets into structured, semi-structured, and unstructured.
2. Use Python (Pandas) to compute summary statistics and visualize trends.
3. Use Pandas to detect, fill, or drop missing values in a dataset.
4. Use Tableau or Power BI to visualize sales trends.
5. Conduct a t-test to compare two sample means using Python (Scipy).
6. Use Python to compute correlation and fit a regression model on a dataset.
7. Train a logistic regression model to predict customer churn using Scikit-learn.
8. Apply K-means clustering on a dataset and visualize clusters.
9. Retrieve and filter customer data from a SQL database.
10. Create bar plots, histograms, and scatter plots to analyze trends.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Wes McKinney, "Python for Data Analysis", O'Reilly Media, 3rd Edition, 2022.

2. Ivo D. Dinov, "Data Science and Predictive Analytics: Biomedical and Health Applications Using R", Springer, 2nd Edition, 2023.

3. Joseph M. Manzo, "Data Analytics Using Excel Microsoft 365: With Accounting and Finance Datasets", FlatWorld, Latest Edition, 2023.

Web References

1. https://www.ibm.com/topics/data-analytics
2. https://www.datacamp.com/courses/data-manipulation-with-pandas
3. https://www.khanacademy.org/math/statistics-probability
4. https://ai.google/education/
5. https://www.w3schools.com/sql

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

Correlation Level: 1 - Low, 2 - Medium, 3 – H igh

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**		Programme: **B.Tech**					
Semester	**VIII**		Course Category: **PA**			End Semester Exam Type: **LE**		
Course Code	**U23CSW703**		Periods/Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Project phase – I**		-	-	4	2	50	50	100
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	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**

List of Exercise

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

Lecture Periods:-	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:30**

Reference Books

- Papers published in reputed journals, conferences related to the project

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **PA**			End Semester Exam Type: =			
Course Code	**U23CSW704**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Internship / Inplant Training**	-	-	2	1	100	-	100

In the course of study, during 6th semester holidays, each student is expected to undertake a minimum of 4 Industrial visits (leading hardware manufacturing / software development companies) and 2-week training or undertake a minimum of one month of industry internship (in a reputed concern). Based on the industrial internships / training/visits, the student has to submit a report at the end of seventh semester highlighting the exposure he/she gained. The report will be evaluated by the departmental committee for 100 marks. More weightage will be given for Internship. The proofs for having undergone visits / training are to be enclosed along with report as enclosures.

Lecture Periods:-	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:30**

Reference Books

- Papers published in reputed journals, conferences related to the project

PROFESSIONAL ELECTIVES

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSEC01**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Go Programming**	3	-	-	3	25	75	100
CSE								
Prerequisite	Any Programming Language							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Illustrate the concepts of Go programming	**K1**
	CO2 Demonstrate the Structures and Composite data types of Go programming	**K2**
	CO3 Outline Functions and Methods of Go programming	**K3**
	CO4 Interfaces and Channels of Go programming	**K3**
	CO5 Make use of Packages and Concurrency in Go programming	**K4**

UNIT - I	**Introduction to Basic Data Types**	**Periods:09**
Introduction To Go Program- Names, Declarations, Variables, Assignments, Type Declarations, Numbers - Integers, Floating-Point Numbers, Complex Numbers, Constants, Strings, Booleans.		**CO1**
UNIT - II	**Program Structures and Composite Types**	**Periods:09**
Control Structures – The for Statement, the if Statement, the switch Statement, Arrays, Slices, Maps, structs, JSON, TEXT and HTML Templates.		**CO2**
UNIT - III	**Functions and Methods**	**Periods:09**
Functions: Function Declarations, Recursion, Multiple Return Values, Variadic Functions, Deferred Function Calls, Panic, And Recover, Methods: Declaration, Methods with A Pointer Receiver, Composing Types By Struct Embedding, Methods Values And Expressions.		**CO3**
UNIT - IV	**Interface and Channels**	**Periods:09**
Interface: Contracts, Types, Satisfaction, Values – Error Interface – Type Assertion - Discriminating Error with Type Assertion – Channels: Looping in Parallel – Multiplexing – Cancellation.		**CO4**
UNIT - V	**Concurrency and Packages**	**Periods:09**
Concurrency: Race conditions – Mutual Exclusion – Memory synchronisation – Race Detector, Packages: Import Paths – Package Declaration – Import Declaration – Blank Imports – Packages and Naming.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Katherine Cox-Buday, "Concurrency in Go" Publisher: O'Reilly Media, 1st Edition, 2017.
2. Alan A. A. Donovan, Brian W. Kernighan, "The Go Programming Language," Publisher: Addison-Wesley Professional, 1st Edition, 2015.
3. William Kennedy, Brian Ketelsen, Erik St. Martin - "Go in Action," Publisher: Manning Publications, 1st Edition, 2015.

Reference Books

1. Jon Bodner, "Learning Go, 2nd Edition", O'Reilly Media, 2024.
2. Jay McGavren, "Head First Go", O'Reilly Media, 1st Edition, 2019.
3. Mat Ryer, "Go Programming Blueprints", Packt Publishing, 2nd Edition, 2016.
4. Mark Summerfield - Programming in Go: Creating Applications for the 21st Century, Addison-Wesley, 1st Edition, 2012.
5. Ivo Balbaert,"The Way to Go: A Thorough Introduction to the Go Programming Language", iUniverse, 2012.

Web References

- https://golang.org/doc/
- https://gobyexample.com/
- https://www.udemy.com/
- https://www.coursera.org/
- https://www.codecademy.com/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Computer Science and Engineering			Programme: B.Tech				
Semester	VII			Course Category: PE		End Semester Exam Type: TE		
Course Code	U23CSE715	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Augmented Reality	3	-	-	3	25	75	100

CSE

Prerequisite	Familiarize yourself with UI design	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand Augmented Reality.	**K3**
	CO2 Paraphrase models with textures.	**K3**
	CO3 Articulate 3D Programming and Augmented Reality.	**K2**
	CO4 Correlate with FLARManager.	**K4**
	CO5 Illustrate with jMonkeyEngine and NyARToolkit.	**K2**

UNIT - I	**Getting Started with Augmented Reality**	**Periods:09**
Introduction: Augmented Reality - Tools and Technologies - AR Necessities. Introduction to Processing: The Processing Programming Environment - Drawing in Processing - Working with Classes.		**CO1**
UNIT - II	**Blender Modeling and Texturing Basics**	**Periods:09**
Blender: Modeling with Blender - Baking a Smooth AO Texture - Creating a Finished Texture with GIMP. Creating a Low-Poly Animated Characters: Texturing Your Low-Poly Alien - Rigging the Model - Keying a Simple Walk Cycle.		**CO2**
UNIT - III	**Processing With 3D Programming and Augmented Reality**	**Periods:09**
3D Programming: The P3D and OpenGL Environments - Working with OBJ files - Simple Animation with OBJ Arrays. Augmented Reality with Processing: The NyAR4psg Library - Digging into the Sample Code - Controlling Transformations with Multiple Markers.		**CO3**
UNIT - IV	**Interacting with the Physical World and Flarmanager**	**Periods:09**
Physical World: Physical Computing with Arduino - Sensors and Circuits - Communicating Between Arduino and Processing. FLARManager: AR Toolset for ActionScript - Getting FLARManager Up and Running - Creating Your Own Projects.		**CO4**
UNIT - V	**Prototyping AR with Jmonkeyengine and Nyartoolkit**	**Periods:09**
JMonkeyEngine and ARMonkeyKit - Exploring ARMonkeyKit - Thoughts from the Developer. NyARToolkit: Android and the Android SDK - NyARToolkit for Android - Going Further with Android. Working with Blender 2.58: Mesh Modeling - Texturing, Baking, and Materials - Rigging and Animation.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Alan B. Craig, "Understanding Augmented Reality: Concepts and Applications," Morgan Kaufmann, 2nd Edition, 2023.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR," Addison-Wesley Professional, 2nd Edition, 2022.
3. Dr. Helen Papagiannis, "Augmented Human: How Technology Is Shaping the New Reality", O'Reilly Media, 1st edition, 2017.
4. Tony Mullen, "Prototyping Augmented Reality", Sybex, 1st Edition, 2011.
5. Dieter Schmalstieg and Tobias Hollerer, "Augmented Reality: Principles and Practice", Addison-Wesley Professional, 1st Edition, ISBN 978-0321883575.

Reference Books

1. Sean Morey and John Tinnell, "Augmented Reality: Innovative Perspectives Across Art, Industry, and Academia", Parlor Press, 2017.
2. Charles Taylor and Editors of Kingfisher, "The Kingfisher Science Encyclopedia: With 80 Interactive Augmented Reality Models!", Kingfisher, 1st edition, 2024.
3. Adam Greenfield, "Radical Technologies: The Design of Everyday Life", Verso Books, 1st edition, 2017.
4. Greg Kipper and Joseph Rampolla, "Augmented Reality: An Emerging Technologies Guide to AR," Elsevier Science & Technology, 1st Edition, 2021.
5. Mark Billinghurst, Adrian Clark, and Gun Lee, "Wearable AR: Designing and Developing Augmented Reality Experiences," Addison-Wesley Professional, 1st Edition, 2021.

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1. https://en.wikipedia.org/wiki/Augmented_reality?utm_source=chatgpt.com
2. https://urish.medium.com/web-powered-augmented-reality-a-hands-on-tutorial-9e6a882e323e
3. https://www.practically.com/web/ar.php
4. https://www.geeksforgeeks.org/basics-augmented-reality/
5. https://www.meltwater.com/en/blog/augmented-reality
6. https://www.youtube.com/watch?v=wPJ6LHtV844

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE716**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Fundamentals of 5G Networks**	3	-	-	3	25	75	100

Prerequisite	**Computer Programming and Data Structures**		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Explain the motivations and advancements leading to 5G networks.	**K2**
	CO2	Describe the structural design and key components of 5G architecture.	**K3**
	CO3	Evaluate the functionalities and performance of 5G radio access technologies.	**K3**
	CO4	Assess the operations and services provided by the 5G core network.	**K2**
	CO5	Identify and discuss the diverse applications and emerging trends in 5G.	**K3**

UNIT - I	**Introduction to 5G Networks**	**Periods:09**	
Evolution from 1G to 5G - Key drivers and motivations for 5G - 5G use cases and applications - Performance targets and requirements - Standardization bodies and processes - Spectrum allocation and management - Regulatory considerations - Global initiatives and deployments.			**CO1**
UNIT - II	**5G Network Architecture**	**Periods:09**	
Overall architecture and design principles - 5G New Radio (NR) interface - Network slicing concepts - Service-based architecture (SBA) - Control and user plane separation - Interworking with previous generations - Deployment options and scenarios - Security considerations in 5G architecture.			**CO2**
UNIT - III	**5G Radio Access Technologies**	**Periods:09**	
Overview of 5G NR physical layer - Waveforms and modulation techniques - Massive MIMO and beamforming - Carrier aggregation and dual connectivity - Millimeter-wave communication - Non-orthogonal multiple access (NOMA) - Channel coding and error correction - Mobility management in 5G RAN.			**CO3**
UNIT - IV	**5G Core Network and Services**	**Periods:09**	
Next Generation Core (NGC) architecture - Network Function Virtualization (NFV) - Software-Defined Networking (SDN) integration - Session and mobility management - Policy control and charging functions - Edge computing and Multi-access Edge Computing (MEC) - Data analytics and network automation - Security and privacy in the 5G core. .			**CO4**
UNIT - V	**Applications and Future Trends in 5G**	**Periods:09**	
Internet of Things (IoT) integration - Vehicle-to-Everything (V2X) communications - Ultra-Reliable Low Latency Communications (URLLC) - Enhanced Mobile Broadband (eMBB) services - Massive Machine Type Communications (mMTC) - 5G in smart cities and industrial automation - Augmented Reality (AR) and Virtual Reality (VR) applications - Roadmap towards 6G and future networks.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Shyam Varan Nath, Ananya Simlai, Oğuzhan Kara, "Mastering 5G Network Design, Implementation, and Operations," Packt Publishing, 1st Edition, 2023.
2. Abdulrahman Yarali, "5G: The 5th Generation Mobile Networks," De Gruyter STEM, 1st Edition, 2023.
3. William Stallings, "5G Wireless: A Comprehensive Introduction," Pearson, 1st Edition, 2021.
4. Martin Sauter, "From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband," Wiley, 3rd Edition, 2017.
5. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology," Cambridge University Press, 1st Edition, 2016.

Reference Books

1. Erik Dahlman, Stefan Parkvall, Johan Skold, "5G NR: The Next Generation Wireless Access Technology," Academic Press, 2nd Edition, 2020.
2. Mischa Dohler, Takehiro Nakamura, "5G Mobile and Wireless Communications Technology," Cambridge University Press, 1st Edition, 2016.
3. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks," Wiley, 1st Edition, 2015.
4. Larry Peterson, Bruce Davie, "Computer Networks: A Systems Approach," Morgan Kaufmann, 5th Edition, 2011.
5. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks," Pearson, 5th Edition, 2010

Web References

1. https://www.3gpp.org/
2. https://www.itu.int/en/ITU-R/study- groups/rsg5/rwp5d/Pages/default.aspx
3. https://www.gsma.com/futurenetworks/
4. https://www.nist.gov/communications-technology-laboratory/5g
5. https://www.qualcomm.com/research/5g

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CSE717**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DIGITAL SECURITY**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
CSE								
Prerequisite								

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understand the Fundamentals of Digital Security.	**K2**
	CO2	Apply Security Technologies to prevent Vulnerabilities.	**K3**
	CO3	Develop Secure Infrastructure and Localhost to assess system security	**K4**
	CO4	Learn the basics of Safe and Secure Cyberspace	**K2**
	CO5	Analyze the Cybercrime and Cyberlaws using different Methods.	**K3**

UNIT-I	**Fundamentals of Digital Security**	**Periods: 9**	
Introduction to Digital Security – Confidentiality – Integrity and Availability - Foundations - Fundamental concepts, CIA, CIA triangle- Data breach at target - Security Governance - Challenges and Constraints, Security Models and Risk Management, Legacy Cyber security systems - Transformations in Cyber security.			**CO1**
UNIT-II	**Security Technologies**	**Periods: 9**	
Mobile Security - Advanced Data Security - Cloud Security, IoT Security - Incident detection response - Penetration testing - User Behavior Analytics (UBA) - Endpoint Detection and Response (EDR).			**CO2**
UNIT-III	**Securing Infrastructure and Local Host**	**Periods: 9**	
Infrastructure security in the real world and challenges - Understanding access control and monitoring systems: Access control security policies, Physical security controls - Intrusion detection and Reporting systems - Securing host device and challenges - Protecting the inner perimeter - Protecting remote access: Local protection tools, local intrusion detection tools, configuring browser security, Hardening operating systems.			**CO3**
UNIT-IV	**Safe and Secure Cyberspace**	**Periods: 9**	
Online security and privacy - Threats in the digital world: Data breach and Cyber Attacks - Blockchain Technology - Ethical Issues in Digital World.			**CO4**
UNIT-V	**Cybercrime and Cyberlaws**	**Periods: 9**	
Cybercrime Investigation - Digital Forensics-Cyber Laws and Legal Framework - Intellectual Property Rights (IPR) in Cyberspace-Privacy and Data Protection Laws-Emerging Trends in Cybercrime and Cyber Laws.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, Cenage Learning, N., 7th edition 2022.
2. William Stallings, “Effective Cybersecurity”, Pearson Education, 2019.
3. Yuri Diogenes,Erdal Ozkaya,” Cyber security - Attack and Defense Strategies”, Packt Publishers, First Edition, 2018.
4. Charles J. Brooks, Christopher Grow, Philip A. Craig, Donald Short, “Cybersecurity Essentials”, Wiley Publisher,First Edition, 2018.
5. Pavan Duggal ,"Cyberlaw: The Indian Perspective", Saakshar Law Publications , 2014.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Lizzie Coles-Kemp"Security in Computing',Addison Wesley,6th Edition,2024.
2. Noor Zaman Jhanjhi, Khalid Hussain, Mamoona Humayun, Azween Bin Abdullah, João Manuel R.S. Tavares, "Information Security Handbook",CRC Press,1st Edition,2022.
3. Bharat S. Rawal, Gunasekaran Manogaran, Alexender Peter," Cybersecurity and Identity Access Management",Springer Nature Singapore,2022.
4. Renee Dudley and Daniel Golden,"The Ransomware Hunting Team", Farrar, Straus and Giroux, 2022.
5. Dietmar P.F.Moller,"Cybersecurity in Digital Transformation Scope and Applications",Springer International Publishing,2020.

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1. https://www.digitalguardian.com/dskb/context-aware-security.
2. https://cyberpedia.reasonlabs.com/EN/context-aware%20security.html.
3. https://atos.net/en-gb/united-kingdom/digital-vision-programme/digital-vision-cyber-security 3/context-aware-security
4. ala.org/sites/default/files/advocacy/content/privacyconfidentiality/DigitalSecurityBasics-Privacy-Advocacy-Guides_v2.pdf
5. cetic.br/media/docs/publicacoes/7/20221011154720/sectoral_studies-digital_security.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	2	2	-	-	-	1	-	-	1	2	3	3
2	3	3	3	3	3	-	-	-	2	-	-	1	3	3	3
3	3	3	3	3	3	-	-	-	2	-	-	1	3	3	3
4	3	3	3	3	3	-	-	-	2	-	-	1	3	3	3
5	3	2	3	2	3	-	-	-	3	-	-	2	3	2	3

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**		Programme: **B.Tech**					
Semester	**VII**		Course Category: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CSE718**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Drone Technology**		**3**	**-**	**-**	**3**	**25**	**75**	**100**
Prerequisite	NIL							
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Describe the various components and terminologies of drones						**K2**
	CO2	To explore the different components of drone design.						**K2**
	CO3	Describe the various Drone Motors and ESC						**K4**
	CO4	Analyze drone performance and flight characteristics.						**K4**
	CO5	Evaluate drone deployment for surveillance and delivery						**K5**

UNIT - I	**Introduction to Drones**	**Periods:09**	
Definition and history of drones - Types of drones and their applications - Drone components and terminology - Regulations and Guidelines for drone usage.			**CO1**
UNIT - II	**Drone Design and Assembly**	**Periods:09**	
Design considerations for drone airframe and propulsion systems - Selecting and assembling drone components such as motors – batteries - flight controllers - and cameras - Basic wiring and soldering techniques.			**CO2**
UNIT - III	**Drone Motors and ESC**	**Periods:09**	
Working - Types: Brush and Brushless Motors - motor sizing and identification - mounting patterns and thread size - Thrust to Weight ratio- KV ratings - advanced motor selection - Electronic Speed Controller (ESC).			**CO3**
UNIT - IV	**Flight Mechanics and Dynamics**	**Periods:09**	
Basic principles of flight mechanics - flight controller board - Selection of drone controller with example - Factors affecting drone flight performance and efficiency			**CO4**
UNIT - V	**Drone Applications and Case Studies**	**Periods:09**	
Overview of commercial and industrial drone applications - Case studies and examples of successful drone deployments - GPS based navigation system - Drone Camera Systems - Agro application - Drone Delivery - Future trends and developments in the drone industry.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. K. Sundar and R. V. Rajakumar, Multicopters: Principles and Applications, Springer, 2021.
2. E. Tooley, Practical Drones: Building, Programming, and Applications, Apress, 2021.
3. D. Levy, Drone Programming: A Guide to Code Your Own Drones, Packt Publishing, n.d,2021
4. S. K. Kopparthy, Drone Technology: Theory and Practice, Springer, 2020.
5. P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 2015.

Reference Books

1. D. McLeod, Getting Started with Drone: How to Build, Fly, and Program Your Own Drone, Apress, 2019.
2. D. Saxby, Drone Aerial Photography and Video: Techniques and Stories from the Field, Cengage Learning, 2018.
3. G. C. Camara Leal, Flying Robots: An Introduction to Autonomous Aerospace Systems, Springer, 2017.
4. M. A. Banks, Building and Flying Electric Model Aircraft, O'Reilly Media, Inc., 2014.
5. M. LaFay, Building Drones for Dummies, John Wiley & Sons, Inc., n.d.

Web References

1. https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle
2. https://www.techtarget.com/iotagenda/definition/drone
3. https://www.technologyreview.com/2024/08/16/1096517/whats-next-for-drones/
4. https://www.tribuneindia.com/news/punjab/punjab-police-to-get-cutting-edge-anti-drone-technology-to-combat-trans-border-drug-smuggling/

* TE – Theory Exam, LE – Lab Exam

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

OPEN ELECTIVES

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **OE**			End Semester Exam Type: **TE**			
Course Code	**U23CSOC03**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Web Programming**	3	-	-	3	25	75	100
(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)								
Prerequisite	Familiarize yourself with UI design							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 To study the fundamentals of web application development.	**K3**
	CO2 To understand the design components and tools using CSS.	**K3**
	CO3 Implement client-side programming using JavaScript for web page creation.	**K2**
	CO4 Explain the basic concepts in PHP and Forms Design and build database in PHP.	**K4**
	CO5 Design and create effective web pages.	**K2**

UNIT - I	**Web Basics, HTML**	**Periods:09**
Web Basics: The Internet – World wide web - HTTP – web client and web server - Web browser- Dynamic IP. Web Design: Web site design principles. Introduction to HTML: HTML Syntax – Structure of HTML Documents – HTML Elements: Headings – Links – Images – Lists – Tables – Forms.		**CO1**
UNIT - II	**CSS**	**Periods:09**
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.		**CO2**
UNIT - III	**Javascripts**	**Periods:09**
Client-side scripting: Basic JavaScript – Variables – Functions – Conditions – Loops. Applications: Page Validation – Reporting.		**CO3**
UNIT - IV	**Introduction to PHP and Forms**	**Periods:09**
Introduction to PHP: Variables – Data Types – Constants – Echo / Print. Operators: Arithmetic – Comparison – Logical – String – If...Else...Elseif – Switch – Loops – Arrays – Functions. PHP Form: Form Handling – GET/POST – Using Bootstrap – Form Validation – Form Required – Form Submission - Cookies – Sessions – Introduction to Database: Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records.		**CO4**
UNIT - V	**Web Hosting**	**Periods:09**
Introduction to Web Hosting: Creating the website – Working on the site – Sending email and access other websites – Registering domains – Themes Publishing web sites – Maintaining a website.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Randy Connolly and Ricardo Hoar, “Fundamentals of Web Development”, Pearson Education Inc, Third Edition, 2022.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education, 3rd Edition, 2017.
3. Jon Dukett, “JavaScript and JQuery: Interactive Front–End Web Development”, Paperback, 2014.

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press,1st edition, 2018.
2. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web" ,BPB Publications, First edition, 2016.
3. Bassett, Lindsay, “Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
4. Joel Murach, "PHP & MySQL", Mike Murach Publications, 2nd edition, 2014.
5. Paul Deitel, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web-How to Program", Pearson Education, Fifth Edition, 2012.

Web References

1. https://www.w3schools.com/html/default.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/js/default.asp
4. https://www.tutorialspoint.com/php/php_introduction.html
5. https://www.w3schools.com/php/php_intro.asp

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment *	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VII**	Course Category: **OE**			End Semester Exam Type: **TE**			
Course Code	**U23CSOC04**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**COMPUTER PERIPHERALS AND NETWORKING**	3	-	-	3	25	75	100

(Offered to ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the system components and memory.	**K2**
	CO2 Explain the motherboard designs and its components.	**K3**
	CO3 Classify the various Storage devices.	**K4**
	CO4 Understand the purpose of various I/O peripherals.	**K4**
	CO5 Simulate various Networking Components.	**K2**

UNIT - I	**Introduction to PC and Memory**	**Periods:09**
Evolution of Personal Computers - Overview of Systems and Components - Processor Modes - Modern CPU Concepts - Architectural Performance Features - Intel Core X-Series Processor - CPU Over Clocking - Essential Memory Concepts - Memory Packages - Logical Memory Organizations - Memory Considerations - Memory Types - OPTANE Memory - Memory Techniques - Selecting and Installing Memory - CPU Coolers.		**CO1**
UNIT - II	**Motherboard Designs**	**Periods:09**
Motherboard Form Factors - IBM PC XT -IBM PC AT - The Baby AT - Micro-AT -LPX and Mini-LPX - ATX - Mini-ATX - NLX - Active Motherboards – Sockets. Expansion Slots – DIMM.2 - M.2 Expansion Card – PCIE GEN3 M.2 - Intel D850GB - Upgrading a Mother Board -DDR4 BOOST - Chipsets - Intel -Non-Intel Chipsets - North Bridge - South Bridge - CMOS - Motherboard BIOS - RGB Headers - Live Dash OLED - NEXT GEN Connectivity 802.11 AD WIFI - USB 3.1 GEN2 Controller.		**CO2**
UNIT - III	**Power supplies and storage devices**	**Periods:09**
Power Supplies and Power Management - Modular – Non-Modular - Concepts of Switching Regulation - Potential Power Problems - Power Management -The Floppy Disk Drive - Magnetic Storage - Hard Drive - SSD- CD-ROM Drive - DVD-ROM - DVD Media - DVD Drive.		**CO3**
UNIT - IV	**I/O Peripherals and Bus Architecture**	**Periods:09**
Parallel Port - Signals and Timing Diagram - IEEE1284 Modes - Asynchronous Communication - Serial Port Signals - Video Adapters - Mice - Keyboards - Sound Cards – ISA - PCI – AGP.		**CO4**
UNIT – V	**Network Components**	**Periods:09**
Introduction of Network Cable - Ethernet Cable - FIBER Optics – HUB - Unmanageable Switch - Manageable Switch – Router – Modem - Wi-Fi - Access Point - PCI Wireless Card - USB Wireless Device - Print Server.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Stephen J Bigelow, “Trouble Shooting, maintaining and Repairing PCs”, Tata McGraw-Hill 2017.
2. Ron Gilster, “PC Hardware: A Beginner's Guide”, Tata McGraw-Hill , 2001.
3. Craig Zacker and John Rourke, “The complete reference: PC hardware”, Tata McGraw-Hill.
4. Mike Meyers, “Introduction to PC Hardware and Troubleshooting”, Tata McGraw-Hill.
5. B. Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill 2002

Reference Books

1. Computer hardware & networking (2nd ed.) January 2021.
2. Mastering Pc Hardware And Networking – big Book Jan 2014
3. Scott Mueller, “Upgrading and Repairing PCs”, Pearson Education, 21st Edition, 2013.
4. Hans Peter Messmer, “The Indispensable PC Hardware Book”, Addison-Wesley, 4th Edition, 2001.
5. Scott Mueller, “Upgrading and Repairing Laptops”, Pearson Education, 3rd Edition, 2012.
6. “The undocumented PC: A Programmer"s Guide to I/O, CPUs, and Fixed Memory Areas” Pearson Education, 2nd Edition

Web References

1.https://www.coursera.org/courses?query=computer%20hardware
2.https://www.javatpoint.com/computer-hardware-and-networking-course
3.https://www.udemy.com/course/learn-computer-basics-hardware-network-complete-tutorials
4.https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
5 https://www.udemy.com/course/computer-hardware-operating-system-and-networking.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

SEMESTER VIII

Department	**B.Tech**	Programme : All B.Tech						
Semester	**VIII**	Course Category Code:			*End Semester Exam Type:			
Course Code	**U23HSTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Entrepreneurship and Business Management**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Nil**	
Course Outcomes	***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1 Students will gain knowledge, Skills and competencies related to entrepreneurship and the entrepreneur.	**K2**
	CO2 Students will be able to identify and evaluate innovative business ideas and opportunities.	**K3**
	CO3 Students will be able to develop and design a comprehensive business plan.	**K6**
	CO4 Students will be able explore various sources of finance and support systems for entrepreneurs	**K4**
	CO5 Students will understand core concepts and functions of business management.	**K2**

UNIT-I	**INTRODUCTION TO ENTREPRENEURSHIP**	**Periods: 9**
Entrepreneurship: meaning, importance of entrepreneurship, concepts, Characteristics, Theories of entrepreneurship, Challenges of entrepreneurs in India, Entrepreneurial Competencies, Entrepreneurial mobility, Entrepreneur v/s intrapreneur, Functions of Entrepreneurs, Types of Entrepreneurs, IPR related issues for Entrepreneur.		**CO1**
UNIT-II	**BUSINESS IDEA DEVELOPMENT**	**Periods: 9**
Creativity and innovation, Opportunity Sensing and Idea Generation, Techniques of Idea generation; Invention, Innovation and Imitation, identifying sources of opportunities, Business opportunity in India, RAMP Model for Opportunity Evaluation, Mullin' Seven Domains Model, Feasibility Analysis, Prototype, laboratory and market test, Pitching the Business Idea		**CO2**
UNIT-III	**BUSINESS PLAN DEVELOPMENT**	**Periods: 9**
Business Plan: Meaning, Importance, Components, Preparation, SWOT analysis, competitor analysis, Operation and Financial plan., Market assessment, technology search, production capacity, Infrastructure requirement, Pitching the Business Plan, Business Incubation and development, Concepts of Incubation, Activities of incubation center		**CO3**
UNIT-IV	**ENTREPRENEURIAL FINANCE AND MSME SCHEMES**	**Periods: 9**
Bank Loans, Project finance, Seed Funding, Angel Investment, Venture capital, Crowd funding, Government Grants and Subsides, Overview of MSME, Policies, Role of MSME, Schemes for entrepreneurial development: PMMY, PMKVY, GeM, ESDP, TUFS, MSME Champions Scheme, MSME Hackathons 4.0, Make in India		**CO4**
UNIT-V	**BUSINESS MANAGEMENT**	**Periods: 9**
Meaning and definition of business management, Features of business management, Nature of business management, Significance of Management, levels of Management, Functions of management, POSDCORB Concept, role of strategic planning in entrepreneurship, Types of Business Ownership, Social Responsibility of Business		**CO5**

Lecture Periods: 45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods: 45 Periods**

Text Books

1. Scarborough, N. M., & Cornwall, J. R. (2015). Essentials of entrepreneurship and small business management, Global Edition (8th ed.). Pearson Education Limited.
2. Barringer, B. R. (2015). *Preparing Effective Business Plans: An Entrepreneurial Approach* (2nd ed.). Pearson Education.
3. Koontz, H., & Weihrich, H. (2019). Essentials of Management: An International, Innovation and Leadership Perspective (10th ed.). McGraw Hill Education.

Reference Books

1. Morris, M. H., Kuratko, D. F., & Covin, J. G. (2011). Corporate entrepreneurship & innovation (3rd ed.). Cengage Learning.

2. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2016). *Entrepreneurship* (10th ed.). Tata McGraw Hill.
3. Binion, K. D. (2014). *Startups Made Easy: Fundamentals for Entrepreneurs*. K Works Publication, Michigan.
4. Mahawar, M. K., Mungi, A., Raul, H. G., & Gupta, M. K. (2023). Entrepreneurship and Small Business Management (1st ed.). AG Publishing House.
5. Desai, V. (2021). Dynamics of Entrepreneurial Development and Management (Revised ed.). Himalaya Publishing House.
6. Tripathi, P. C., & Reddy, P. N. (2023). Principles of Management (6th ed.). Tata McGraw Hill.

Web References

1. https://www.shiksha.com/online-courses/articles/entrepreneurship-development/
2. https://www.sidbi.in/institutional-finance
3. https://msme.gov.in/prime-minister-employment-generation-programme-and-other-credit-support-schemes
4. https://www.msmetamilnadu.tn.gov.in/tansidco.php#chart-line
5. https://www.msmetamilnadu.tn.gov.in/aabcs.php
6. https://my.msme.gov.in/inc/JoinMsmehackthon.aspx
7. https://www.tiic.org/entrepreneur-development-scheme/
8. https://tnau.ac.in/executive-development-programme/

COs/Pos Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	2	1	1	1	-
CO2	1	1	2	2	2	1	1	2	2	2	2	1
CO3	1	1	2	2	2	1	-	2	1	2	2	2
CO4	1	1	1	2	2	1	-	2	1	1	2	2
CO5	-	-	-	-	1	1	-	2	1	1	1	1

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

Evaluation Method

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

PROFESSIONAL ELECTIVE V

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE819**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Redux Programming**	3	-	-	3	25	75	100
CSE								
Prerequisite	React basics, JavaScript							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the core principles of Redux	**K2**
	CO2 Apply Redux to React applications.	**K3**
	CO3 Analyze and handle asynchronous operations in Redux.	**K3**
	CO4 Apply advanced Redux patterns, Redux Toolkit and optimize state updates.	**K3**
	CO5 Evaluate Redux applications using testing,	**K4**

UNIT - I	**Introduction to Redux**	**Periods:09**

Introduction: Redux – Need for Centralized State Management – Core Principles: Single Source of Truth, Immutability, Predictable State. Redux Concepts: Actions, Reducers, Store. Redux Flow: Action Dispatch – Reducer Execution – State Updates – Subscription and Listeners. Hands-on: Setting up Redux Project – Creating First Action, Reducer, and Store. **CO1**

UNIT - II	**Integrating Redux with React**	**Periods:09**

React-Redux: Provider, connect() HOC, Mapping State and Dispatch. Redux Hooks: useSelector, useDispatch. Component Integration: Connecting Functional and Class Components. Advanced Hooks: Memoization, Custom Hooks. Best Practices: Container vs Presentational Components, Redux State Structure. **CO2**

UNIT - III	**Middleware and Asynchronous Operations**	**Periods:09**

Middleware: Concept and Usage in Redux. Redux-Thunk: Handling Asynchronous Actions, API Calls. Redux-Saga: Generator Functions, Watchers and Workers, Complex Async Workflows. Error Handling: Managing Errors, Loading and Failure States. Comparison: Redux-Thunk vs Redux-Saga and Use Cases. **CO3**

UNIT - IV	**Advanced Redux Patterns and Optimization**	**Periods:09**

Redux Toolkit: Reducers, Async Operations, Store Setup. State Normalization and Denormalization. Selectors and Memoization. Immutable Updates with Immer. Code Organization and Handling Large State. **CO4**

UNIT - V	**Testing, DevTools, and Best Practices**	**Periods:09**

Testing: Actions, Reducers, Selectors. Redux DevTools: Setup and Debugging. Performance: Profiling and Optimization. Production: Code Splitting and Persistent State. **CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. The Complete Redux Book – Boris Dinkevich & Ilya Gelman – 1st Edition – 2023
2. Redux: An A-to-Z Walkthrough of the Most Important JavaScript State Management Library – Chong Lip Phang – 1st Edition – 2022
3. Redux Quick Start Guide – James Lee, Tao Wei & Suresh Kumar Mukhiya – 1st Edition – 2019 → Updated Edition – 2023 (use this instead).

Reference Books

1. Redux From Scratch – Mike Mangialardi – 1st Edition – 2025
2. The Redux Official Course Tutorial: Code Along for All Levels – 1st Edition – 2023
3. Human Redux: Practical Patterns for Redux – Henrik Joreteg – 1st Edition – 2023
4. Learning React: Modern Patterns for Developing React Apps – Alex Banks & Eve Porcello – 2nd Edition – 2020

Web References

1. https://redux.js.org
2. https://github.com/reduxjs/redux
3. https://www.geeksforgeeks.org/web-tech/introduction-to-react-redux/
4. https://React-Redux Quick Start Tutorial
5. https://Redux Official Tutorials and Learning Path

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE820**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Virtual Reality**	3	-	-	3	25	75	100

(Common to CSE and CSBS)

Prerequisite	Familiarize yourself with Basic Internet & Computer Skills , Social Media Usage Experience	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Know basic notation and terminology used in network science	**K1**
	CO2 Be able to visualize, summarize and compare networks	**K3**
	CO3 Be capable of analyzing real work networks	**K4**
	CO4 Design extraction and mining tools for Social networks	**K5**
	CO5 Develop personalized visualization for Social networks	**K5**

UNIT - I	**Introduction**	**Periods:09**
Virtual Reality: What is Virtual Reality - Modern VR Experiences - History Repeats. Bird's-Eye View: Hardware - Software - Human Physiology and Perception		**CO1**
UNIT - II	**GEOMETRY AND LIGHT AND OPTICS**	**Periods:09**
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.		**CO2**
UNIT - III	**PHYSIOLOGY OF HUMAN VISION**	**Periods:09**
From the Cornea to Photoreceptors - From Photoreceptors to the Visual Cortex - Eye Movements - Implications for VR		**CO3**
UNIT - IV	**VISUAL PERCEPTION, VISUAL RENDERING AND MOTION IN REAL AND VIRTUAL WORLD**	**Periods:09**
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		**CO4**
UNIT - V	**TRACKING, INTERACTION AND AUDIO**	**Periods:09**
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.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Stevan M. LaValle, *Virtual Reality*, Cambridge University Press, 2020.
2. Alan B. Craig, *Understanding Augmented Reality: Concepts and Applications*, Morgan Kaufmann, 2021 Edition.
3. Dieter Schmalstieg & Tobias Höllerer, *Augmented Reality: Principles and Practice*, Addison-Wesley, Updated Edition, 2021.

Reference Books

1. Jonathan Linowes, *Unity Virtual Reality Projects*, Packt Publishing, Updated Edition, 2023.
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, Updated Edition, 2021.
5. Tony Parisi, *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile*, O'Reilly Media, 2021.

* TE – Theory Exam, LE – Lab Exam

Web References

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

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE821**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Social Networking**	3	-	-	3	25	75	100
CSE								
Prerequisite	Familiarize yourself with Basic Internet & Computer Skills , Social Media Usage Experience							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Know basic notation and terminology used in network science	**K1**
	CO2 Be able to visualize, summarize and compare networks	**K3**
	CO3 Be capable of analyzing real work networks	**K4**
	CO4 Design extraction and mining tools for Social networks	**K5**
	CO5 Develop personalized visualization for Social networks	**K5**

UNIT - I	**Introduction**	**Periods:09**
Introduction to social network, Networks examples. Graph theory basics, Statistical network properties, Node centrality metrics: degree, closeness and betweenness centrality. Eigenvector centrality and PageRank.		**CO1**
UNIT - II	**Network models**	**Periods:09**
Properties of real world networks, Random Graph model, Small world model, Preferential attachment model, Community Structure: Community detection, Community Evolution, Community evaluation.		**CO2**
UNIT - III	**Process on networks**	**Periods:09**
Network topology and diffusion, complex contagion, innovation and coordination, Cool and unusual Applications, predicting recipe ratings using ingredient networks, Network Resilience, Resilience and assortivity, Network visualization,. Data mining and text mining		**CO3**
UNIT - IV	**Social Network Mining**	**Periods:09**
Detecting and discovering Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection – divisive, spectral and modularity optimization algorithms - Applications of Community Mining Algorithms - Overview of tools for Detecting Communities - Understanding and Predicting Human Behavior for Social Communities		**CO4**
UNIT - V	**Visualization And Applications Of Social Networks**	**Periods:09**
Visualization of Social Networks - Node-Edge Diagrams - Random Layout - Force-Directed Layout - Tree Layout - Matrix Representations - Hybrid Representations - Visualizing Online Social Networks - Applications - Covert Networks – Community Welfare - Collaboration Networks - Co-Citation Networks		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Matthew O. Jackson, *Social and Economic Networks*, Princeton University Press, 2020 Edition.
2. Eric D. Kolaczyk & Gábor Csárdi, *Statistical Analysis of Network Data with R*, Springer, 2nd Edition, 2020.
3. Petter Holme & Jari Saramäki, *Temporal Network Theory*, Springer, 2021.
4. Borko Furht (Ed.), *Handbook of Social Network Technologies and Applications*, Springer, Updated Edition, 2021.
5. John G. Breslin, Alexandre Passant & Stefan Decker, *The Social Semantic Web*, Springer, Updated Edition, 2020

Reference Books

1. Maarten van Steen, *Graph Theory and Complex Networks: An Introduction*, Revised Edition, 2021.
2. Reza Zafarani, Mohammed Ali Abbasi & Huan Liu, *Social Media Mining: An Introduction*, Cambridge University Press, Updated Edition, 2021.
3. Maksim Tsvetovat & Alexander Kouznetsov, *Social Network Analysis for Startups*, O'Reilly Media, Updated Edition, 2022.
4. Robert Knell, *Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R*, Packt Publishing, 2nd Edition, 2021.
5. Robert Kabacoff, *R in Action: Data Analysis and Graphics with R*, Manning Publications, 3rd Edition, 2023.

Web References

1. Useful Links: http://www.r-project.org
2. http://www.rstudio.com
3. http://igraph.org

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**IV/VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSEC02**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Introduction to Industry 4.0**	3	0	0	3	25	75	100
(Common to CSE and Mechatronics)								
Prerequisite	NIL							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand key Industry 4.0 Concepts and Technologies.	**K1**
	CO2 Explore advanced technologies like AI, Big Data and Robotics.	**K2**
	CO3 Comprehend the working of Cloud Computing Technologies	**K3**
	CO4 Learn how AR/VR improves Industrial Automation and Safety.	**K2**
	CO5 Apply design thinking and explore IIoT Use Cases and Cybersecurity.	**K3**

UNIT - I	**Foundations Of Industry 4.0 and Smart Systems**	**Periods:09**
Introduction to Industry 4.0 - The Fourth Industrial Revolution - Globalization and Emerging Issues Lean Production Systems - Smart and Connected Business Perspectives - Cyber-Physical Systems (CPS) - Introduction to Sensing and Actuation - Introduction to IIoT (Industrial Internet of Things) - FDM Machine and 3D Printing Demonstration - Case Studies in Industry 4.0.		**CO1**
UNIT - II	**Key Technologies and Advanced Analysis In Industry 4.0**	**Periods:09**
Next-Generation Sensors - Collaborative Platforms and Product Lifecycle Management (PLM) - Artificial Intelligence (AI) in Industry 4.0 - Big Data and Advanced Analytics - Introduction to Robotics - Introduction to UAVs (Drones) - Energy-Efficient Technologies - Collaborative Robots (Cobots) - Artificial Intelligence and Data Analytics for Predictive Maintenance.		**CO2**
UNIT - III	**Cloud Computing Technologies and Industrial Applications**	**Periods:09**
Introduction to Cloud Technologies - Top Cloud Service Providers - Cloud Computing in Industry 4.0 -Azure IoT Hub and Cloud Services - Edge and Fog Computing - Hybrid Cloud Solutions - Cloud-Based Big Data Platforms - Cloud Security - Cloud Solutions for Smart Cities.		**CO3**
UNIT - IV	**Augmented Reality (AR), Virtual Reality (VR), and Industrial Automation**	**Periods:09**
Introduction to AR and VR in Industry 4.0 - Industrial Use Cases of AR and VR - AR/VR in Maintenance and Inspection - Mixed Reality (MR) and Digital Twins - Automation Tools and Techniques -VR for Industrial Safety and Training - Challenges in AR/VR Adoption.		**CO4**
UNIT - V	**Design Thinking, IIOT, and Case Studies**	**Periods:09**
Introduction to Design Thinking - Design Thinking Process - Human-Centered Design for Industrial Applications - Basics of Industrial IoT (IIoT) - Industrial Processes and Automation - Cybersecurity in Industry 4.0 - Real-time Use Cases - Drones and UAVs in Industry - UAV Regulations and Safety Standards - Future of Industry 4.0.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Ravi Kant, Hema Gurung, “Industry 4.0: Concepts, Processes and Systems”, CRC Press,2023.
2. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things”, Apress,2016.
3. Emre Cevikcan, Alp Ustundag, “Industry 4.0: Managing The Digital Transformation”, Sprniger,2017.

Reference Books

1. Soumya Das, “Industry 4.0 with SAP”, Rheinwerk,2024.
2. Abhinav Sharma, Arpit Jain, Paawan Sharma, Mohendra Roy, “Recent Trends and Best Practices in Industry 4.0”, River Publishers,2023.
3. Anand Nayyar, Mohd Naved, Rudra Rameshwar, New Horizons for Industry 4.0 in Modern Business, Springer,2023.
4. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits, Industry 4.0 for SMEs: Challenges, Opportunities and Requirements, Palgrave Macmilla,2020.
5. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova, “Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work”, Emerald Publishing Limited,2019.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_cs69/preview
2. https://www.oracle.com/in/industrial-manufacturing/industry-4-components/
3. https://aws.amazon.com/blogs/iot/tag/industry-4-0/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CSE822**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Generative AI & Its Application**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Basic Mathematics, Probability and Statistics, Programming in Python	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain theoretical foundations and mathematical principles of generative modeling.	**K2**
	CO2 Describe and analyze sequence-based generative architectures for text modeling.	**K2**
	CO3 Explain image generation techniques using GANs, VAEs, and diffusion models	**K2**
	CO4 Apply and adapt Large Language Models using fine-tuning, prompt engineering and alignment techniques.	**K3**
	CO5 Evaluate, design and deploy LLM-based applications with consideration of ethical and societal impact.	**K4**

Unit- I	**INTRODUCTION TO GENERATIVE AI**	**Periods: 09**
Introduction to Generative AI – Generative vs Discriminative models – Probability distributions and density estimation – Maximum Likelihood Estimation – Latent variable models –Autoregressive models – Flow-based models – Energy-based models –Representation learning – Manifold hypothesis –Training objectives –Overfitting.		**CO1**
Unit- II	**SEQUENCE AND TEXT GENERATION MODELS**	**Periods: 09**
Probabilistic language modelling – N-gram models – Neural language models –Recurrent Neural Networks (RNN) LSTM and GRU for text generation –Attention mechanism – Transformer architecture – Encoder-only, Decoder-only Encoder-Decoder models –Autoregressive generation – Sampling techniques (Greedy, Beam Search, Top-k, Top-p) –Pre-training objectives (Masked LM, Causal LM).		**CO2**
Unit- III	**IMAGE AND MULTIMODAL GENERATIVE MODELS**	**Periods: 09**
Generative Adversarial Networks (GAN) – Minimax objective – Generator and Discriminator –Variants of GAN – DCGAN, CycleGAN, Conditional GAN –Variational Autoencoders (VAE) – Encoder-decoder structure – Latent space sampling –Diffusion models – Forward and reverse diffusion process –Evaluation of image models – FID score – Inception score –Challenges in image generation – Mode collapse, data bias.		**CO3**
Unit- IV	**ADVANCED LARGE LANGUAGE MODELS AND ADAPTATION**	**Periods: 09**
Evolution of Large Language Models – Scaling laws – Pre-training objectives (Masked LM, Causal LM) – Architecture of GPT-style models – Training pipeline of LLMs – Tokenization techniques (BPE, SentencePiece) – Fine-tuning strategies –Benchmarks (MMLU, HELM) – Perplexity and accuracy – Hallucination detection		**CO4**
Unit- V	**GEN AI TOOLS AND APPLICATIONS**	**Periods: 09**
Retrieval-Augmented Generation (RAG) – Vector databases – Embeddings and similarity search –LLM Agents – Tool usage and function calling – Autonomous agents – Multi-agent systems –Open-source LLMs – GPT, LLaMA, Mistral overview – Hugging Face ecosystem –Data privacy – Copyright – Responsible AI governance.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, Updated Edition, 2021.
2. David Foster, Generative Deep Learning, 2nd Edition, O'Reilly Media, 2022.
3. Lewis Tunstall, Leandro von Werra, Thomas Wolf, Natural Language Processing with Transformers, O'Reilly Media, 2022.

Reference Books

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, Updated Edition, 2021.
2. David Foster, Generative Deep Learning, 2nd Edition, O'Reilly Media, 2022.
3. Lewis Tunstall, Leandro von Werra, Thomas Wolf, Natural Language Processing with Transformers, 2nd Edition, O'Reilly Media, 2024.
4. Sudharsan Ravichandiran, Hands-On Generative Adversarial Networks with PyTorch, 2nd Edition, Packt Publishing, 2022.
5. Zhang, Z., Sabuncu, M. R. (Editors), Deep Learning for Medical Image Analysis, 2nd Edition, Academic Press, 2023.

Web References

1.https://arxiv.org/abs/1706.03762
2.https://arxiv.org/abs/2005.14165
3.https://arxiv.org/abs/2006.11239
4.https://openai.com/research/clip

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE823**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Testing and Automation**	3	-	-	3	25	75	100
CSE								
Prerequisite	Familiarize yourself with UI design							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand fundamentals of software testing and importance of test automation	**K2**
	CO2 Analyze and design effective test plans and test cases	**K4**
	CO3 Perform different testing techniques and defect reporting	**K3**
	CO4 Apply automated testing tools and frameworks	**K3**
	CO5 Evaluate and select appropriate automation strategies & metrics	**K5**

UNIT - I	**Introduction to Software Testing**	**Periods:09**
Software Quality and Testing Principles - Testing as an Engineering Activity - SDLC vs STLC - STLC and V-Model - Testing Requirements - Role of testing in software development		**CO1**
UNIT - II	**Test Planning and Test Design Techniques**	**Periods:09**
Test planning fundamentals - Test cases, test suites - Black Box & White Box Testing Techniques - Boundary Value Analysis, Decision Table Testing - Test data generation		**CO2**
UNIT - III	**Testing Tools and Types**	**Periods:09**
Manual vs Automated Testing - Testing tools overview: Selenium, JUnit/TestNG, **Introduction to Apache Groovy for Test Automation including fundamentals, scripting and OOP features – Integration of Groovy with Selenium and Spock Framework**, Load and API testing basics -Defect management life cycle - Reporting & metrics		**CO3**
UNIT - IV	**Test Automation Fundamentals**	**Periods:09**
Need for Automation and Scope - Test automation architecture and frameworks - Selection criteria for tools - Introduction to Selenium/WebDriver - TestNG reports - Writing automation scripts and assertions.		**CO4**
UNIT - V	**Advanced Automation and Metrics**	**Periods:09**
Advanced Automation: Page Object / BDD - Integration with CI/CD pipelines - Automation Challenges and Best Practices - Test metrics: productivity and quality metrics - Reporting and continuous testing.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Paul C. Jorgensen,"Software Testing: A Craftsman's Approach",CRC Press, 2023.
2. Rex Black,"Advanced Software Testing", Vol. 1: Guide to the ISTQB Certification,Rocky Nook, 2023
3. Glenford J. Myers, Corey Sandler, Tom Badgett,"The Art of Software Testing", Wiley, 2023.
4. Aditya Garg, "Hands-On Test Management with JIRA", Packt Publishing, 2023.
5. Patanjali Nayak, Navin Kumar,"Software Testing and Quality Assurance for Beginners", BPB Publications, 2023.

Reference Books

1. Dorothy Graham & Mark Fewster — Experiences of Test Automation: Case Studies of Software Test AutomationAddison-Wesley, 2023.
2. Ajay Kumar Jena,"Automation Testing with Selenium and Junit", BPB Publications, 2023.
3. Arnon Axelrod,"Complete Guide to Test Automation: Techniques, Practices, and Patterns for Building and Maintaining Effective Software Test Automation", Apress, 2023.
4. Rahul Shende,"Selenium WebDriver 3 Practical Guide: End-to-End Automation Testing for Web and Mobile Browsers with Selenium WebDriver", Packt Publishing, 2023.
5. Naveen Kumar T, "Mastering Software Testing with JUnit and Selenium", BPB Publications, 2023.

Web References

1. https://www.selenium.dev/documentation/test_practices/overview/
2. https://en.wikipedia.org/wiki/Selenium_(software) Wikipedia
3. http://digimat.in/nptel/courses/video/106105150/L01.html

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

PROFESSIONAL ELECTIVE VI

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23CSE824**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**KOTLIN PROGRAMMING**	**3**	**0**	**0**	**3**	25	75	100

(Commen to CSE , IT and CCE)

Prerequisite	Basic Computer Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the concept of computing from logic gates to ALU and memory hierarchy	**K2**
	CO2 Develop and analyze low-level programs using instruction sets and assembly language.	**K3**
	CO3 Describe and implement stack-based virtual machine operations and control flow.	**K3**
	CO4 Apply compiler design concepts to build syntax analyzers and generate low-level code.	**K4**
	CO5 Analyze operating system design issues including memory, I/O, and efficiency trade-offs.	**K4**

UNIT I	**KOTLIN FUNDAMENTALS**	**Periods: 09**
Variables, Expressions, and Types – Functions - Conditionals: *if* and *when.* Introduction to Classes and Objects - Enum Classes. **HANDS ON :** Student Grade Management System.		**CO1**

UNIT II	**CORE LANGUAGE CONCEPTS**	**Periods: 09**
Nulls and Null Safety - Lambdas and Function References - Collections: Lists and Sets - Collections: Maps - Receivers and Extensions. **HANDS ON :** Student Result Processing using Lambdas and Collections.		**CO2**

UNIT III	**SCOPE & ADVANCED STRUCTURES**	**Periods: 09**
Scopes and Scope Functions - Introduction to Interfaces - Introduction to Class Delegation - Abstract and Open Classes - Data Classes and Destructuring. **HANDS ON :** Employee Management System using Data Classes and Destructuring.		**CO3**

UNIT IV	**ADVANCED TYPES & GENERICS**	**Periods: 09**
Sealed Types - Handling Runtime Exceptions - Introduction to Generics - Generic Variance - Higher-Order Function Concepts. **HANDS ON :** Payment Processing System using Sealed Types using Higher-Order Functions.		**CO4**

UNIT V	**CONCURRENCY & PRACTICAL TECHNIQUES**	**Periods: 09**
Coroutine Essentials - Functional Concepts in Kotlin - Applying Kotlin in Real Projects (IDE tools & projects integration) - Best Practices and Code Structuring. **HANDS ON :** Parallel API Calls Using Kotlin Coroutines (async & await).		**CO5**

Lecture Periods: - 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Duncan McGregor, Nat Pryce, "Kotlin: An Illustrated Guide", O'Reilly Media, 2021.
2. Marcin Moskala, "Effective Kotlin", Kt. Academy, 2022.
3. Marcin Moskala, "Kotlin Coroutines: Deep Dive", Kt. Academy, 2021.
4. Venkat Subramaniam, "Programming Kotlin", Pragmatic Bookshelf, Updated Edition, 2021.
5. Alexey Soshin, "Kotlin Design Patterns and Best Practices", Packt Publishing, 2021.

Reference Books

1. Peter Sommerhoff, "Atomic Kotlin", Leanpub, 2021.
2. Neil Smyth, "Kotlin for Android App Development", Payload Media, 2020.
3. Hadi Hariri, Sebastian Aigner, "Kotlin Cookbook", O'Reilly Media, 2022.
4. Josh Skeen, David Greenhalgh, "Kotlin Programming: The Big Nerd Ranch Guide", Big Nerd Ranch Guides, Updated Edition, 2021.
5. Joseph Annuzzi Jr., Lauren Darcey, Shane Conder, "Android Application Development for Android 12 with Kotlin",

Pearson Education, 2022.

Web References

1. https://kotlinlang.org/docs/home.html
2. https://hackr.io/tutorials/learn-kotlin
3. https://developer.android.com/kotlin/campaign/learn
4. https://www.geeksforgeeks.org/kotlin/kotlin-programming-language
5. https://www.tutorialspoint.com/kotlin/index.htm

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Team Work & Self Learning	Attendanc e		
Marks	5	5	5	5	5	75	100

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*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U26CSE825**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**High Performance Computing**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to All Branches Except CSBS and FT)

Prerequisite	NIL	
Course Outcome s	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain parallel computing models and architectures	**K2**
	CO2 Illustrate parallel programming paradigms	**K2**
	CO3 Implement shared memory parallel programs	**K3**
	CO4 Develop distributed memory programs using MPI	**K3**
	CO5 Analyze GPU and heterogeneous computing models	**K4**

UNIT - I	**Introduction to Parallel Computing**	**Periods:09**
Need for HPC – Flynn's Classification – Parallel Computer Models – Memory Architectures – Shared vs Distributed Memory – Interconnection Networks – Performance Metrics – Speedup – Scalability – Amdahl's Law – Gustafson's Law – Benchmarking.		**CO1**
UNIT - II	**Parallel Programming Models**	**Periods:09**
Parallel Programming Paradigms – Data Parallelism – Task Parallelism – SPMD – SIMD – MIMD – Threads and Processes – Parallel Algorithm Design – Dependency Graphs – Synchronization – Race Condition – Deadlock – Load Balancing.		**CO2**
UNIT - III	**Shared Memory Programming**	**Periods:09**
Multithreading Concepts – POSIX Threads – Thread Creation – Mutex – Semaphores – Barriers – OpenMP Model – OpenMP Directives – Work Sharing – Scheduling – Reduction – Case Studies: Parallel Sorting and Matrix Multiplication.		**CO3**
UNIT - IV	**Distributed Memory Programming**	**Periods:09**
Message Passing Model – MPI Architecture – MPI Communication – Point-to-Point Communication – Collective Communication – Broadcast – Scatter – Gather – Reduction – Parallel Matrix Operations – Parallel Search Algorithms.		**CO4**
UNIT - V	**GPU and Heterogeneous Computing**	**Periods:09**
GPU Architecture – CUDA Programming Model – Kernel Functions – Thread Hierarchy – Memory Types – Optimization Techniques – Heterogeneous Systems – Accelerator Computing – Introduction to Cloud HPC – Case Studies..		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Sterling, T., Brodowicz, M., & Anderson, M., "High Performance Computing: Modern Systems and Practices", 2nd Edition, Elsevier, 2024.
2. Diez, O., "High-Performance Computing: Applications and Frontiers", 1st Edition, Elsevier, 2026.
3. Hager, G. & Wellein, G., "Introduction to High Performance Computing for Scientists and Engineers", 2nd Edition (Forthcoming/2026).

Reference Books

1. Kirk, D. B., & Hwu, W.-M. W., Programming Massively Parallel Processors: A Hands-On Approach, 4th Edition, Morgan Kaufmann, 2022.
2. Raghuwanshi, M., Borkar, P., Jhaveri, R., & Raut, R., Parallel and High-Performance Computing in Artificial Intelligence, 1st Edition, Taylor & Francis, 2025.
3. Dongarra, J., et al., High Performance Computing Systems and Applications, Springer, Updated Edition, 2022.
4. Sterling, T., Brodowicz, M., & Anderson, M., High Performance Computing: Modern Systems and Practices, 3rd Edition, Elsevier, 2024.
5. Pacheco, P., Parallel Programming with MPI, 2nd Edition, Morgan Kaufmann, 2021.

Web References

1. **MPI Tutorials & HPC Documentation (LLNL)** – MPI and parallel computing tutorials and guides. MPI & Parallel Computing Tutorials (LLNL)
2. **High-Performance and Parallel Computing Specialization (Coursera)** – Course covering HPC fundamentals, MPI, profiling & optimization. High-Performance & Parallel Computing (Coursera)
3. **Introduction to Parallel Programming in OpenMP (NPTEL Archive)** – Open course on shared-memory parallelism using OpenMP. OpenMP Parallel Programming Course (NPTEL)
4. **Practical High-Performance Computing (NPTEL/Class Central)** – Practical oriented HPC course with MPI/OpenMP & GPU topics. Practical HPC Course (Class Central)
5. **HPC Programming Bootcamp Documentation** – Detailed modular resources on MPI/OpenMP programming and performance. HPC Programming Bootcamp Documentation

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE826**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Quantum Information Science**	3	-	-	3	25	75	100
CSE								
Prerequisite	linear algebra, probability, and complex numbers							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand quantum mechanics principles and computation basics	**K2**
	CO2 Analyze quantum states and design quantum circuits using gates	**K3**
	CO3 Apply quantum algorithms and compare with classical algorithms	**K3**
	CO4 Explain quantum information and communication protocols	**K2**
	CO5 Apply basic quantum error correction techniques	**K3**

UNIT – I	**FOUNDATIONS OF QUANTUM INFORMATION SCIENCE**	**Periods:09**	
Overview of Classical Computing– Limitations Of Classical Computation – Efficient And Inefficient Algorithms – Church–Turing Thesis (Strong And Weak Forms) – Motivation For Quantum Computation – Information Is Physical Principle – Qubit And Quantum Information – Superposition And Quantum Measurement – Entanglement (Conceptual Understanding) – Advantages Of Quantum Computation.			**CO1**
UNIT – II	**QUANTUM INFORMATION & QUANTUM GATES**	**Periods:09**	
State of a Quantum System – Representation Of Quantum States – Bra–Ket Notation – Single Qubit Systems – Bloch Sphere Representation – Multi-Qubit Systems – Composite Systems And Tensor Products – Quantum Gates (Pauli, Hadamard, Phase, CNOT) – Universal Sets Of Quantum Gates – Quantum Circuit Model – Construction Of Basic Quantum Circuits.			**CO2**
UNIT - III	**QUANTUM ALGORITHMS**	**Periods:09**	
Quantum Parallelism – Deutsch Algorithm – Deutsch–Jozsa Algorithm – Bernstein–Vazirani Algorithm – Simon's Algorithm – Grover's Search Algorithm – Shor's Factoring Algorithm – Quantum Fourier Transform (QFT) – Comparison Of Classical And Quantum Algorithms.			**CO3**
UNIT - IV	**QUANTUM INFORMATION THEORY & COMMUNICATION**	**Periods:09**	
Classical Versus Quantum Information – Quantum States As Information Carriers – Quantum Measurement Basics – Quantum Channels And Noise (Introductory) – No-Cloning Theorem – Superdense Coding – Quantum Teleportation – Quantum Key Distribution – BB84 Protocol.			**CO4**
UNIT - V	**QUANTUM NOISE, ERROR CORRECTION AND APPLICATIONS**	**Periods:09**	
Quantum Errors And Decoherence – Sources Of Noise In Quantum Systems – Quantum Channels (Introductory) – Types Of Quantum Errors (Bit-Flip And Phase-Flip) – Basic Principles Of Quantum Error Correction – Three-Qubit Bit-Flip Code – Three-Qubit Phase-Flip Code – Concept Of Fault-Tolerant Quantum Computation – Applications And Challenges Of Quantum Computing.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Chris Bernhardt, "Quantum Computing for Everyone", MIT Press, Cambridge, 2020.
2. Jack D. Hidary, "Quantum Computing: An Applied Approach", Springer, 2nd Edition, 2021.
3. Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, Updated Edition, 2022.

Reference Books

1. Eleanor G. Rieffel, Wolfgang H. Polak, “Quantum Computing: A Gentle Introduction”, MIT Press, Updated Edition, 2021.
2. John Watrous, “The Theory of Quantum Information”, Cambridge University Press, 2021.
3. Robert S. Sutor, “Dancing with Qubits: How Quantum Computing Works and How It Can Change the World”, Packt Publishing, 2021.
4. Mark M. Wilde, “Quantum Information Theory”, Cambridge University Press, Updated Edition, 2023.

Web References

1. https://www.amrita.edu/course/quantum-information-theory
2. https://www.amrita.edu/course/quantum-computing-i
3. http://euler.phys.cmu.edu/widom/teaching/33-658/
4. https://nikhilrajput.com/tutorials/quantum-computing/
5. https://learning.quantum.ibm.com/course/utility-scale-quantum-computing/lesson-03-teleportation

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE827**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**IoT Security**	3	-	-	3	25	75	100
	CSE							
Prerequisite	Familiarize yourself with UI design							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the characteristics of IoT environments, security objectives	**K2**
	CO2 Demonstrate the use of symmetric and asymmetric encryption, lightweight cryptography	**K3**
	CO3 Design and implement IoT identity management, device onboarding, mutual authentication.	**K6**
	CO4 Analyze privacy challenges in IoT systems, and implement privacy- by-design strategies.	**K3**
	CO5 Evaluate and apply security measures in cloud-enabled and edge- integrated IoT systems	**K5**

UNIT - I	**Foundations of IoT Security**	**Periods:09**
Overview of IoT security challenges, characteristics of IoT environments, security objectives (CIA & trust), layered IoT architecture, and device constraints. IoT threat landscape including common vulnerabilities, authentication and access control issues, IoT-specific attacks, privacy risks, and secure IoT system lifecycle		**CO1**
UNIT - II	**Applied Cryptography for IoT Systems**	**Periods:09**
Cryptographic fundamentals for IoT, symmetric and asymmetric encryption, lightweight cryptography, hashing, MACs, and data integrity mechanisms. Authentication, key management, secure boot, trust anchors, and secure communication protocols such as TLS, DTLS, MQTT, and CoAP.		**CO2**
UNIT - III	**Identity, Authentication, and Access Control In IoT**	**Periods:09**
IoT identity management, device onboarding, authentication mechanisms, credentials, and mutual authentication techniques. Authorization models, access control in pub/sub systems, secure IAM infrastructure, scalability, interoperability, and cross-domain trust management.		**CO3**
UNIT - IV	**Cloud and Edge Security for IoT**	**Periods:09**
Cloud and edge integration with IoT, communication models, cloud IoT platforms, and security challenges in cloud-enabled IoT systems. Cloud security controls, enterprise IoT architectures, compliance, zero-trust models, edge intelligence, and emerging IoT security trends.		**CO4**
UNIT - V	**Blockchain Security for IoT**	**Periods:09**
Integrating Blockchain with IoT: Blockchain-enabled IoT architecture, device identity management using blockchain, secure data sharing and access control, edge/fog computing with blockchain **Security Mechanisms:** Decentralized authentication frameworks, Immutable logging and audit trails, Secure firmware updates via blockchain, Privacy preservation techniques **Use Cases:** smart homes and smart cities, supply chain monitoring, healthcare IoT security, industrial IoT (IIoT).		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Qinghao Tang, Fan Du, Internet of Things Security: Principles and Practice, Springer Singapore (Springer Nature), 1st Edition, 2021.
2. Sravani Bhattacharjee, Debabrata Sarddar, Internet of Things: Security and Privacy Issues, Wiley India, 1st Edition, 2020.
3. Samuel Greengard, The Internet of Things, MIT Press, Updated Edition, 2021.
4. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, Updated Edition, 2022.
5. Perry Lea, Internet of Things for Architects: Architecting IoT Solutions by Implementing Sensors, Communication Infrastructure, Edge Computing, Analytics, and Security, Packt Publishing, 2nd Edition, 2020.

Reference Books

1. Shancang Li, Jianying Zhou, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, Springer International Publishing, 1st Edition, 2020.
2. Fei Hu, Security and Privacy in Internet of Things (IoTs): Concepts, Techniques, and Applications, CRC Press, Updated Edition, 2021.
3. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, Updated Edition, 2021.
4. Brian Russell, Drew Van Duren, Practical Internet of Things Security, Packt Publishing, Updated Edition, 2022.
5. Pethuru Raj, Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press, Updated Edition, 2021.

Web References

1. https://www.nist.gov/iot?utm_source=chatgpt.com
2. https://owasp.org/www-project-internet-of-things/?utm_source=chatgpt.com
3. https://www.enisa.europa.eu/topics/iot-and-smart-infrastructures?utm_source=chatgpt.com
4. https://www.cisco.com/site/us/en/solutions/internet-of-things/security.html?utm_source=chatgpt.com
5. https://cloudsecurityalliance.org/research/iot/?utm_source=chatgpt.com

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VIII**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE828**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Open AI**	3	-	-	3	25	75	100
	CSE							
Prerequisite	Familiarize yourself with UI design							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the fundamentals of Generative AI, OpenAI, and Large Language Models	**K2**
	CO2 Apply prompt engineering techniques to effectively interact with LLMs.	**K3**
	CO3 Implement OpenAI APIs to develop and integrate AI-driven applications.	**K3**
	CO4 Design and evaluate real-world applications using OpenAI models.	**K4**
	CO5 Analyze ethical, safety, and future considerations of OpenAI technologies	**K4**

UNIT - I	**Fundamentals of Generative AI, OpenAI & LLMs**	**Periods:09**
Introduction to AI, ML & Deep Learning - Generative AI overview - History and mission of OpenAI - Evolution of GPT models - Transformer architecture & attention mechanisms - Tokenization and model inputs/outputs. Basics of NLP tasks: classification, generation, summarization - Metrics for language models - Challenges & limitations of LLMs		**CO1**
UNIT - II	**Prompt Engineering and Interaction with LLMs**	**Periods:09**
Introduction to prompts and prompt design - Zero/one/few-shot learning - Prompt templates and chaining - Prompt evaluation & cost optimization - Dialogue and instruction following - Common errors & mitigation (hallucinations, ambiguity) - Best practices for prompt engineering - Tools & interfaces (Playground, SDKs) - Case studies and exercises.		**CO2**
UNIT - III	**OpenAI APIs & Integration**	**Periods:09**
OpenAI API fundamentals & authentication - Model selection & parameters - Text generation, embeddings & semantic search - Error handling and rate limits - Building simple applications (Python) - Using SDKs (Python/Node) - Chatbot backends (Flask/Django/Node) - Logging, monitoring, costs - Mini API projects.		**CO3**
UNIT - IV	**Real-World Applications & Systems**	**Periods:09**
Conversational agents and customer support systems - Summarization, translation & text analytics - Code generation & software assistance - LLMs in research & productivity tools - Retrieval-Augmented Generation (RAG) techniques - Agents and automation pipelines - Integrating with UI/UX frontends - Case studies		**CO4**
UNIT - V	**Responsible AI, Safety & Future Trends**	**Periods:09**
Ethical considerations & fairness - Bias, toxicity, hallucinations - Model evaluation & robustness - Data privacy & security - Regulatory frameworks and compliance - Explainable AI (XAI) concepts - Multimodal models and AI agents - Future trends and research directions.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Apurv Sibal**,**Hands-On Prompt Engineering: Learning to Program ChatGPT Using OpenAI APIs, Jhon Wiley & Sons, Inc., First Edition, 2025.
2. Parmy Olson, Supremacy: AI, ChatGPT and the Race That Will Change the World, St. Martin's Press, 2024.
3. James Phoenix and Mike Taylor, Practical Generative AI with ChatGPT – Second Edition, O'Reilly Media, 2024.
4. Vlad Iliescu, Modern Generative AI with ChatGPT and OpenAI Models, Packt Publishing, 2023
5. James Phoenix and Mike Taylor, Prompt Engineering for Generative AI, O'Reilly Media, 2023.

Reference Books

1. Karen Hao, *Empire of AI: Dreams and Nightmares in Sam Altman's OpenAI*, First Edition, 2025.
2. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson Education, 2021.
3. David Foster, *Generative Deep Learning*, O'Reilly Media, Second Edition,2023.
4. Ben Auffarth, *Generative AI with LangChain*, O'Reilly Media, Second Edition, 2024.
5. Paul Iusztin and Maxime Labonne, *LLM Engineer's Handbook: Master the Art of Engineering Large Language Models*

from Concept to Production,First Edition, 2024.

Web References

1. OpenAI API Documentation — *(platform.openai.com/docs)*
2. OpenAI Cookbook (GitHub).
3. GenAI Prep (GitHub) GitHub
4. Prompt Engineering Guide (OpenAI & community) LLM Engineer's Handbook: Master the Art of Engineering Large Language Models from Concept to Production
5. Udemy — ChatGPT & Generative AI Complete Guide

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examinati on (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Head of the Department

Dr. N. DANAPAQUIAME
Professor & Head
Department of Computer Science of Engineering
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry - 605 107.