SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B. TECH. INFORMATION TECHNOLOGY

ACADEMIC REGULATIONS 2023
(R-2023)

CURRICULUM & SYLLABI

COLLEGE VISION AND MISSION

Vision

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

Mission

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

DEPARTMENT VISION AND MISSION

Vision

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

Mission

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

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

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

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

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

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

PO2: Problem analysis:

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

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

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

PO5: Modern tool usage:

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

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

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

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Fortify

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

PEO2: Equip

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

PEO3: Endow

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

PEO4: Conventional

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

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO1: Establishment of Mathematical and computer systems concepts

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

PSO2: Establishment of applications and information concepts

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

PSO3: Establishment of Business, Technological concepts

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

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	Course Category	Breakdown of Credits
1.	Humanities, Social Sciences and 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 Elective Courses (PE)	**18**
6.	Open Electives Courses (PE)	**9**
7.	Project Work and Internship (PA)	**13**
8.	Ability Enhancement Courses (AEC*)	-
9.	Mandatory Courses (MC*)	-
	Total	**170**

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

HONOURS/MINOR DEGREE PROGRAMME:

Sl.No	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.	Ability Enhancement Courses (AEC*)	-	-	-	-	-	-	-	-	-
10.	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	-
Total		**21**	**23**	**23**	**23**	**21**	**22**	**20**	**17**	**170**

The student is permitted to opt for earning an *honours/minor degree* in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an honours/minor 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 - III**

SEMESTER – I										
Sl. No.	Course Code	Course Title	Cate-gory	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	U23ITT101	IT Essentials	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	U23ITC1XX	Certification Course - I **	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23ITM101	Induction Programme	MC	2 Weeks			-	-	-	-
							21	425	575	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Cate-gory	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	U23ITC2XX	Certification Course - II **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23ITM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							23	575	625	1200

SEMESTER – III										
Sl. No.	Course Code	Course Title	Cate-gory	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	U23CSTC04	Database Management Systems	PC	3	0	0	3	25	75	100
3	U23CSTC05	Operating Systems	PC	3	0	0	3	25	75	100
4	U23ITT302	Automata Languages and Computation	PC	3	0	0	3	25	75	100
5	U23ITT303	Software Engineering and Project Management	PC	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ITB301	Microcontrollers and its Interfacing	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	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	U23ITC3XX	Certification Course - III **	AEC	0	0	4	-	100	-	100
12	U23ITS301	Skill Enhancement Course - I *	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23ITM303	Climate Change	MC	2	0	0	-	100	-	100
							23	675	625	1300

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

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Cate-gory	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	U23ITT404	Algorithms Design and Analysis	PC	3	0	0	3	25	75	100
4	U23ITT405	Data Communication and Computer Networks	PC	3	0	0	3	25	75	100
5	U23ITE4XX	Professional Elective I #	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ITB402	Internet 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	U23ITP401	Algorithms Design and Analysis Laboratory	PC	0	0	2	1	50	50	100
10	U23ITP402	Data Communication and Computer Networks Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23ITC4XX	Certification Course - IV **	AEC	0	0	4	-	100	-	100
12	U23ITS402	Skill Enhancement Course - II *	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23ITM404	Right to Information and Good Governance	MC	2	0	0	-	100	-	100
							23	675	625	1300

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

SEMESTER – V											
Sl. No.	Course Code	Course Title	Cate-gory	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory											
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23CSTC06	Artificial Intelligence	PC	3	0	0	3	25	75	100
3	U23ITT506	Information and Network Security	PC	3	0	0	3	25	75	100
4	U23ITT507	Data Analytics	PC	3	0	0	3	25	75	100
5	U23ITE5XX	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	U23CSPC05	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
8	U23ITP503	Information and Network Security Laboratory	PC	0	0	2	1	50	50	100
9	U23ITP504	Data Analytics Laboratory	PC	0	0	2	1	50	50	100
Project Work											
10	U23ITW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course											
11	U23ITC5XX	Certification Course - V **	AEC	0	0	4	-	100	-	100
Mandatory Course											
12	U23ITM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

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

SEMESTER – VI										
Sl. No.	Course Code	Course Title	Cate-gory	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITTC03	Machine Learning	PC	3	0	0	3	25	75	100
2	U23ITT608	Mobile Application Development	PC	3	0	0	3	25	75	100
3	U23ITT609	Blockchain Technology	PC	3	0	0	3	25	75	100
4	U23ITE6XX	Professional Elective III #	PE	3	0	0	3	25	75	100
5	U23XXOCXX	Open Elective II $	OE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ITB603	IoT Programming	PC	2	0	2	3	50	50	100
Practical										
7	U23ITPC03	Machine Learning Laboratory	PC	0	0	2	1	50	50	100
8	U23ITP605	Mobile Application Development Laboratory	PC	0	0	2	1	50	50	100
9	U23ITP606	Blockchain Technology Laboratory	PC	0	0	2	1	50	50	100
Project										
10	U23ITW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23ITC6XX	Certification Course - VI **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23ITM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	625	575	1200

SEMESTER – VII										
Sl. No.	Course Code	Course Title	Cate-gory	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITT710	Neural Network and Deep Learning	PC	3	0	0	3	25	75	100
2	U23ITT711	Cloud Computing and Virtualization	PC	3	0	0	3	25	75	100
3	U23ITT712	IT Operations and Management	PC	3	0	0	3	25	75	100
4	U23ITE7XX	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	U23ITP707	Neural Network and Deep Learning Laboratory	PC	0	0	2	1	50	50	100
7	U23ITP708	Cloud Computing and Virtualization Laboratory	PC	0	0	2	1	50	50	100
Project										
8	U23ITW703	Project Phase - I	PA	0	0	4	2	50	50	100
9	U23ITW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Cate-gory	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	U23ITE8XX	Professional Elective V #	PE	3	0	0	3	25	75	100
3	U23ITE8XX	Professional Elective VI #	PE	3	0	0	3	25	75	100
Project										
8	U23ITW805	Project Phase - II	PA	0	0	16	8	50	100	150
							17	125	325	450

PROFESSIONAL ELECTIVE COURSES (18 CREDITS)

Professional Elective - I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE401	Object Oriented Analysis and Design
2	U23ITE402	Web Application Development
3	U23ITE403	Information Coding Techniques
4	U23ITE404	Agile Methodologies
5	U23ITE405	Data Warehousing and Data Mining
Professional Elective - II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE506	Theory of Compiler Design
2	U23ITE507	Information Visualization
3	U23ITE508	Software Testing
4	U23ITE509	Automation Techniques and Tools
5	U23ITE510	Parallel and Distributed Computing
Professional Elective - III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE611	Quantum Computing
2	U23ITE612	Full Stack Development
3	U23ITE613	Edge and Fog Computing
4	U23ITEC01	Software Defined Networks
5	U23ITEC02	Natural Language Processing
Professional Elective - IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE714	Six Sigma
2	U23ITE715	Cyber Security and Forensics
3	U23ECEC01	Digital Image Processing
4	U23ITE716	Intrusion Detection System
5	U23ITEC03	Robotic Process Automation
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE817	Cloud Services Management
2	U23ITE818	Bio-Inspired Computing
3	U23ITE819	Storage Technologies
4	U23ITEC04	Human Computer Interaction
5	U23ITEC05	Augmented Reality and Virtual Reality
Professional Elective - VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE820	Green Computing
2	U23ITE821	Generative AI
3	U23ITE822	Game Development
4	U23ITE823	E-Commerce
5	U23ECEC02	Wireless Sensor Networks

DEPARTMENT OF IT

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective (Offered in Semester V/VI)				
1	U23HSOC01	Intellectual Property Rights	MBA	Common to all Branches
2	U23HSOC02	New Product Development	MBA	
3	U23HSOC03	Finance for Engineers	MBA	
4	U23HSOC04	Economics for Engineers	MBA	
5	U23HSOC05	Marketing Management	MBA	

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective (Offered in Semester V/VI)				
1	U23ITOC01	Database System: Design & Development	IT	EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS
2	U23ITOC02	Computer Hardware and Troubleshooting	IT	EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS
Open Elective (Offered in Semester VII)				
1	U23ITOC03	Essentials of Data Science	IT	EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS
2	U23ITOC04	Big Data Technologies	IT	EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS

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Puducherry – 605 107
TRAIN LAB ACADEMY

The following courses are provided by Trainlab Academy for Regulation 2023:

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

DineshKumar A
Branch Manager
Trainlab Academy

Dr.A. Vijayalakshmi
Professor and Head,
Department of BME
Trainlab – Coordinator

Dr J. Madhusudanan
Professor and Head,
Department of AI & DS &
Trainlab – Coordinator

Dean Academic (Core)
(Dr. Arivalagar.AA)

Dean Academic (Circuit)
(Dr.S. Anbumalar)

Director Cum Principal
(Dr.V.S.K. Venkatachalapathy)

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 Eigenvectors 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.

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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/

COs/POs/PSOs Mapping

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**	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 measuresand 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

COs/POs/PSOs Mapping

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**	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 - NumberSystem – 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. YashvantKanetkar, "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. VikasVerma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, "Programming in C", Second Edition, Oxford University Press, 2011.

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	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	**Information Technology**			Programme: **B.Tech.**				
Semester	**I**			Course Category : **PC**			*End Semester Exam Type: **TE**	
Course Code	**U23ITT101**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**IT Essentials**			**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	Classify the types and fundamentals of servers	**K2**
	CO2	Develop scripting using PHP	**K2**
	CO3	Explain the basics of networking and Internet	**K2**
	CO4	Summarize the fundamentals and components of mobile communication	**K2**
	CO5	Explain the architectures and features of current trends in information Technology	**K2**

UNIT- I	**Web Essentials**	**Periods: 9**	
Website Essentials: Client-Server Paradigm - Browser Fundamentals - Authoring tools - Types of Servers: Application Server - Web Server - Database Server			**CO1**
UNIT- II	**Scripting Essentials**	**Periods: 9**	
Need for Scripting languages - Types of scripting languages - Working Principle - Client-Side scripting - Server-Side scripting - PHP Variables and Constants - Flow Control and Looping - Functions - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts			**CO2**
UNIT- III	**Telecommunications and Networking Essentials**	**Periods: 9**	
Fundamental computer network concepts - Communication media and channels - Ethernet - TCP/IP - Wireless Local Area Network - WiFi - Network Routing - Switching - Network communication			**CO3**
UNIT- IV	**E-Commerce and M-Commerce Essentials**	**Periods: 9**	
Basic concepts - Types of E-Commerce - B2C Electronic commerce - B2B Electronic commerce - Ethical and legal issues - M-Commerce concept - M-Commerce applications.			**CO4**
UNIT- V	**Information Systems Essentials**	**Periods: 9**	
Transaction Processing Systems - Functional area Information systems - Information system for marketing and management - Information system for Human Resource Management - ERP planning systems - ERP system for business process.			**CO5**

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

Text Books

1. R. Kelly Rainer, Brad Prince, Introduction to Information Systems, Wiley, 9th Edition, 2021.
2. Joel Murach and Ray Harris, murach's PHP and MySQL, Murach, 4th Edition 2022.
3. P. T. Joseph, E-Commerce: An Indian Perspective , 6th Edition , 2019.

Reference Books

1. Brian.K.Williams, Stacey.C.Sawyer using Information Technology - A Practical Introduction to Computers and Communication, Tata McGraw Hill Publishing Company Ltd., New Delhi, 11th Education, 2015.
2. V.Rajaraman, Introduction to Information Technology, PHI Learning, Second Edition, 2013.
3. Introduction to Information Technology, Pearson Education, ITL Education solutions Ltd., 2012.
4. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, Third Edition, O'REILLY, 2014.
5. Pelin Aksoy, Laura DeNardis, Introduction to Information Technology, Cengage Learning, Fourth Indian Reprint 2010.
6. IT essentials Companion Guide v7, Cisco Networking Academy,2020.

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2. https://www.computer-pdf.com/tutorials-it-essentials
3. https://www.ebooknetworking.net/ebooks/it-essentials.html
4. https://edurev.in/p/68703-/IT-Essentials

* 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	2	-	-	-	-	1	-	-	3	3	3
2	2	2	2	2	2	-	-	-	-	1	-	-	3	3	3
3	2	2	2	2	2	-	-	-	-	1	-	-	3	3	3
4	2	2	2	2	2	-	-	-	-	1	-	-	3	3	3
5	2	2	2	2	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	**Information Technology**	Programme: **B. Tech.**						
Semester	**I**	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 in the 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 printPublisher, 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.

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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

COs/POs/PSOs Mapping

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	5	5	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 Code: **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		40
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**

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I**	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

COs/POs/PSOs Mapping

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**	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/

COs/POs/PSOs Mapping

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**	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.

Web References

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

COs/POs/PSOs Mapping

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 practicalclasses			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	**I**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23ITC1XX**	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 coursein 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	**Information Technology**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **MC**			End Semester Exam Type: -			
Course Code	**U23ITM101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Induction Programme**	2 Weeks			Non-Credit	-	-	-
Prerequisite	**-**							

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 vast secular nation	**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 - Prognostic test on 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 parties) - 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, சிறபப்பு சஙொறச் சபெொழிவு - தமிழர் மரபு மற்றும் தமிழர் சதொழில்நுட்பம்.		**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",Roja muthiah research publishers, 1st Edition 2019
9. தமிழக வரலொறு - மகக்களஙொம் பண் பொடுமம், பிளம்ளள, கக. கக. , சஙனம்ளன : உலகதம் தமிழெொரெொயம்ஙசிநிறுவனம் , 2002.
10. கணினித்தமிழ் - முளனவர் இல.சுந்தரம், விகடன் பிரசுரம்.
11. கீழடி - ளவளக நதிகக்களரயிலம் ஙமங்க களல நகர நொகரிகமம், தமிழக சதொலம்லியலம் ⊢ளற

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

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 ofintervals — 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 ofderivatives 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 DifferentialEquations 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 1st 2017.
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.

Web References

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/

COs/POs/PSOs Mapping

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	**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 anduses of various batteries.	**K2**
	CO6 Understand the specific operating condition under which corrosion occurs andsuggest 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, CO2 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 usinghard 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 H2 -O2 fuel cell-applications.		**CO5**
UNIT - VI	**Corrosion**	**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 Chemistryll”, 17th edition. Dhanpat Rai Pub. Co., New Delhi, (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, DhanpatRai Publishing Company. 2022
4. Mars Fontana “Corrosion Engineering”, July 2017
5. JinaRedlin, “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

COs/POs/PSOs Mapping

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**	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**	**-**	**-**	**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 UsingBranches 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 – Introductionto 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

COs/POs/PSOs Mapping

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	2	3	3	2	3	-	-	-	-	-	-	-	2	3	3
5	3	3	3	2	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**	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**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to All Branches)

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 Searchand 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/

COs/POs/PSOs Mapping

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
								-	-	-	-	-	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**	**-**	**-**	**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 - Shiftregisters – 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, HardwBlired 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, Zvonko Vranesic and Safwat Zaky, “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/

COs/POs/PSOs Mapping

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 Code: **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, In plant 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**

LecturePeriods: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=UOceysteIjo

COs/POs/PSOs Mapping

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 50marks)	

Practical

Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		40
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

Department	**Mechanical Engineering**	Programme: **B.Tech.**						
Semester	**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 printedenclosure.
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

COs/POs/PSOs Mapping

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**	**-**	**-**	**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 shouldreturn 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.

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.

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

COs/POs/PSOs Mapping

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**	**-**	**-**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches)

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 Experiments:

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. 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

COs/POs/PSOs Mapping

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 ofpractical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**Second**	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**	**-**	**-**	**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 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 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 ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, 2012.
3. John F.Wakerly,"Digital Design Principles and Practices",Pearson Education,Fourth Edition,2008.
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/

COs/POs/PSOs Mapping

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	**Information Technology**	Programme: **B.Tech.**						
Semester	**I**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23ITC2XX**	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **MC**			End Semester Exam Type: -			
Course Code	**U23ITM202**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Sports Yoga and NSS**	-	-	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**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 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

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 Outcomes	**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

COs/POs/PSOs Mapping

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

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	**U23CSTC04**		Periods / Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Database Management Systems**		**3**	**0**	**0**	**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 - 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, 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/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
2	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
3	3	2	1	1	-	-	-	-	-	-	-	-	3	3	2
4	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
5	3	2	1	1	3	-	-	-	-	-	-	-	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 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	IT Essentials, Digital Design and System Architecture									
Course Outcomes	**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	**Information Technology**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: PC			*End Semester Exam Type:**TE**	
Course Code	**U23ITT302**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**AUTOMATA LANGUAGES AND COMPUTATION**			**3**	**-**	**-**	**3**	**25**	**75**	**100**
				IT						
Prerequisite	Discrete Mathematics, Design and Analysis of Algorithms									
Course Outcomes	**On completion of the course, the students will be able to**								**BT Mapping (Highest Level)**	
	CO1	Understand and construct various types of finite automata.							**K3**	
	CO2	Write regular expressions for given pattern and convert it to automata							**K3**	
	CO3	Convert push down Automata to context free grammar and context free grammar to push down automata							**K4**	
	CO4	Design Turing Machine to accept regular languages and perform computations							**K4**	
	CO5	Explore the un-decidability and NP-class problems.							**K4**	

Unit-I	**Automata and Regular Expressions**	**Periods:9**
Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – conversion of NFA into DFA. Finite Automata with Epsilon transitions – Equivalence of NFAs with and without ε-moves – conversion of NFA ε-moves into NFA. Finite Automata with output – Mealy and Moore machines		**CO1**
Unit-II	**Regular Expressions and Languages**	**Periods:9**
Regular expression – Regular Languages - Equivalence of Finite Automata and regular expressions – Conversion of regular expression into NFA ε-moves - Conversion of regular expression into DFA (Direct and indirect method). Minimization of DFAs. Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages.		**CO2**
Unit-III	**Context Free Grammar and Push Down Automata**	**Periods:9**
Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions - Languages of pushdown automata – Equivalence of pushdown automata and CFG – conversion of CFG to PDA – PDA to CFG.		**CO3**
Unit-IV	**Normal Forms and Turing Machines**	**Periods:9**
Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF). Turing Machine : Basic model – definition and representation – Instantaneous Description – Turing Machine for accepting Regular languages – TM as Computer of Integer functions(Addition & subtraction)		**CO4**
Unit-V	**Undecidability**	**Periods:9**
Undecidable Problems –PCP-MPCP– Classes of problems: P, NP,NP complete and NP hard – NP Complete problems - 3-CNF SAT problem – Clique Problem - Node cover Problem.		**CO5**

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

Text Books

1. John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.
2. Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.

Reference Books

1. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016
2. Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015
3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006

Web References

1. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
2. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
3. https://www.javatpoint.com/automata-tutorial
4. https://www.gatevidyalay.com/tag/theory-of-computation-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	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	**Information Technology**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: PC			*End Semester Exam Type:**TE**	
Course Code	**U23ITT303**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Software Engineering and Project Management**			**3**	**-**	**-**	**3**	**25**	**75**	**100**
				IT						
Prerequisite	Basic Computer Knowledge, IT Essentials									
Course Outcomes	**On completion of the course, the students will be able to**								**BT Mapping (Highest Level)**	
	CO1	Explain various process models software project development							**K2**	
	CO2	Develop Software Requirement Specification for a given application							**K3**	
	CO3	Prepare Software design for an application							**K3**	
	CO4	Discuss various software testing methods							**K2**	
	CO5	Describe various aspects of software project management							**K2**	

Unit-I	**The Software Process**	**Periods:9**	
Introduction to Software Engineering - Ethics in Software Engineering - Software Process - Software Engineering Practice - Software Process Models: Waterfall Models - Incremental - Evolutionary and Unified Process model - Comparison Study of Software Process Models - Agile Process and Models			**CO1**
Unit-II	**Requirements Analysis and Specification**	**Periods:9**	
Requirement Gathering and Analysis - Software Requirement Specification: Users of SRS - Characteristics of Good & Bad SRS - Important Categories of Customer Requirements - Documenting Functional Requirements - Traceability - Organization of SRS - Techniques for Representing Complex Logics - Feasibility Study - Case Study: Software Requirements Specification (SRS) for Application Project.			**CO2**
Unit-III	**Software Design**	**Periods:9**	
Overview of the Design Process - Characteristics of Good Software Design - Cohesion and Coupling - Layered Arrangements of Modules - Approaches to Software Design - Function Oriented Software Design: Data Flow Diagram - Transformation of DFD model into structure chart - Object Modelling Using UML: UML Diagrams - Use Case Model - Class diagrams - Interaction Diagrams - Activities Diagrams - State Chart Diagram			**CO3**
Unit-IV	**Software Coding and Testing**	**Periods:9**	
Coding, Code Review - Software Documentation - Testing - Unit Testing - Black-box testing - White-box testing - Debugging - Program Analysis Tools - Integration Testing - Testing Object - Oriented Programs - System Testing			**CO4**
Unit-V	**Project Management**	**Periods:9**	
Software Project Management Complexities - Responsibilities of a Software Project Manager - Project Planning - Metrics for Project Size Estimation - Project Estimation Techniques - Empirical Estimation Techniques - COCOMO Estimation Technique - Staffing Estimation - Scheduling - Organization and Team Structures - Staffing - Risk Management - Configuration Management			**CO5**

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

Text Books

1. Roger Pressman, Bruce Maxim, “Software Engineering - A Practitioner’s Approach”, 9th Edition, McGraw Hill International Edition, 2019
2. Rajib Mall, “Fundamentals of Software Engineering”, Fifth Edition, PHI Learning Private Limited, 2018
3. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Education Asia, 2016

Reference Books

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

Web References

1.https://archive.nptel.ac.in/courses/106/105/106105182/
2.https://www.coursera.org/learn/introduction-to-software-engineering
3.https://www.udemy.com/course/software-engineering-101/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
2	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
3	3	2	1	1	-	-	-	-	-	-	-	-	3	3	2
4	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
5	3	2	1	1	3	-	-	-	-	-	-	-	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	**Information Technology**			Programme: **B.Tech.**					
Semester	**III**			Course Category Code: **PC**			*End Semester Exam Type: **TE**		
Course Code	**U23ITB301**	Periods / Week			Credit	Maximum Marks			
		L	T	P	C	CAM	ESE	TM	
Course Name	**Microcontrollers and Its Interfacing**	**2**	**0**	**2**	**3**	**50**	**50**	**100**	
	IT								
Prerequisite	Digital Design and System Architecture								

	On completion of the course, the students will be able to		**BT Mapping (Highest Level)**
Course Outcomes	**CO1**	Distinguish the basics of microprocessor and describe the 8051 Microcontroller architecture and its programming.	**K2**
	CO2	Explain the concepts of PIC16F Microcontroller architecture and its programming.	**K2**
	CO3	To understand the memory and I/O device interfacing of 8051 and PIC16F Microcontroller.	**K2**
	CO4	Use 8051 Microcontroller for Peripheral Interfacing.	**K3**
	CO5	Use PIC16F Microcontroller for Peripheral Interfacing.	**K3**

Unit- I	**Basics of Microprocessor and 8051 Microcontroller**	**Periods: 10**	
Basic Introduction of Microprocessor, Microcomputers and Microcontrollers, Intel 8051 Microcontroller: Architecture-Pin configuration-stack and memory organization-Addressing Modes-Instruction set-Ports-Timers.			**CO1**
Unit- II	**Introduction to PIC 16F Microcontroller**	**Periods: 10**	
Overview of PIC Family-PIC 16F microcontrollers: History and features –Architecture – memory organization – addressing modes – Special Function Registers-Status Register-Pin Diagram- instruction set – PIC programming – Data Conversion, RAM & ROM Allocation, on chip peripherals: I/O port			**CO2**
Unit- III	**Programming and Interfacing of Intel 8051 and PIC16F**	**Periods: 10**	
Intel 8051 Programming and interfacing: Assembly Language Programming on I/O Interfacing: LCD, Keyboard, Stepper Motor-7 Segment LED Display. **PIC16F Programming and Interfacing**: PIC to LCD – Keyboard– parallel and serial ADC, DAC– Stepper motor interfacing			**CO3**
Unit- IV	**Peripheral Interfacing and it ALP of 8051 Microcontroller**	**Periods: 15**	
1. Develop and Execute an ALP on Arithmetic operations using INTEL 8051 Microcontroller. 2. Develop and Execute an ALP on LED Blinking using INTEL 8051 Microcontroller. 3. Develop and Execute an ALP on Logical and Compare instructions using 8051 Microcontroller. 4. Develop and Execute an ALP on BCD and ASCII code conversion using 8051 Microcontroller. 5. Develop and Execute Programs on branching instructions and Looping using PIC Microcontroller. 6. Interface LCD with 8051 Microcontroller. 7. Interface Keyboard with 8051 Microcontroller.			**CO4**
Unit- V	**Peripheral Interfacing and it Programming of PIC 16F**	**Periods: 15**	
1. Develop and Execute an ALP on Programs on Arithmetic instructions using PIC16F Microcontroller 2. Develop and Execute Programs on Logical and Compare instructions using PIC16F Microcontroller. 3. Develop and Execute Programs on BCD and ASCII code conversion using PIC16F Microcontroller. 4. Develop and Execute Programs on branching instructions and Looping using PIC16F Microcontroller. 5. Interface LCD with PIC16F Microcontroller. 6. Interface Keyboard with PIC16F Microcontroller. 7. Interface ADC/DAC with PIC16F Microcontroller. 8. Interface stepper motor with PIC16F Microcontroller.			**CO5**

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

Text Books

1. Kenneth J.Ayala," 8051 Microcontroller Architecture, Programming and Application", PHI Learning New Delhi, July 2004, ISBN: 978-1401861582
2. Muhammad Ali Mazidi *,"8051 Microcontroller and Embedded. Systems*. Using Assembly and C", Pearson, Second Edition.
3. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ,"PIC Microcontroller and Embedded Systems using Assembly and C for PIC18", Pearson Education 2008 .
4. John Iovine, "PIC Microcontroller Project Book", McGraw Hill 2000
5. Gaonkar R. S.,"PIC Microcontroller",Penram International Publishing (India) Pvt. Ltd.

Reference Books

1. Verle Milan,"PIC Microcontrollers – Programming in C",Mikroelektronika, 1st Edition, 2009.
2. Matic Nebojsa,"PIC Microcontroller",Mikroelektronika, 1st Edition 2008
3. Rajkamal,"Microcontrollers: Architecture, Programming, Interfacing and System Design", Second Edition,January 2011. ISBN-13: 978-8131759905
4. MATHUR, SUNIL , Panda Jeebananda,"MICROPROCESSORS AND MICROCONTROLLERS", PHI Learning, New Delhi,2016.
5. Krishna Kant,"MICROPROCESSORS AND MICROCONTROLLERS: Architecture Programming and system design",PHI Learning,New Delhi,2016

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1. http://www.faqs.org/faqs/microcontroller-faq/8051/
2. https://archive.nptel.ac.in/courses/108/105/108105102/
3. http://en.wikipedia.org/wiki/PIC_microcontroller
4. www.microchip.com/pic/
5. www.engineersgarage.com/articles/pic-microcontroller-tutorial
6. www.pic18-simulator-ide.software.informer.com
7. www.best-microcontroller-projects.com/pic-microcontroller.html

COs/POs/PSOs Mapping

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

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*		75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10	30	*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: **LE**			
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 Outcomes	**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) SubmittingVideo 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 thetopic 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: WritingConversation 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 DiscussionPractice - 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, SpottingErrors - 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 UniversityPress, 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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

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 Outcomes	**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: -	**Tutorial Periods: -**	**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.

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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

* 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	-	-	-	-	-	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

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	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 (HighestLevel)**
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	**III**	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**
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	**Information Technology**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **MC**			*End Semester Exam Type: **-**			
Course Code	**U23ITM303**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CLIMATE CHANGE**	**2**	**0**	**0**	**-**	**100**	**-**	**100**
		IT						
Prerequisite	-							

Course Outcomes	**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-Intergovernment 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)- Internationaland 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. J. David Neelin, “Climate change and climate modelling”, Cambridge University press, 2011.
3. Robin Moilveen, “Fundamentals of weather and climate”, Oxford University Press, 2nd Edition, 2010.
4. Andrew Dessler and Edward A. Parson, “The Science and Politics of Global Climate Change”, Cambridge Universitypress, 3rd Edition, 2019.
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. JasonSmerdon, “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

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 Outcomes	**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**

Lecture Periods: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, 1st 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, 2nd 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 Publishing Company, Pvt. Ltd., New Delhi, 5th Edition, 2003.

Web References

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 Outcomes	**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 toObjects 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 TeaPress, 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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PC**				*End Semester Exam Type: **TE**		
Course Code	**U23ITT404**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Algorithms Design and Analysis**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	**Programming and Data Structures**							

Course Outcomes	**On completion of the course, the students will be able to**		**BT Mapping (Highest Level)**
	CO1	Analyze the efficiency of algorithms using various frameworks	**K4**
	CO2	Analyze divide and conquer and greedy techniques to solve problems.	**K4**
	CO3	Use dynamic programming techniques to solve problems	**K3**
	CO4	Apply backtracking method for solving problems.	**K3**
	CO5	Apply branch and bound technique for solving problems.	**K3**

Unit- I	**Introduction**	**Periods: 09**	
Algorithm notation - Algorithm analysis: Time and space complexity - Asymptotic Notations and itsproperties Best case, Worst case and average case analysis – Recurrence relation: substitution method– Lower bounds – searching: linear search,Fibonacci search and Interpolation Search, Pattern search:The naïve string-matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm.			**CO1**
Unit- II	**Divide And Conquer and Greedy Approaches**	**Periods: 09**	
Divide and Conquer: General method - Binary search - Finding maximum and minimum - Merge sort -Quick sort;Greedy Technique: General method – Fractional knapsack problem - Optimal Merge pattern–Huffman Trees Minimum spanning tree: Kruskal's and Prim's algorithm - Shortest path: Dijkstra'salgorithm			**CO2**
Unit- III	**Dynamic Programming**	**Periods: 09**	
General Method - Elements of dynamic programming — Matrix-chain multiplication - Multi stage graph — Travelling salesman problem — 0/1 knapsack problem - Optimal Binary Search Trees, Shortest path:Bellman-Ford algorithm - Floyd - Warshall algorithm			**CO3**
Unit- IV	**Backtracking**	**Periods: 09**	
General Method: N-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycle– KnapsackProblem.			**CO4**
Unit- V	**Branch and Bound**	**Periods: 09**	
Introduction – Bounding - FIFO Branch and Bound - Least Cost (LC) Search Branch and Found –15-Puzzle Problem – Travelling Salesman Problem - 0/1 Knapsack Problem –.Assignment problem. Introduction to NP-Hard and NP-Completeness.			**CO5**

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

Text Books

1. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition,Galgotia Publications, Pvt. Ltd., 2008.
3. Thomas H. Corman, Charles E. Leiserson, Ronald and L. Rivest, Introduction to Algorithms, Second Edition,Prentice-Hall of India, 2003

Reference Books

1. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, PearsonEducation, 2006.

Web References

1. https://archive.nptel.ac.in/courses/106/106/106106131/
2. https://nptel.ac.in/courses/106102064
3. https://onlinecourses.nptel.ac.in/noc23_cs88/preview
4. https://archive.nptel.ac.in/courses/106/106/106106127/
5. http://www.digimat.in/nptel/courses/video/106106145/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	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
2	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
3	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
4	3	3	3	2	-	-	-	-	-	-	-	2	3	2	-
5	3	3	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PC**				End Semester Exam Type: **TE**		
Course Code	**U23ITT405**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Communication and Computer Networks**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Digital Design and System Architecture**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand basic concepts of data communication and networking.	**K1**
	CO2 Explain the functioning of various network protocols.	**K2**
	CO3 Design simple data communication systems.	**K2**
	CO4 Analyze network architectures and protocols.	**K2**
	CO5 Design and configure basic networks and troubleshoot common networking issues.	**K1**

Unit- I	**Fundamentals of Data Communication**	**Periods: 09**
Process of data communication and its components: Transmitter, Receiver, Medium, Message, Protocol – Protocols, Standards, Standard organizations – Bandwidth, Data Transmission Rate, Baud Rate and Bits per second – Modes of Communication (Simplex, Half duplex, Full Duplex) – Analog Signal and Digital Signal, Analog and Digital transmission: Analog To Digital, Digital to Analog Conversion – Classification of Network – Network Architecture.		**CO1**

Unit- II	**Transmission Media and Switching**	**Periods: 09**
Communication Media: Guided Transmission Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable – Unguided Transmission Media Radio Waves, Microwaves, Infrared, Satellite – Line-of-Sight transmission Point to point, Broadca – Multiplexing: Frequency – Division Multiplexing Time-Division Multiplexing – Switching: Circuit-switched networks, packet switching networks.		**CO2**

Unit- III	**Error Detection, Correction and Wireless Communication**	**Periods: 09**
Types of Errors: Single Bit Error and Burst Error, Redundancy – Error Detection: LRC, VRC, CRC – Forward 3.3 Error Correction : Forward error Correction – IEEE standards: 802.1, 802.2, 802.3, 802.4,802.5 – Wireless LANs – Bluetooth Architecture – Mobile Generations.		**CO3**

Unit- IV	**Network Topologies and Network Devices**	**Periods: 09**
Network Topologies: Introduction, Definition, Selection, Criteria, Types of Topology – i) Bus ii) Ring iii) Star iv) Mesh v) Tree vi) Hybrid – Network Connecting Devices: Hub, Switch, Router, Repeater, Bridge, Gateway, Modem, Wireless infrastructure Components		**CO4**

Unit- V	**Reference Models**	**Periods: 09**
OSI Reference Model – TCP/IP Model – Introduction of IP – Various types of addressing - IPV4 and IPV6 – OSI and TCP/IP Network Model.		**CO5**

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

Text Books

1. Andrew S Tanenbaum, Computer Networks, Pearson Education, 6th Edition, 2022.
2. Behrouz A. Forouzan, Data Communications and Networking, TMH, 5th Edition, 2012
3. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, TMH, 6th Edition, 2022

Reference Books

1. James F.Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet., Pearson Education, 7th Edition, 2017
2. William Stallings, Data and Computer Communications, Pearson Education, 10th Edition, 2014
3. Prakash C. Gupta, Data Communications and Computer Networks, Kindle Edition, 2nd Edition, 2013
4. S. Keshav, An Engineering Approach to Computer Networks, Pearson Education, 3rd Edition, 2008
5. Alberto Leon-Garcia, Communication Networks – Fundamental Concepts and Key Architectures, TMH, 2nd Edition, 2017

Web References

1. https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/
2. https://archive.nptel.ac.in/courses/106/105/106105082/
3. https://archive.nptel.ac.in/courses/106/105/106105183/
4. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
5. https://www.telecomtrainer.com/dcn-dedicated-core-network/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
2	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
3	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
4	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
5	3	2	2	2	3	-	-	-	-	-	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code:**PC**				*End Semester Exam Type:**TE**		
Course Code	**U23ITE401**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Object Oriented Analysis and Design**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	**Software Engineering and Project Management**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (HighestLevel)
	CO1 Understand Object Oriented Software Development Process and OO Methodologies	**K2**
	CO2 Select an appropriate UML Diagram and design software using OO concepts	**K2**
	CO3 Apply object oriented analysis processes for projects	**K3**
	CO4 Understand different stages of design process with a case study	**K2**
	CO5 Apply design patterns to develop software	**K3**

Unit- I	**Introduction**	**Periods: 09**
Object Oriented System Development-Object Basics-OO Software Development Life Cycle-Unified Process-OO Methodology, Unified Modeling Language (UML)-Use Case-Case study: The Next Gen POSsystem.		**CO1**
Unit- II	**UML Diagrams**	**Periods: 09**
UML Class Diagram-Use case Diagram-UML Interaction Diagram-Sequence Diagram-Collaboration Diagram-State Machine Diagram-Activity Diagram-Implementation Diagram.		**CO2**
Unit- III	**Object Oriented Analysis**	**Periods: 09**
Use case driven Object analysis – approaches for identifying classes – identifying objects, relationshipsattributes, methods for ATM banking system.		**CO3**
Unit- IV	**Object Oriented Design**	**Periods: 09**
Object oriented design process-Design axioms-Designing Classes, Methods-Access layer: objectstorage and object interoperability, View layer: Designing interface objects, Prototyping User interface. Case Study: Designing access layer and user interface for the ATM banking system		**CO4**
Unit- V	**Design Patterns and Testing**	**Periods: 09**
GRASP: Designing Objects with Responsibilities-Creator-Information Expert-Low Coupling-HighCohesion-Controller. Testing: Software Quality Assurance – Impact of Object Orientation on Testing – Develop Test Cases and Test Plans.		**CO5**

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

Text Books

1. Ali Bahrami, “Object Oriented systems development”, Paperback-Bigbook, 2017.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented SoftwareArchitecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.
3. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2 nd Edition, Pearson Education, 2005.

Reference Books

1. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press,2009.
2. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3 rd Edition, Pearson Education,2007.
3. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative
4. Development, Third Edition, 2004, O’reily Publications.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_cs84/preview
2. https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design
3. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	-	-	-	-	-	-	-	1	1	2	2	3
2	3	2	2	2	2	-	-	-	2	-	-	3	1	2	-
3	2	2	1	2	-	-	-	-	-	-	-	3	2	2	-
4	3	1	2	2	1	-	-	-	3	-	-	3	-	3	1
5	3	2	1	1	-	-	-	-	2	-	-	3	-	3	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: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE402**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Web Application Development**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	**IT Essentials ,Basic Programming Knowledge**							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Understand program with core concepts of PHP	**K2**
	CO2 Explain the oops concepts in PHP	**K2**
	CO3 Design and build database	**K3**
	CO4 Use Ajax & JQuery to enhance the functioning of web pages.	**K2**
	CO5 Design a micro project	**K3**

Unit- I	**CORE PHP**	**Periods: 09**
PHP Foundation: Installation - Syntax - Variables - Echo / Print - Data Types - Strings - Numbers - Math -Constants - Operators: Arithmetic - Comparison - Logical - String - Arrays - If...Else...Else if - Switch - Loops - Functions -Arrays - Superglobals - RegEx.		**CO1**
Unit- II	**PHP Forms**	**Periods: 09**
PHP Form: Form Handling - GET/POST - Using Bootstrap - Form Validation - Form Required - FormSubmission.PHP Date and Time - Include - File Upload - Cookies - Sessions - Exceptions. OOPS: Classes/Objects - Constructor - Destructor - Access Modifiers - Inheritance.		**CO2**
Unit- III	**PHP and MySQL Database**	**Periods: 09**
Database: Connect - Create Databases - Building Tables - Insert Data - Get Last ID - Insert Multiple - Prepared - Select Data -Where - Order By - Delete Data - Update Data - Limit Data		**CO3**
Unit- IV	**PHP AJAX & Jquery**	**Periods: 09**
PHP AJAX: AJAX Database - AJAX XML - AJAX Search - AJAX Poll. Introduction of JQuery: Syntax – Selectors - Events - jQuery Syntax For Event Methods - Commonly Used jQuery Event Methods.		**CO4**
Unit- V	**Micro Project & Case Study**	**Periods: 09**
Database Connectivity with PHP - Design and build a Login form and event registration form. Case Study -Student information system, Health Management System		**CO5**

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

Text Books

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

Reference Books

1. Richard Blum,“PHP, MySQL & JavaScript All-in-One”, John Wiley &Sons,2018
2. Jon Duckett,”JavaScript and JQuery: Interactive Front-End Web Development”, Wiley.

Web References

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	-	1	-	-	-	-	-	2	3	-	-	3
2	2	1	1	-	1	-	-	-	-	-	3	3	-	-	3
3	3	2	3	-	2	-	-	-	-	-	3	3	-	-	3
4	3	2	3	-	2	-	-	-	-	-	3	3	-	-	3
5	3	2	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
	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 :**PEC**				*End Semester Exam Type:**TE**		
Course Code	**U23ITE403**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Information Coding Techniques**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	**Mathematics, Computer Networks**							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Understand the notions of information and channel capacity	**K1**
	CO2 Evaluate the compression and decompression techniques	**K2**
	CO3 Analyze the various concepts of Multimedia communication	**K3**
	CO4 Analyze error correction and detection using linear block codes	**K3**
	CO5 Understand the basic concepts of cryptography	**K1**

Unit-I	**Information Entropy Fundamentals**	**Periods:09**	
Introduction to Information Theory – Uncertainty and Information- Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem			**CO1**
Unit-II	**Data And Voice Coding**	**Periods:09**	
Introduction - Run length encoding- Arithmetic coding – Lempel Ziv algorithm – Pulse Code Modulation – Differential Pulse Code Modulation - Delta Modulation – Adaptive Delta Modulation – Coding speech at low bit rates - Vocoders –Linear Predictive Coding – Code Excited LPC – Perceptual Coding – Dolby AC-3.			**CO2**
Unit-III	**Image And Video Coding**	**Periods:09**	
Introduction – Image Compression – GIF – TIFF – Digitized Documents – JPEG Standards – Video Compression Principles – Motion Compensation and Estimation – H.261 – MPEG Standards			**CO3**
Unit-IV	**Error Control Coding**	**Periods:09**	
Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial –Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes			**CO4**
Unit-V	**Cryptography**	**Periods:09**	
Introduction – Encryption techniques – Symmetric cryptography – Data Encryption Standard – Asymmetric Cryptography – RSA Algorithm – Pretty Good Privacy – DH Protocol - Introduction to Physical Layer Security: Information - Theoretic Secrecy, Secret Communication Over Noisy Channels, Secret - Key Generation from Noisy Channels, Cooperative jamming. Illustrative Program: RSA algorithm.			**CO5**

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

Text Books

1. Information Theory, Coding and Cryptography by Ranjan Bose, McGraw Hill, 3rd Edition, 2016.
2. Digital Communication Systems by Simon Haykin, Wiley India, 2013.
3. Physical Layer Security in Wireless Communications by Xiangyun Zhou, Lingyang Song, Yan Zhang, 1st Edition, 2016.

Reference Books

1. A Saha, N Manna and S Mandal, Information Theory, Coding and Cryptography, Pearson.2013.
2. S Gravano, Error Control Codes, Oxford University Press
3. J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009.
4. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

Web References

1. https://nptel.ac.in/courses/117101053/Information Theory and Coding/
2. https://www.elprocus.com/modulation-with-its-block-diagram/
3. https://www.geeksforgeeks.org/modulation techniques/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	-	-	-	-	-	-	1	3	2	1
2	3	3	2	2	1	-	-	-	-	-	-	1	3	2	1
3	3	3	2	2	1	-	-	-	-	-	-	1	3	2	1
4	3	3	2	2	1	-	-	-	-	-	-	1	3	2	1
5	3	3	2	2	1	-	-	-	-	-	-	1	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE404**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**AGILE METHODOLOGIES**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
		IT						
Prerequisite	**Software Engineering and Project Management**							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain evolutionary, iterative and adaptive development methods	**K2**
	CO2 Apply agile software process in requirement engineering	**K3**
	CO3 Outline agile methods for project planning and development	**K2**
	CO4 Choose agile methods for software design	**K3**
	CO5 Apply agile based testing with quality assurance.	**K3**

Unit- I	**Introduction**	**Periods: 09**
Iterative and Evolutionary Development; Introduction to Agile: Agile development – Classification of methods – Agile manifesto and principles – Communication and feedback – Specific agile methods – Agile modelling; Theories for Agile Management; Management Accounting for Systems; Agile Project Management: Traditional versus RAD model for project management – Task planning and effort tracking – The project manager's new work.		**CO1**
Unit- II	**Requirements Engineering for Agile Methods**	**Periods: 09**
Traditional and Agile Requirement Engineering; Methods and Tools for Agile Practitioners: Requirements elicitation – Requirements representation and documentation – Requirements analysis – Requirements management; Agile Approaches to Requirements Engineering: The customer – Requirements evolution – Non-functional requirements; Tools for Requirements Management in AMs.		**CO2**
Unit- III	**Agile Project Planning and Development Management**	**Periods: 09**
Agile Project Planning: The Project buffer and its usage – Logical collection of inventories – Critical path – Parallel path – Critical chain – Project tracking metrics; Agile Development Management: Identifying and monitoring the flow – Bottleneck; Agile Maturity Model: A new maturity model.		**CO3**
Unit- IV	**Agile Methods**	**Periods: 09**
Scrum: Method overview – Life cycle – Work products – Values – Roles and practices – Process mixtures – Adoption strategies; Extreme Programming; Unified Process; EVO.		**CO4**
Unit- V	**Agile Testing and Quality Assurance**	**Periods: 09**
Agile testing: Nine principles and six concrete practices for testing on agile teams; Agile Metrics: Feature driven development (FDD) – Financial and production metrics in FDD – Agile approach to quality assurance – Test driven development; SMM: A process improvement frame- work for agile requirements engineering practices–case study.		**CO5**

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

Text Books

1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results ", Prentice Hall, 2003.
2. Craig Larman, "Agile and Iterative Development: A Manager's Guide ", Addison-Wesley, 2004.
3. Elisabeth Hendrickson, "Agile Testing ", Quality Tree Software Inc 2008.

Reference Books

1. Hazza, Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
2. Chetankumar Patel, Muthu Ramachandran, "Story Card Maturity Model (SMM): A Process Improvement Frameworkfor Agile Requirements Engineering Practices", Journal of Software, Academy Publishers, Vol 4, No 5, 422-435, Jul 2009.
3. Kevin C Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth- Heinemann, 2007.
4. Didar Zowghi, Zhi Jin, "Requirements Engineering", Springer, chapter 15, 2014.
5. Aybuke Aurum, Claes Wohlin, "Engineering and Managing Software Requirements", Springer 2005, chapter 14.

Web References

1. https://www.coursera.org/specializations/agile-development
2. https://www.udemy.com/course/scrum-methodology/
3. http://www.atlassian.com/jira-software/agile
4. http://agilemanifesto.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
5	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PE**				*End Semester Exam Type: **TE**		
Course Code	**U23ITE405**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Warehousing and Data Mining**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
		IT						

Prerequisite	Database Management Systems	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions	**K2**
	CO2 Apply KDD process for finding interesting pattern from warehouse and Characterize the kinds of patterns that can be discovered by association rule mining.	**K3**
	CO3 Discover interesting patterns from large amounts of data to analyze for predictions and classification	**K4**
	CO4 Apply data mining clustering techniques to large data sets.	**K3**
	CO5 Develop a data mining application for data analysis using various tools.	**K3**

Unit- I	**Introduction to Data Warehousing**	**Periods: 09**
Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture — Schemas — Modeling: Schemas - Data Cube — OLAP Operations - Data Warehouse Implementation - Data Generalization by Attribute-Oriented Induction.		**CO1**

Unit- II	**Data Mining and Association Rule Mining**	**Periods: 09**
Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods — Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.		**CO2**

Unit- III	**Classification**	**Periods: 09**
Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – SupportVector Machines.		**CO3**

Unit- IV	**Clustering**	**Periods: 09**
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – PartitioningMethods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.		**CO4**

Unit- V	**Data Mining Applications**	**Periods: 09**
Mining Object - Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining –Mining the World Wide Web.		**CO5**

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

Text Books

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Elsevier, 3rd Edition, 2012.
2. Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining and OLAP, Tata McGraw - Hill Edition, 13th Edition,2008.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education, 2007.

Reference Books

1. Gupta G.K., —Introduction to Data Mining with Case Studies, Prentice Hall of India, Eastern Economy Edition, 2006.
2. Charu C. Aggarwal, Data Mining: The Textbook, Springer, Kindle Edition, 2015.
3. Margret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson, 17th Edition, 2013.
4. George K Marakas, Modern Data Warehousing, Mining, and Visualization: Core Concepts, Pearson, 2002.
5. K.P.Soman, Insight into Data Mining: Theory and Practice, PHI Publications, 7th Edition, 2014.

Web References

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2. https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/
3. https://www.javatpoint.com/data-warehouse
4. https://www.tutorialspoint.com/dwh/index.htm
5. https://www.guru99.com/data-warehousing-tutorial.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	-	1	2	-	-	-	-	2	3	1	1
2	3	3	2	3	-	1	2	-	-	-	-	2	3	1	1
3	3	3	2	3	-	1	2	-	-	-	-	2	3	1	1
4	3	3	2	3	-	1	2	-	-	-	-	2	3	1	1
5	3	3	2	3	-	1	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PC**				*End Semester Exam Type:**TE**		
Course Code	**U23ITB402**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Internet Programming**	**2**	**-**	**2**	**3**	**50**	**50**	**100**
		IT						
Prerequisite	Basics of Programming Languages							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
CO1	Make use of HTML5 and CSS3 to design modern website	**K3**
CO2	Utilize JavaScript and DOM to implement dynamic web page	**K3**
CO3	Develop responsive web applications using Servlets and AJAX	**K3**
CO4	Build web application using ReactJS framework	**K3**
CO5	Develop web application using NodeJS framework	**K3**

UNIT-I	**WEB ESSENTIALS**	**Periods:10**
Web Essentials: Clients – Servers – Communication; HTTP protocol: Request and Response Messages – Functionalities of Web Client and Web Server; Web Server: Vulnerabilities – At- tacks & its prevention; HTML5: Table – List – Image – Form – Semantic elements – CSS3: Types of style sheets – Selectors –Box Model – Rule cascading –Inheritance – Transformations – Transitions – Animations.		**CO1**

UNIT-II	**CLIENT-SIDE PROGRAMMING AND FRAMEWORK**	**Periods:10**
JavaScript: Variables – Data types – Statements – Function – Object – Array – Built-in objects– JSON: Parse – Event handling: Form, Mouse and Keyboard events– DOM: Document tree – Node object –Event handling: Event propagation. **Client-Side Framework:** Javascript for ReactJS – React elements – React DOM – React Components – Mapping Arrays with JSX		**CO2**

UNIT-III	**SERVER-SIDE PROGRAMMING AND FRAMEWORK**	**Periods:10**
Servlets: Architecture – Life Cycle – Parameter data – Form GET and POST actions Sessions – Cookies and URL rewriting – DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - AJAX: Ajax Client Server Architecture **Server-Side Framework:** Node building blocks: Global objects, Events, Asynchronous Nature – Node and the Web: Server and Client – Build and the NodeJS using MVC: Routing, Creation of Modules, Views and Controllers		**CO3**

UNIT-IV	**Laboratory Exercises**	**Periods:15**
1. Build a web page using Table, Lists, Image, and anchor elements. 2. Create a web page that displays college information using various Style Sheets. 3. Create a web page using HTML5 and CSS3 Elements. 4. Create a web page with the following. a. Cascading Style Sheets. b. Embedded Style Sheets. c. Inline Style Sheets. Use our college Information for the web pages. 5. Validate the Registration, user login, user profile and payment by Credit Card pages using JavaScript. 6. Develop a web application to authenticate the user with servlet and MySQL.		**CO4**

UNIT-V	**Laboratory Exercises**	**Periods:15**
1. Conversion of Static Webpages into Dynamic Webpages Using JSP. 2. Develop a web application using Session tracking mechanisms, Servlet and MySQL. (Ex: Online Shopping application) 3. Develop a Popup Menu Application using AJAX. 4. Develop a front end of the Online Exam Web application using ReactJS 5. Develop a back end of the Online Exam Web application using NodeJS 6. Develop a complete Web Application for Event Registration Process		**CO5**

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

Text Books

1. Jeffrey C, Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011
2. Alex Banks, Eve Porcello, “Learning React: Modern Patterns for Developing React Apps”, O’Reilly Media Inc., June 2020

Reference Books

1. David McFarland, “CSS3: The missing manual”, O’Reilly Media, December 2012
2. Matthew MacDonald, “HTML5: The missing manual”, O’Reilly Media, August 2011
3. Shelly Powers, “Learning Node 2nd Edition”, 1st Edition, O’Reilly Media, June 2016
4. Sitepoint Team, “Your First Week With Node.js”, SitePoint, February 2018
5. ” How to Hack a Web Server”

Web References

1. https://www.w3schools.com/html/html_scripts.asp
2. https://www.geeksforgeeks.org/html-css/
3. https://www.json.org/json-en.html
4. https://www.w3schools.com/js/js_json_intro.asp
5. https://www.geeksforgeeks.org/javascript/
6. https://www.geeksforgeeks.org/introduction-to-jdbc/

COs/POs/PSOs Mapping

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	3	2	3	-	-	-	-	-	-	-	-	-	2	-	-
3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
4	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
5	3	2	3	-	-	-	-	-	-	-	-	-	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	Conductio nof Practical	Report	Viva	Total	End Semester Examinatio n(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 for50 Marks	

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

Department	**English**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **HS**			*End Semester Exam Type: **LE**			
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 Outcomes	**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 emergingtrends - 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 Reasoningand 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	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

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

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

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 Outcomes	**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.

COs/POs/PSOs Mapping

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

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

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	**IV**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITP401**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Algorithms Design and Analysis Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Information Technology								
Prerequisite	**Data structures**							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Develop programs for sorting a given set of elements and analyse its time complexity	**K3**
	CO2	Solve and analyse the problems using greedy methods	**K3**
	CO3	Solve and analyse the problems using dynamic programming.	**K3**
	CO4	Apply backtracking method to solve various problems	**K3**
	CO5	Apply branch and bound method to solve 0/1 knapsack problem	**K4**

List of Exercises

1. Implement Insertion Sort and analyse the time complexity.
2. Sort a given set of elements using the quick sort method and determine the time required to sort the sortedand unsorted elements.
3. Implement Merge sort and analyse the time complexity.
4. Apply Greedy method to compress the given data using Huffman encoding.
5. Implement fractional knapsack problem using Greedy Strategy.
6. Implement minimum spanning tree using Prim's algorithm and analyse its time complexity.
7. Find shortest path for the given graph using Dijkstra Method
8. Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd'salgorithm.
9. Find the Shortest path from the given source to destination in multistage graph using dynamic programming
10. Implement matrix chain multiplication and find the optimal sequence of parentheses.
11. Find a subset of a given set S = {sl, s2,..... , sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1,8}. A suitablemessage is to be displayed if the given problem instance doesn't have a solution.
12. Implement N-Queens problem using backtracking.
13. Implement graph coloring problem using backtracking.
14. Find all Hamiltonian cycle from given graph using backtracking
15. Find the solution to the Travelling Salesman Problem. Repeat the experiment for a graph having total numberof nodes (n) = 4, 8, 12, 16, 20 and note the time required to find the solution. Plot the graph taking n on the x-axis and time on y-axis and analyze the graph to determine whether it is exponential or not

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

Reference Books

1. Andrew S Tanenbaum, Computer Networks, Pearson Education, 6th Edition, 2022.
2. Behrouz A. Forouzan, Data Communications and Networking, TMH, 5th Edition, 2012
3. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, TMH, 6thEdition, 2022
4. James F.Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet.,Pearson Education, 7th Edition, 2017
5. William Stallings, Data and Computer Communications, Pearson Education, 10th Edition, 2014

Web References

1. https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/
2. https://archive.nptel.ac.in/courses/106/105/106105082/
3. https://archive.nptel.ac.in/courses/106/105/106105183/
4. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
5. https://www.telecomtrainer.com/dcn-dedicated-core-network/

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

correlation Level: 1 - Low, 2 - Medium, 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	**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 Objectives	To introduce the fundamental concepts of research, including the different types, processes, and the importance of reasoning in developing research questions and designs.		
	To equip students with the skills to identify and formulate research problems, conduct effective literature reviews, and understand the role of libraries and digital tools in sourcing relevant information.		
	To provide a foundational understanding of experimental research methods, data collection, analysis techniques, and the interpretation of research findings.		
	To teach the structure and components of research papers and dissertations, along with the ethical considerations in research, including plagiarism and scientific misconduct.		
	To familiarize with the basics of intellectual property rights, including patents, copyrights, and trademarks, and the processes involved in their registration and enforcement.		
Course Outcomes	***On completion of the course, the students will be able to***		**BT Mapping (Highest Level)**
	CO1	Explain the differences between various types of research and describe how different research methods are used to address engineering problems.	**K2**
	CO2	Develop the ability to identify research problems, perform comprehensive literature reviews, and use various tools and services for effective information retrieval.	**K2**
	CO3	Gain proficiency in designing experiments, analyzing data, and interpreting results using both numerical and graphical methods.	**K4**
	CO4	Apply ethical guidelines to structure and write research papers and dissertations, avoiding plagiarism.	**K3**
	CO5	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: 6**
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: 6**
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: 6**
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: 6**
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview.		**CO4**
UNIT-V	**Ethics and Legal aspects in research**	**Periods: 6**
Ethical Considerations in Research: Introduction to Scientific Misconduct. Basics of Intellectual Property Rights - Introduction to Patents, Copyrights, and Trademarks – Case studies on ethical dilemmas in research.		**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. Ram Ahuja, “Research methods”, 2nd Edition, Rawat Publications, 2022
3. Creswell, J. W., and Creswell, J. D., “Research Design: Qualitative, Quantitative, and Mixed Methods Approaches” , 5th Edition, SAGE Publications, 2018
4. Kothari, C. R., “Research Methodology - Methods and Techniques”, 5th Edition, New Age International Publishers, 2003
5. T. Ramappa, “Intellectual Property Rights under WTO”, S. Chand Publishers, 2008

Reference Books

1. Thiel D. V., “Research Methods for Engineers”, Cambridge University Press, 2014
2. Ganesan R, Research Methodology for Engineers, MJP Publishers, 2004
3. Agarwal C & Sharma V, “Research Methodology in Sociology”, Commonwealth Publishers, 2012
4. Thody A, “Writing and Presenting Research” (SAGE Study Skills Series), SAGE Publications, 2006
5. Bordens K. S. and Abbott B. B, “Research Design and Methods - A Process Approach”, 8th Edition, McGraw Hill, 2011

Web References

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/
6. https://www.scholastic.com/parents/school-success/homework-help/homework-project-tips/7-steps-to-successful-research-report.html
7. https://www.futurelearn.com/info/courses/business-research-methods- investigation.
8. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India
9. https://researchgate.net/
10. https://journals.sagepub.com/home/jmx

COs/POs Mapping

Course Outcomes (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	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

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**	**0**	**0**	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/

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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23ITT506**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Information and Network Security**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Data Communication and Computer Networks							

Course Outcomes		**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1	Articulate the importance of professional practice, Law and Ethics in the Information Security.	**K2**
	CO2	Identify and model information security risks.	**K3**
	CO3	Apply the different cryptographic operations using public and private key cryptography.	**K3**
	CO4	Identify and use appropriate algorithms for assuring System security and authentication.	**K3**
	CO5	Examine the security requirements and solutions for wireless networks and distributed systems.	**K4**

Unit- I	**Introduction to Information Security**	**Periods: 09**
Introduction: History - Information Security - Critical Characteristics of Information - CNSS Security Model -Components of an Information System - The Security in the Systems Life Cycle. The need for Security: Business Needs - Threats and attacks. Legal, Ethical and Professional issues in Information Security.		**CO1**
Unit- II	**Security Analysis and Design**	**Periods: 09**
Planning for Security: Information Security Policy, Standards and Practices - Information Security Blueprint: The ISO 27000 series - NIST Security Models. Risk Management: Overview - Risk Identification, Risk Assessment - Risk Control.		**CO2**
Unit- III	**Symmetric Ciphers and Asymmetric Ciphers**	**Periods: 09**
Introduction: Computer Security Concepts - Security attacks - Security Services - Security Mechanisms. Symmetric Ciphers: Classical Encryption Techniques - Block Cipher Structure - DES - AES - Triple DES – Blowfish - RC5 - IDEA. Asymmetric Ciphers: Principles of Public Key Cryptosystems - RSA - Diffie Hellman Key Exchange - Elgamal Cryptographic System.		**CO3**
Unit- IV	**Integrity and Authentication Algorithms**	**Periods: 09**
Cryptographic hash functions: Secure Hash Algorithm (SHA-512) - MAC: Authentication Requirements -Authentication Functions - HMAC - CMAC. Digital Signatures: Elgamal Digital Signature Scheme - PSS Digital Signature Algorithms. Key Management and Distribution: Symmetric Key Distribution using Symmetric and Asymmetric Encryption - Distribution of Public Keys - X.509 - Public Key Infrastructure - Kerberos.		**CO4**
Unit- V	**Internet and Network Security**	**Periods: 09**
Internet Security: Electronic Mail Security-S/MIME, Pretty Good Privacy. Network security: SSL - Transport Layer Security-Secure Electronic Transaction - Firewalls - IP Security - VPN - Intrusion.		**CO5**

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

Text Books

1. William Stallings, “Cryptography and Network Security Principles and Practice”, Pearson Publishers, 8th Edition, 2023.
2. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, Cengage Learning, 5th Edition, 2015.
3. Atul Kahate, “Cryptography and Network Security”, McGraw Hill, 4th Edition, 2019.

Reference Books

1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2. Harold F. Tipton, Micki Krause, “Information Security Management Handbook”, 6th Edition, 2007.
3. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", 5th Edition, Prentice Hall, New Delhi, 2015.

Web References

1. https://www.coursera.org/learn/-network-security
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. https://www.imperva.com/learn/data-security/information-security-infosec/
5. https://www.udemy.com/course/infosec-fundamentals/
6. https://archive.nptel.ac.in/courses/106/106/106106129/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	1	-	-	-	2	-	-	-	2	3	2	2
2	3	3	2	1	-	-	-	-	-	-	-	1	3	2	2
3	3	3	2	1	-	-	-	-	-	-	-	2	3	2	2
4	3	3	1	1	-	-	-	-	-	-	-	1	3	2	2
5	3	3	1	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	5	5	5	5	5	75	100

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
Course Code	**U23ITT507**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Data Analytics**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Probability and Statistics, Programming in Python							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain Data Analytics and its significance in modern data-driven decision-making processes	**K2**
	CO2 Develop skills to collect and preprocess data from various sources	**K3**
	CO3 Identify and utilizing statistical summaries and visualization techniques	**K3**
	CO4 Apply predictive modeling techniques with machine learning contexts	**K3**
	CO5 Explore Big data and advanced analytics techniques	**K4**

Unit- I	**Introduction to Data Analytics**	**Periods: 09**
Data Analytics - Definition and Importance of Data Analytics - Types of Data Analytics - Data Analytics Life Cycle - Analytics platforms Jupyter, RStudio		**CO 1**

Unit- II	**Data Collection and Preprocessing**	**Periods: 09**
Data Collection Methods - Sources of Data: Structured, Semi-Structured, Unstructured - Techniques for Data Collection - Data Quality and Data Cleaning - Handling Missing Data - Outlier Detection and Treatment - Data Normalization and Standardization		**CO 2**

Unit- III	**Statistical Analysis and Data Visualization**	**Periods: 09**
Introduction to EDA - Importance and Objectives of EDA - Statistical Summaries Data Visualization - Visualization Techniques: Histograms, Bar Charts, Box Plots, Scatter Plots - Tools for Visualization: Matplotlib, Tableau		**CO 3**

Unit- IV	**Machine Learning for Data Analytics**	**Periods: 09**
Introduction to Predictive Analytics - Modeling Techniques - Supervised and Unsupervised Learning - Regression Techniques - Linear Regression - Logistic Regression - Evaluation Metrics for Regression Models - Classification Techniques: Decision Trees, Support Vector Machines		**CO 4**

Unit- V	**Big Data and Advanced Topics**	**Periods: 09**
Introduction to Big Data: Characteristics of Big Data - Time Series Analysis - Text Analytics and Natural Language Processing: Text mining and sentiment Analysis - Clustering Techniques: K-Means, Hierarchical - Ethical Considerations in Data Analytics		**CO 5**

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

Text Books

1.. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 3rd Edition 2022
2. Peter Bruce, Andrew Bruce, Peter Gedeck, "Practical Statistics for Data Scientists", O'Reilly Media, 2nd Edition, 2020
3. Foster Provost and Tom Fawcett, "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking", O'Reilly Media, 2013

Reference Books

1. Dr. Gaurav Aroraa, Chitra Lele, Dr. Munish Jindal ," Data Analytics: Principles, Tools, and Practices: A Complete Guide for Advanced Data Analytics Using the Latest Trends, Tools, and Technologies ", 1st Edition, bpb, 2022
2. Dr. Bharti Motwani, "Data Analytics with R",Wiley, 2019
3. Anil Maheswari, "Data Analytics", McGraw Hill, 2nd edition, 2023

Web References

1. https://careerfoundry.com/en/blog/data-analytics/what-is-data-analytics/
2. https://www.geeksforgeeks.org/data-analytics-and-its-type/
3. https://www.geeksforgeeks.org/r-programming-language-introduction/
4. https://www.datacamp.com/blog/jupyter-and-r-markdown-notebooks-with-r
5. https://www.turing.com/kb/how-data-collection-and-data-preprocessing-in-python-help-in-machine-learning

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	2	-	-	1	-	2	-	2	2	2	-
2	3	3	2	3	2	-	-	1	-	2	-	2	2	2	1
3	3	3	2	3	2	-	-	1	-	2	-	2	2	2	1
4	3	3	3	3	3	-	-	1	-	2	-	2	3	2	2
5	3	3	3	3	3	-	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
	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	**V**	Course Category Code: **PE**				*End Semester Exam Type:**TE**		
Course Code	**U23ITE506**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Theory of Compiler Design**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Automata Languages and Computation							

Course Outcomes		**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1	Explain various phase of compiler and sketch a lexical analyzer for sample language	**K2**
	CO2	Apply different parsing techniques to build top down and bottom parser	**K3**
	CO3	Demonstrate the use of SDT in code generation	**K3**
	CO4	Explain the design of simple code generator	**K2**
	CO5	Apply code optimization techniques to create efficient target code	**K3**

Unit- I	**Introduction to Compilers and Lexical Analysis**	**Periods: 09**
Introduction - Translators - Compilation and Interpretation - Language processors - The Phases of Compiler - Lexical Analysis - Role of Lexical Analyzer - Input Buffering - Expressing tokens by Regular Expression - Recognition of Tokens - Finite Automata - Regular Expressions to Automata NFA, DFA - Minimizing DFA - Language for Specifying Lexical Analyzers - LEX tool.		**CO 1**

Unit- II	**Syntax Analysis**	**Periods: 09**
Role of Parser - Grammars - Context-free grammars - Writing a grammar - Top Down Parsing: General Strategies - Recursive Descent Parser Predictive Parser - LL(1) - Bottom Up Parsing: Operator Precedence parser - LR Parser: SLR - CLR and LALR - Error Handling and Recovery in Syntax Analyzer - YACC tool - Design of a Syntax Analyzer for a Sample Language		**CO 2**

Unit- III	**Syntax Directed Translation and Intermediate Code Generation**	**Periods: 09**
Syntax directed Definitions - Construction of Syntax Trees - Bottom -Up evaluation of S-attributed definitions - Top Down translation. Type Checking - Type Systems - Specification of a simple type Checker - Equivalence of Type Expressions - Type Conversions. Intermediate Code generation - Intermediate languages: Postfix notation - Syntax Tree - Three Address Code - Declaration - Assignment Statements - Boolean Expression - Back patching		**CO 3**

Unit- IV	**Run-Time Environment and Code Generation**	**Periods: 09**
Runtime Environments - Source language issues - Storage organization - Storage Allocation Strategies: Static, Stack and Heap allocation - Parameter Passing-Symbol Tables - Dynamic Storage Allocation - Issues in the Design of a code generator - Basic Blocks and Flow graphs - Design of a simple Code Generator - Optimal Code Generation for Expressions - Dynamic Programming Code Generation.		**CO 4**

Unit- V	**Code Optimization**	**Periods: 09**
Principal Sources of Optimization - Peep-hole optimization - DAG - Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm - Recent trends in Compiler Design		**CO 5**

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

Text Books

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools",2nd Edition, Pearson Education, 2023
2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002
3. Allen I. Holub, "Compiler Design in C", Prentice-Hall Software Series, 1993

Reference Books

1. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.
2. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004.
3. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.

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1. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2. https://www.geeksforgeeks.org/compiler-design-tutorials/
3. https://www.wikitechy.com/tutorials/compiler-design/type-expression-in-compiler-design
4. https://www.javatpoint.com/compiler-tutorial

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	2	-	-	-	-	2	-	1	3	2	-
2	3	3	2	3	3	-	-	-	1	2	-	2	3	3	1
3	3	3	2	3	3	-	-	-	1	2	-	2	3	3	2
4	3	2	1	2	2	-	-	-	1	2	-	1	3	2	-
5	3	3	2	3	3	-	1	-	1	2	-	2	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE507**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Information Visualization**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Probability and Statistics, Programming in Python, Data Analytics							

	On completion of the course, the students will be able to		**BT Mapping (Highest Level)**
Course Outcomes	**CO1**	Identify and recognize visual perception and representation of data	**K2**
	CO2	Explain various Visualization Techniques	**K2**
	CO3	Represent text and Document Visualization	**K3**
	CO4	Analyze various interaction concepts and Techniques	**K4**
	CO5	Evaluate visualizations for various applications	**K4**

Unit- I	**Introduction**	**Periods: 09**
Introduction - Visualization Process - Role of Cognition - Scatterplot - Role of User - Data Foundations - Types of Data - Data Preprocessing - Human Perception and Information Processing - Perception - Perceptual processing - Perception in Visualization		**CO1**
Unit- II	**Visual Foundation and Techniques**	**Periods: 09**
Visualization Process - Semiology of Graphical Symbols - Eight Visual Variables, Visual Techniques for Spatial Data: One Dimensional Data - Two-Dimensional Data - Three-Dimensional Data - Dynamic Data - Combining Techniques, Visual Techniques for Geospatial Data: Point, Line and Area Data, Visualization Technique for Time Oriented Data – Multivariate Data		**CO2**
Unit- III	**Text and Document Visualization**	**Periods: 09**
Introduction - Levels of Text Representations - Vector Space Model - Single Document Visualization - Document Collection - Extended Text Visualization		**CO3**
Unit- IV	**Interaction Concepts and Techniques**	**Periods: 09**
Interaction: Operation - Operands and Spaces - Unified Framework, Interaction Techniques: Screen Space - Object Space - Data Space - Attribute Space - Data Structure Space - Visualization Structure Space - Animating Transformations		**CO4**
Unit- V	**Designing and Evaluating Visualization Techniques**	**Periods: 09**
Steps in Designing Visualization - Problems in Designing, evaluating: User Tasks - Characteristics: User, Data, Visualization, Structures for Evaluating Visualizations - Benchmark Procedures		**CO5**

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

Text Books

1. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", Natick, 2nd Edition, CRC Press, 2015
2. Aragues, Anthony," Visualizing Streaming Data: Interactive Analysis Beyond Static Limits", O'Reilly Media Inc., 2018
3. Colin Ware, "Information Visualization Perception for Design", Elsevier Science,2019

Reference Books

1. Tamara Munzner," Visualization Analysis & Design" ,1st Edition, AK Peters Visualization Series, 2014
2. Scott Murray, "Interactive Data Visualization for the Web ",2nd Edition, 2017
3. Dr. Chun-hauh Chen, W.K. Hardle, A. Unwin, "Handbook of Data Visualization", Springer publication, 2016
4. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020

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1. https://www.tableau.com/learn/articles/data-visualization
2. https://www.ibm.com/topics/data-visualization
3. https://www.coursera.org/learn/ball-state-university-data-visualization-open

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	2	-	-	-	-	-	-	2	2	2	-
2	3	2	1	2	2	-	-	-	-	-	-	2	2	2	-
3	3	3	2	3	3	-	-	-	-	-	-	2	3	2	2
4	3	3	2	3	3	-	-	-	-	-	-	2	3	3	2
5	3	3	2	3	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE508**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Software Testing**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Software Engineering and Project Management							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Articulate the basic concepts of software testing and the need for software testing.	**K2**
	CO2 Design Test planning and different activities involved in test planning.	**K3**
	CO3 Design effective test cases that can uncover critical defects in the application	**K3**
	CO4 Demonstrate various advanced testing tools to test real time applications.	**K3**
	CO5 Demonstrate various automation tools to test real time applications.	**K3**

Unit- I	**Foundations of Software Testing**	**Periods: 09**
Fundamental of Software Testing - Black-Box Testing and White-Box Testing - Software Testing Life Cycle - V- model of Software Testing - Program Correctness and Verification - Reliability versus Safety – Failures - Errors and Faults (Defects) - Software Testing Principles - Program Inspections - Stages of Testing: Unit Testing - Integration Testing - System Testing		**CO1**
Unit- II	**Test Planning**	**Periods: 09**
The Goal of Test Planning - High Level Expectations - Intergroup Responsibilities - Test Phases - Test Strategy - Resource Requirements - Tester Assignments - Test Schedule - Test Cases - Bug Reporting - Metrics and Statistics.		**CO2**
Unit- III	**Test Design and Execution**	**Periods: 09**
Test Objective Identification - Test Design Factors - Requirement identification - Testable Requirements - Modeling a Test Design Process - Modeling Test Results - Boundary Value Testing - Equivalence Class Testing - Path Testing - Data Flow Testing - Test Design Preparedness Metrics - Test Case Design Effectiveness - Model-Driven Test Design - Test Procedures - Test Case Organization and Tracking - Bug Reporting - Bug Life Cycle.		**CO3**
Unit- IV	**Advanced Testing Concepts**	**Periods: 09**
Performance Testing: Load Testing - Stress Testing - Volume Testing - Fail-Over Testing - Recovery Testing - Configuration Testing - Compatibility Testing - Usability Testing - Testing the Documentation - Security testing - Testing in the Agile Environment - Testing Web and Mobile Applications.		**CO4**
Unit- V	**Testing Tools and Software Test Automation**	**Periods: 09**
Selenium - J-Meter - Software test automation - Skills needed for automation - Scope of automation - Design and architecture for automation - Requirements for a test tool - Challenges in automation - Test metrics and measurements - Project, Progress and Productivity Metrics.		**CO5**

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

Text Books

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012.
2. Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Taylor & Francis Group, 4th Edition, 2014
3. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" ,2nd Edition 2018.

Reference Books

1. Ron Patton, “Software testing”, Sams Publishing, 2nd Edition, 2006
2. Elfriede Dustin, Thom Garrett, Bernie Gaurf, “Implementing Automated Software Testing”, Pearson Education, 2009
3. Glenford J. Myers, Corey Sandler, Tom Badgett, “The Art of Software Testing”, John Wiley & Sons ,3rd Edition, 2012
4. Varun Menon, “TestNg Beginner's Guide”, Packt Publishing, 2013
5. Satya Avasarala, “Selenium WebDriver Practical Guide”, Packt Publishing. 2014
6. Carl Cocchiaro, “Selenium Framework Design in Data-Driven Testing”, Packt Publishing, 2018

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1. https://onlinecourses.nptel.ac.in/noc24_cs47/preview
2. https://www.geeksforgeeks.org/software-testing-tutorial/
3. https://www.javatpoint.com/software-testing-tutorial
4. https://www.geeksforgeeks.org/software-engineering-selenium-an-automation-tool/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	1	2	-	-	-	-	2	-	1	2	2	-
2	3	3	3	2	3	-	-	-	1	2	2	2	3	3	1
3	3	3	3	3	3	-	-	-	1	2	2	2	3	3	2
4	3	3	3	3	3	-	-	-	1	2	2	2	3	3	2
5	3	3	3	3	3	-	-	-	1	2	2	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITE509**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Automation Techniques and Tools**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Software Engineering and Project Management							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Illustrate the basics of automation.	**K2**
	CO2 Apply the different automation techniques in various applications.	**K3**
	CO3 Empathize and analyze various Software tools.	**K4**
	CO4 Develop application using Katalon	**K3**
	CO5 Demonstrate the various testing level automation.	**K3**

Unit- I	**Introduction to Automation**	**Periods: 09**
Introduction and Importance of Automation - Types of Automation - Applications of Automation in Various Industries - History and Evolution of Automation - Future Trends in Automation - Benefits and Challenges of Automation - Role of Automation in Industry 4.0 - Ethics and Social Aspects of Automation.		**CO1**
Unit- II	**Automation Techniques**	**Periods: 09**
Understanding the Concept of Automation Techniques - Different Types of Automation Techniques - Applications and Use Cases of Automation Techniques - Hands-on: Implementing Automation Techniques - Automation Techniques in Software Development - Automation Techniques in Manufacturing - Automation Techniques in Data Analysis - Emerging Automation Techniques.		**CO2**
Unit- III	**Automation Tools - Selenium**	**Periods: 09**
Introduction to Selenium - Installation of Selenium - Features of Selenium - Use Cases of Selenium - Hands-on: Creating Test Cases using Selenium - Introduction to Automation Frameworks		**CO3**
Unit- IV	**Automation Tools - Katalon**	**Periods: 09**
Introduction to Katalon - Installation of Katalon - Features of Katalon - Use Cases of Katalon - Hands-on: Creating Test Cases using Katalon - Introduction to Continuous Integration/Continuous Deployment (CI/CD)		**CO4**
Unit- V	**Test and Process Automation**	**Periods: 09**
Understanding the Concepts of Test and Process Automation - Tools Used in Test and Process Automation - Hands-on: Creating Automated Tests and Automating a Business Process - Introduction to Robotic Process Automation (RPA).		**CO5**

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

Text Books

1. Glenford J. Myers, Corey Sandler, and Tom Badgett,"The Art of Software Testing", 3rd Edition", 2011
2. Al Sweigart,"Automate the Boring Stuff with Python", No Starch Press, 2nd Edition, 2015.
3. Richard Murdoch, "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant", 1st Edition, 2018.

Reference Books

1. Robert C. Martin, "Clean Code: A Handbook of Agile Software Craftsmanship", 2008
2. Mark Fewster and Dorothy Graham, "Software Test Automation", Addison-Wesley Professional, 3rd Edition, 2009
3. Jez Humble and David Farley, "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", 2010
4. Dorothy Graham and Mark Fewster, "Experiences of Test Automation: Case Studies of Software Test Automation", 2012
5. Jaime Buelta, "Python Automation Cookbook", 2018

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4. https://www.selenium.dev/documentation/en/
5. https://docs.katalon.com/katalon-studio/docs/overview.html
6. https://www.techopedia.com/definition/32099/automation-techniques
7. https://www.geeksforgeeks.org/software-engineering-automation-tools/
8. https://www.atlassian.com/continuous-delivery/principles/continuous-integration-vs-delivery-vs-deployment

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	2	-	-	-	-	2	1	1	2	2	1
2	3	3	3	2	3	-	-	-	2	2	2	2	3	3	2
3	3	3	3	3	3	-	-	-	2	2	2	2	3	3	3
4	3	3	3	3	3	-	-	-	2	2	2	2	3	3	3
5	3	3	3	3	3	1	-	-	2	2	2	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
	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	**V**	Course Category Code: **PE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITE510**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Parallel and Distributed Computing**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Operating Systems, Database Management Systems							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain the fundamental principles of Parallel Computing	**K2**
	CO2 Develop algorithms using Parallel Computing models.	**K2**
	CO3 Apply the design techniques for various distributed applications.	**K3**
	CO4 Analyze and evaluate Distributed Algorithms	**K4**
	CO5 Implement and integrate Distributed Computing concepts into real-world applications.	**K3**

Unit- I	**Introduction to Parallel Computing**	**Periods: 09**
Introduction to Parallel Computing - Need for Parallel Computing - Parallel Architectures: SISD, SIMD, MISD, MIMD - Parallel Programming Models - Types of Parallelism: Data Parallelism, Task Parallelism - Introduction to Shared Memory and Distributed Memory Architectures.		**CO1**
Unit- II	**Parallel Algorithms and Applications**	**Periods: 09**
Parallel Algorithm Design Principles - Parallel Sorting Algorithms: Bitonic Sort, Odd-Even Transposition Sort - Matrix Multiplication in Parallel - Performance Metrics: Speedup - Efficiency - Scalability - Parallel Programming with OpenMP and MPI - Case Studies and Applications of Parallel Computing.		**CO2**
Unit- III	**Introduction to Distributed Computing**	**Periods: 09**
Distributed Systems Overview - Characteristics and Design Issues - Communication in Distributed Systems - Processes and Threads - Models of Distributed Computing: Client-Server - Peer-to-Peer - Cloud Computing.		**CO3**
Unit- IV	**Distributed Algorithms and Synchronization**	**Periods: 09**
Clock Synchronization in Distributed Systems - Logical Clocks: Lamport's Logical Clocks, Vector Clocks - Distributed Mutual Exclusion Algorithms - Leader Election Algorithms - Distributed Deadlock Detection - Case Studies of Distributed Algorithms.		**CO4**
Unit- V	**Advanced Distributed Computing and Applications**	**Periods: 09**
Advanced Distributed Computing Models - Distributed Databases and Replication - Security in Distributed Computing - Emerging Trends in Distributed Computing - Case Studies and Applications.		**CO5**

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

Text Books

4. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", 2nd Edition, Addison-Wesley, 2003
5. Ajay D. Kshemkalyani , Mukesh Singhal, " Distributed Computing: Principles, Algorithms, and Systems", 2nd Edition, Cambridge University Press, 2011
6. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall, 2nd Edition, 2016

Reference Books

6. Kai Hwang, Zhiwei Xu, "Scalable Parallel Computing: Technology, Architecture, Programming", McGraw-Hill, 1998
7. Barry Wilkinson and Michael Allen, "Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers", 2nd Edition Pearson, 2004
8. Hagit Attiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulations, and Advanced Topics", 2nd Edition, Wiley, 2004
9. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems: Concepts and Design", Pearson, 5th Edition, 2011
10. Christian Cachin, Rachid Guerraoui, and Louis Rodrigues, " Introduction to Reliable and Secure Distributed Programming", 2nd Edition, Springer, 2011

Web References

9. https://mpitutorial.com/
10. https://www.coursera.org/learn/cloud-computing
11. https://cs105.net/
12. https://it.iiita.ac.in/ParallelandDistributedComputing.html/
13. https://www.udemy.com/topic/distributed-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	2	1	1	1	-	-	-	-	1	-	1	2	2	-
2	3	2	2	2	2	-	-	-	-	2	-	1	2	2	1
3	3	3	3	2	2	-	-	-	1	2	-	2	3	2	1
4	3	3	3	3	3	-	-	-	1	2	-	2	3	3	2
5	3	3	3	3	3	1	-	-	1	2	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **OE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITOC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Database System: Design and Development**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Common to EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS								
Prerequisite	**-**							

Course Outcome	**On completion of the course, the students will be able to**		**BT Mapping (Highest Level)**
	CO1	Summarize the fundamental concepts of databases and Entity-Relationship (E-R) model	**K2**
	CO2	Apply E-R Model to create relational databases for the given problems.	**K2**
	CO3	Manipulate and build database queries using Structured Query Language	**K3**
	CO4	Apply data normalization principles to develop a normalized database or a given application	**K3**
	CO5	Discover about transaction management principles on relational databases	**K2**

Unit- I	**Introduction To Database System and ER Model**	**Periods: 09**
Database Systems Applications-Purpose of Database Systems, Views of Data –Data Abstraction – Instances and Schemas - Data Models - Database System Architecture - Entity-Relationship Model – ER Diagram - Extended ER Model - ER into Relational Model		**CO1**
Unit- II	**Relational Model**	**Periods: 09**
Introduction to the Relational Model – Structure – Database Schema, Keys – Schema Diagrams, Tables. Relational Algebra - Extended-Relational Algebra Operations**.**		**CO2**
Unit- III	**Database Languages**	**Periods: 09**
SQL: Introduction - DDL - DML – Integrity Constraints - Set Operations - Joins - Nested Queries - View - Trigger - Stored Procedures.		**CO3**
Unit- IV	**Relational-Database Design**	**Periods: 09**
Functional Dependencies – Non-loss Decomposition – First, Second and Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.		**CO4**
Unit- V	**Transactions**	**Periods: 09**
Transactions: Transaction concepts and states - Concurrent Execution – Serializability – Concurrency Control: Lock based Protocol - Timestamp based Protocol - Recovery System: Log - Based Recovery -Shadow Paging**.**		**CO5**

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

Text Books

1. Abraham Silberschatz, Henry F.Korth, S.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. Shio Kumar Singh, Database Systems: Concepts, Design and Applications, Pearson Education, New Delhi, Second Edition,2011.

Reference Books

1. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 6th Edition – McGraw-Hill Higher Education, International Edition, 2015
2. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015
3. Date C J, Kannan A and Swamynathan S, “An Introduction to Database System”, 8th Edition, Pearson Education, New Delhi, 2006
4. Alan Beaulieu, “Mastering SQL Fundamentals”, Second Edition, O’Reilly,2009

Web References

1. http://www.database.com/
2.http://freevideolectures.com/course/2668/database-management-system#

COs/POs/PSOs Mapping

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	1	2	2
2	2	1	3	1	3	-	-	-	-	-	-	2	1	2	2
3	2	1	3	2	3	1	-	-	-	-	-	2	2	2	2
4	2	2	3	2	3	2	-	-	-	-	-	2	2	2	2
5	2	2	2	-	-	-	-	-	-	-	-	2	1	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **OE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITOC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Computer Hardware and Troubleshooting**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

Common to EEE, ECE, ICE, CCE, BME, CIVIL, MECH, MECHATRONICS

Prerequisite: **-**

Course Outcome	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Identify and describe the key components of a motherboard	**K2**
	CO2 Explain the concept of primary memory	**K2**
	CO3 Explain the characteristics of secondary storage devices and can perform partitioning, formatting of HDD	**K2**
	CO4 Gain knowledge about data recovery, handling viruses, and working with DOS.	**K2**
	CO5 Utilize various software diagnostic tools and multimeters in troubleshooting the devices	**K2**

UNIT-I	**Motherboard Components**	**Periods:9**	
Introduction to Hardware Software and Firmware - Mother Board- IO and memory expansion slots- SMPS- Drives- front panel and rear panel connectors- Processors - Chipsets . Bus Standards: Overview and features of PCI, AGP, PCMCIA			**CO1**
UNIT-II	**Primary Memory Storage Devices**	**Periods:9**	
Introduction to Primary Memory- Main Memory, Cache memory – DDR, DDR2, DDR3, DDR4, DDR5, Low power DDR -Reading memory error messages			**CO2**
UNIT-III	**Secondary and Removable Storage Devices**	**Periods:9**	
Secondary Storage: Hard Disk Drive- IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting, SSD, Removable Storage: CD-R, CD-RW,DVD - ROM and DVD - RW, USB.			**CO3**
UNIT-IV	**Installation and Preventive Maintenance**	**Periods:9**	
Introduction – System configuration – Pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery			**CO4**
UNIT-V	**Troubleshooting Hardware Problems**	**Periods:9**	
Troubleshooting Tools: Software Diagnostic Disk -Multimeter- Cable tester-Troubleshooting Power-Supply Problems- Troubleshooting RAM problems - Troubleshooting HDD problems			**CO5**

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

Text Books

1. Craig Zacker & John Rourtre,"PC Hardware- The complete reference", TMH.
2. Mark Minosi," The Complete PC Upgrade & Maintenance Guide 4/e, BPB publications.
3. S.K. Chauhan, "PC Upgrading, maintenance and troubleshooting guide",
4. Charles J.Brooks," PC Maintenance and Troubleshooting Field Guide",Pearson IT Certification Publishers

Reference Books

1. Dr. Ajay Rana and Dr. Ajit Mittal, Mastering PC Hardware & Networking, latest edition, Khanna Publishers
2. Balasubramanian D, Computer Installation and Servicing 2nd Edition , McGraw hill Publications, 2010
3. Hans Peter Messmer, Indispensable PC Hardware Book, Pearson Education, 4th Edition, 2003.
4. Scott Muller, Upgrading and Repairing PCs, 15th Edition, 2002.

Web References

1. https://edu.gcfglobal.org/en/computerbasics/basic-troubleshooting-techniques/1/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
2	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
3	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
4	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
5	2	1	2	1	2	1	1	-	-	2	1	1	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	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	**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**	**3**	**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 Specific Outcomes (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	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITP503**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Information and Network Security Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
IT								
Prerequisite	Data Communication and Computer Networks							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
CO1	Demonstrate classical Encryption Techniques to solve the information security problems.	**K3**
CO2	Build cryptosystems by applying symmetric and public key encryption algorithms.	**K3**
CO3	Implement applications using key exchange and message authentication algorithms.	**K3**
CO4	Develop a digital signature scheme using Digital signature standard.	**K3**
CO5	Demonstrate the network security system using open source tools, Snort, Net Stumbler, KF Sensor	**K3**

List of Exercises

1. Implement the following substitution techniques:
    a. Caesar Cipher
    b. Playfair Cipher
    c. Hill Cipher
    d. Vigenere Cipher
2. Implement the following transposition techniques
    a. Rail fence
    b. Row & Column Transformation
3. Implement DES & AES algorithm for practical applications.
4. Implement RSA Algorithm for public key cryptography.
5. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
6. Calculate the message digest of a text using the SHA-3 algorithm.
7. Implementation of RSA based signature system using Digital signature standard.
8. Learn to install Virtual Box or any other equivalent software on the host OS.
9. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
10. Setup a honey pot and monitor the honeypot on network. (KF Sensor)
11. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net Stumbler)
12. Demonstrate Intrusion Detection System (IDS) using Snort Tool

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

Reference Books

1. William Stallings, “Cryptography and Network Security Principles and Practice”, Pearson Publishers, Eighth Edition, 2023.
2. Michael Gregg,Build Your Own Security Lab: A field guide for network Testing, Wiley,India edition, ISBN: 9788126516919.
3. Arthur Cobnklin, ‘Principles of Computer Security CompTIA Security+ and Beyond’, Greg White 5th Edition,2018,McGraw-Hill Education.

Web References

1. https://www.coursera.org/learn/-network-security
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. https://www.imperva.com/learn/data-security/information-security-infosec/
5. https://www.udemy.com/course/infosec-fundamentals/
6. https://archive.nptel.ac.in/courses/106/106/106106129/
7. https://www.snort.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	2	-	-	-	-	1	-	-	1	-	1
2	3	2	2	2	2	-	-	-	-	1	-	-	2	-	1
3	3	2	2	2	2	1	-	-	-	1	-	-	2	-	1
4	3	3	2	2	2	-	-	-	-	1	-	-	2	-	1
5	3	3	2	2	2	1	-	-	-	1	-	-	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	**Information Technology**		Programme: **B.Tech.**					
Semester	**V**		Course Category Code: **ES**			*End Semester Exam Type: **LE**		
Course Code	**U23ITP504**		Periods / Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Data Analytics Laboratory**		**0**	**0**	**2**	**1**	**50**	**50**	**100**
IT								
Prerequisite	Probability and Statistics, Programming in Python							
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Demonstrate the ability to install necessary software and set up environments to perform data analytics tasks						**K3**
	CO2	Implement data collection and importing data techniques.						**K3**
	CO3	Analyze and preprocess and encoding categorical variables to prepare datasets for analysis.						**K4**
	CO4	Implement visualization techniques to visualize data						**K3**
	CO5	Apply various machine learning models for classification and clustering.						**K3**

List of Exercises

1. Introduction to Data Analytics Tools
   - Install Python/R and set up Jupyter Notebook/RStudio.
   - Perform basic operations: importing libraries, reading datasets and Implement DES algorithm for practical applications.
2. Perform web scraping to collect data using Python libraries like BeautifulSoup/Scrapy. Fetch data from APIs and import it into Python/R. Import datasets from various formats (CSV, Excel, SQL databases).
3. Handle missing data using techniques like mean/mode imputation and removal. Perform data normalization and standardization. Encode categorical variables using techniques like one-hot encoding.
4. Compute descriptive statistics (mean, median, mode, variance, standard deviation) and create basic visualizations: histograms, bar charts, and box plots using Matplotlib/Seaborn.
5. Create advanced visualizations: scatter plots, pair plots, heatmaps. Conduct correlation analysis and visualize correlations using heatmaps.
6. Implement logistic regression and evaluate the model using confusion matrix, accuracy, precision, recall, and F1 score.
7. Build and visualize decision trees, prune decision trees and evaluate their performance
8. Implement K-Means clustering and determine the optimal number of clusters using the elbow method.
9. Visualize time series data and identify patterns and implement simple time series forecasting models such as moving averages and ARIMA
10. Implement the Apriori algorithm to find frequent itemsets. Conduct market basket analysis and generate association rules
11. Hadoop and Spark: setup and basic operations and Implement basic data processing tasks using PySpark.

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

Reference Books

4. Python for Data Analysis" by Wes McKinney
5. "R for Data Science" by Hadley Wickham and Garrett Grolemund

Web References

1. https://researchportal.vub.be/en/organisations/data-analytics-laboratory
2. https://link.springer.com/article/10.1023/A:1019299211575

COs/POs/PSOs Mapping

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

Department	**Information Technology**	Programme: **B. Tech.**						
Semester	**V**	Course Category Code: **PA**				*End Semester Exam Type: -		
Course Code	**U23ITW501**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Micro Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
IT								

Prerequisite	Programming Languages, IT Essentials		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	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	**Information Technology**	Programme: **B. Tech.**						
Semester	**V**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23ITC5XX**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Certification Course - V**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
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 Methods

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **MC**			*End Semester Exam Type: -			
Course Code	**U23ITM505**	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	**K2**
	CO2 Distinguish the Indian languages and literature	**K2**
	CO3 Describe the philosophy of ancient, medieval and modern India	**K2**
	CO4 Illustrate the information about the fine arts in India	**K2**
	CO5 Describe the contribution of scientists of different eras	**K2**

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. 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

Department	**Information Technology**	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	Engineering Mathematics, Artificial Intelligence, Data Analytics	
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

7. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, The MIT Press, 2014
8. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2015
9. 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	3	2	1	2	-	-	-	-	-	-	2	3	2	-
2	3	3	3	2	3	-	-	-	-	-	-	3	3	3	2
3	3	3	2	1	2	-	-	-	-	-	-	2	3	2	-
4	3	3	3	3	3	-	-	-	-	-	-	3	3	3	2
5	3	3	3	3	3	-	-	-	-	-	-	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
Course Code	**U23ITT608**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Mobile Application Development**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Programming in JAVA, Database Management Systems							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Exhibit the knowledge on Android devices and platforms.	**K2**
	CO2 Build android applications using the core android design components	**K3**
	CO3 Design and develop sophisticated mobile interfaces using rapid prototyping techniques.	**K3**
	CO4 Use simulator tools to test and publish the application.	**K3**
	CO5 Create interactive applications in android using databases with multiple activities including audio, video and notifications and deploy them in marketplace	**K3**

Unit- I	**Introduction To Android**	**Periods: 09**
Introduction to Android: The Android Platform- Android SDK - Eclipse Installation - Android Installation. Building you First Android application - Understanding Anatomy of Android Application - Android Manifest file		**CO1**
Unit- II	**Android Application Design Essentials**	**Periods: 09**
Anatomy of Android applications - Android terminologies. Application Context - Activities - Services - Intents - Receiving and Broadcasting Intents. Android Manifest File and its common settings - Using Intent Filter – Permissions		**CO2**
Unit- III	**Android User Interface Design & Multimedia**	**Periods: 09**
User Interface Screen elements - Designing User Interfaces with Layouts - Drawing and Working with Animation. Playing Audio and Video - Recording Audio and Video - Using the Camera to Take and Process Pictures		**CO3**
Unit- IV	**Testing Android applications**	**Periods: 09**
Testing Android applications - Publishing Android application - Using Android preferences. Managing Application resources in a hierarchy - Working with different types of resources - Memory Management		**CO4**
Unit- V	**Android APIs**	**Periods: 09**
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		**CO5**

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

Text Books

11. Ricardo Costeira , Fuad Kamal , Kevin D. Moore ,“Android Fundamentals by Tutorials : Build Android Apps With Kotlin & Jetpack Compose”, Kodeco Inc., 2024
12. Reto Meier, “Professional Android 4 Application Development”, Wrox., 2012
13. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd Edition, 2011

Reference Books

14. Bill Phillips, Chris Stewart and Kristin Marsicano, “Android Programming: The Big Nerd Ranch Guide”, 4th Edition, Big Nerd Ranch Guides, 2019
15. Dawn Griffiths and David Griffiths, “Head First Android Development”, 1st Edition, O‟ Reilly SPD Publishers, 2015
16. Erik Hellman, “Android Programming - Pushing the Limits”, 1st Edition, Wiley India Pvt. Ltd., 2014
17. Ed Burnette, Hello Android: Introducing Google's Mobile Development Platform, The Pragmatic Publishers, North Carolina USA, 3rd Edition, 2010
18. Mark L Murphy, “Beginning Android”, Wiley India Pvt. Ltd., 2009

Web References

1. https://developer.android.com/training/basics/firstapp
2. Google Developer Training, "Android Developer Fundamentals Course - Concept Reference”, Google Developer Training Team, 2017

COs/POs/PSOs Mapping

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	3	1	-	-	-	-	-	2	3	2	1
2	3	3	3	2	3	-	-	-	-	-	-	2	3	3	2
3	3	3	3	2	3	-	-	-	-	2	-	2	3	3	2
4	3	3	3	2	3	-	-	-	-	-	-	3	3	3	2
5	3	3	3	3	3	1	-	-	2	-	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23ITT609**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Blockchain Technology**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Database Management Systems, Information and Network Security							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Articulate the basic concepts of Block Chain Technologies.	**K2**
	CO2 Explain the functional /operational aspects of Cryptocurrency Ecosystem	**K2**
	CO3 Develop an application using Ethereum	**K3**
	CO4 Compute models for Block Chain Technology	**K3**
	CO5 Implement applications in diverse domains using Block chain technology.	**K3**

Unit- I	**Introduction to Block Chain**	**Periods: 09**	
Block Chain - History of Block Chain – Types of Block Chain – Consensus – CAP Theorem and Block Chain – Decentralization using Block Chain – Block Chain and full ecosystem decentralization – Platforms for decentralization.			**CO1**
Unit- II	**Introduction to Cryptocurrency**	**Periods: 09**	
Bitcoin – Digital keys and addresses – Transactions – Mining – Bitcoin Network and Payments – Wallets – Bitcoin Payments Alternative coins – Theoretical Foundations - Bitcoin limitations – Name coin – Lite coin – Prime coin – Zcash – Smart contracts – Ricardian contracts.			**CO2**
Unit- III	**Ethereum**	**Periods: 09**	
Introduction – Ethereum network – Components of the Ethereum ecosystem – Programming Languages – Ethereum Development Environment – Development Tools and Frameworks. Illustrative: Setup the Ethereum development environment.			**CO3**
Unit- IV	**Web3 and Hyperledger**	**Periods: 09**	
Introduction to Web3 – Contract Deployment – Development Frameworks – Hyperledger as a protocol – Reference Architecture – Hyperledger Fabric - Sawtooth Lake – Corda.			**CO4**
Unit- V	**Block Chain Applications**	**Periods: 09**	
IoT with Block Chain – Block Chain based voting system - Border Control – Medical Record Management System - Alternative Blockchains – Kadena – Ripple – Rootstock – Quorum - Scalability – Privacy – Other Challenges			**CO5**

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

Text Books

10. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, 2nd Edition, Packt Publishing, 2018
11. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016
12. Roberto Infante, "Building Ethereum Dapps: Decentralized Applications on the Ethereum Blockchain", O’Reilly, 2019

Reference Books

1. Andreas M. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, 2nd Edition, O’Reilly, 2015
2. Andreas M. Antonopoulos, “Mastering Ethereum: Building Smart Contracts and DApps”, 1st Edition, O’Reilly, 2018
3. Narayan Prusty, “Building Blockchain Projects”, Packt, 2017

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6. https://nptel.ac.in/courses/106/105/106105152/
7. https://www.coursera.org/learn/machine-learning
8. https://machinelearningmastery.com/
9. https://towardsdatascience.com/machine-learning/home/
10. 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	1	1	2	-	-	-	-	-	-	2	3	2	1
2	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
3	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
4	3	3	3	3	3	-	-	-	-	-	-	3	3	3	3
5	3	3	3	3	3	-	2	2	2	2	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
	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	**VI**	Course Category Code :**PE**			End Semester ExamType:**TE**			
Course Code	**U23ITE610**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Quantum Computing**	**2**	**1**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Quantum Mechanics, Probability, Computing							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain the basics of quantum mechanics	**K2**
	CO2 Identify Different Qubits and Gates used for quantum operations	**K2**
	CO3 Apply Different Quantum Algorithms with gates and circuits	**K3**
	CO4 Summarize Various Quantum error correction algorithms.	**K3**
	CO5 Demonstrate the real-time applications of quantum computing.	**K3**

UNIT-I	**Quantum Computing Concepts**	**Periods:09**	
Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions			**CO1**
UNIT-II	**Quantum Gates and Circuits**	**Periods:09**	
Universal logic gates - Basic single qubit gates - Pauli Gates - Hadamard Gate - Phase Gate - Multiple qubit gates: Controlled Gates - SWAP Gate - Toffoli Gate - Circuit development - Quantum error correction			**CO2**
UNIT-III	**Quantum Algorithms**	**Periods:09**	
Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm – Quantum Counting			**CO3**
UNIT-IV	**Quantum Information Theory**	**Periods:09**	
Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels – Quantum Information over Noisy Quantum Channels.			**CO4**
UNIT-V	**Quantum Cryptography**	**Periods:09**	
Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm – Quantum Cryptography - Quantum Key Distribution - BB84 - Ekart 91			**CO5**

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

Text Books

1. Parag K Lala, "Quantum Computing, A Beginners Introduction", First edition, Mc Graw Hill Education, 2020
2. Chris Bernhardt, "Quantum Computing for Everyone", MIT Press, 2020
3. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.

Reference Books

1. Norlen, H.,"Quantum Computing in Practice with Qiskit and IBM Quantum Experience",Packt Publishing, 2020
2. Johnston, E. R., Harrigan, N., & Gimeno-Segovia, M, "Programming Quantum Computers: Essential Algorithms and Code Samples". O'Reilly Media, 2019
3. Rieffel, E. G., & Polak, W. H., "Quantum Computing: A Gentle Introduction", MIT Press, 2011

Web References

1. https://learn.microsoft.com/en-us/azure/quantum/
2. https://quantum.ibm.com/
3. https://www.nist.gov/programs-projects/quantum-information-program

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	2	-	-	-	-	-	-	2	3	2	1
2	3	3	2	2	2	-	-	-	-	-	-	2	3	2	2
3	3	3	3	2	3	-	-	-	-	-	-	3	3	3	2
4	3	3	3	3	3	-	-	-	-	-	-	3	3	3	3
5	3	3	3	3	3	-	2	2	2	2	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
	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	**VI**		Course Category Code:**PE**			*End Semester Exam Type:**TE**		
Course Code	**U23ITE612**		Periods/Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Full Stack Development**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT									
Prerequisite	Database Management System, Web Application Development								
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Describe the various stacks available for web application development						**K2**
	CO2	Use Node.js for application development						**K3**
	CO3	Develop applications with MongoDB						**K3**
	CO4	Use the features of Angular and Express						**K3**
	CO5	Develop React applications						**K3**

Unit-I	**Basics of Full Stack**	**Periods:09**	
Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular– Node – Mongo DB – React			**CO1**
Unit-II	**Node Js**	**Periods:09**	
Basics of Node JS – Installation – Working with Node packages – Using Node package manager –Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js			**CO2**
Unit-III	**Mongo DB**	**Periods:09**	
Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts –Access control – Administering databases – Managing collections – Connecting to MongoDB fromNode.js – simple applications			**CO3**
Unit-IV	**Express and Angular**	**Periods:09**	
Implementing Express in Node.js - Configuring routes - Using Request and Response objects -Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives			**CO4**
Unit-V	**React**	**Periods:09**	
MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering			**CO5**

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

TextBooks

1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and Angular Web Development”, Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node”, Second Edition, Apress, 2019.
3. Jennifer Niederst Robbins, "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics", Dokumen Publication,2018

Reference Books

1. Chris Northwood, “The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer”, Apress; 1st edition, 2018
2. Kirupa Chinnathambi, “Learning React: A Hands-On Guide to Building Web Applications using React and Redux”, Addison-Wesley Professional, 2nd edition, 2018

Web References

1. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. https://www.coursera.org/specializations/full-stack-react
3. https://www.udemy.com/course/the-full-stack-web-development/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	2	-	-	-	2	2	1	2	2	3	1
2	3	3	3	2	3	-	-	-	2	2	2	3	3	3	2
3	3	3	3	3	3	-	-	-	3	2	2	3	3	3	2
4	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3
5	3	3	3	3	3	-	2	2	3	3	2	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE613**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Edge and Fog Computing**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Database Management Systems, Computer Networks							

Course Outcomes	**On completion of the course, the students will be able to**		**BT Mapping (Highest Level)**
	CO1	Explain the fundamentals of Fog and Edge Computing	**K2**
	CO2	Explain the various Challenges in Federating Edge	**K2**
	CO3	Apply the concept of optimization and middleware	**K3**
	CO4	Infer the Data Management methodologies in Fog Computing	**K3**
	CO5	Apply the Computing techniques in building applications	**K3**

UNIT-I	**Introduction**	**Periods: 09**	
Fog and Edge Computing Completing the Cloud - Advantages of FEC: SCALE - FEC Advantages: SCANC - Hierarchy of Fog and Edge Computing			**CO1**
UNIT-II	**Challenges in Federating Edge Resources**	**Periods: 09**	
Introduction - Networking Challenges - Management Challenges - Edge-as-a-Service (EaaS) Platform - Edge Node Resource Management (ENORM) Framework - Miscellaneous Challenges			**CO2**
UNIT-III	**Optimization and Middleware**	**Periods: 09**	
Optimization Problems in Fog and Edge Computing, Middleware for Fog and Edge Computing : Design Issues			**CO3**
UNIT-IV	**Data Management in Fog Computing**	**Periods: 09**	
Introduction - Fog Data Management - Fog Data Life Cycle - Data Characteristics - Data Pre-Processing and Analytics - Data Privacy - Data Storage and Data Placement			**CO4**
UNIT-V	**Applications and Issues**	**Periods: 09**	
Exploiting Fog Computing in Health Monitoring - Testing Perspectives of Fog-Based IoT Applications - Legal Aspects of Operating IoT Applications in the Fog			**CO5**

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

Text Books

1. Rajkumar Buyya, Satish Narayana Srirama,"Fog and Edge Computing: Principles and Paradigms", Wiley, 2019.
2. Wei Chang ,Jie Wu, "Fog/Edge Computing For Security, Privacy, and Applications" , Springer, 2021.
3. Taehong Kim, Seong-Eun Yoo, Youngsoo Kim, " Edge/Fog Computing Technologies for IoT Infrastructure " , MDPI , 2021.

Reference Books

1. Taehong Kim, Seong-Eun Yoo, Youngsoo Kim, " Edge/Fog Computing Technologies for IoT Infrastructure " , MDPI , 2021.
2. Muhammad Maaz Rehan ," Blockchain-Enabled Fog and Edge Computing Concepts Architectures and Applications ", Taylor & Francis/Routledge , 2022.
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010.

Web References

1.https://www.mdpi.com/1424-8220/21/24/8226

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	2	-	-	-	2	2	1	2	3	3	2
2	3	3	2	2	2	-	-	-	2	2	2	2	3	2	2
3	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3
4	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3
5	3	3	3	3	3	-	-	-	3	3	2	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	**Information Technology**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PE**		*End Semester Exam Type:**TE**		
Course Code	**U23ITEC01**			Periods/Week			Credit	Maximum Marks
				L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Software Defined Networks**			**3**	**-**	**-**	**3**	**25**	**75**	**100**
Common to IT and CCE								
Prerequisite	Data Communication and Computer Networks							
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Explain the basics of networking and working of SDN						**K2**
	CO2	Articulate SDN controllers						**K3**
	CO3	Infer various Emerging Protocol, Controller, and Application Models						**K2**
	CO4	Relate technologies adopted in Data Center						**K4**
	CO5	Expound the exploration of SDN in other environments						**K2**
UNIT-I	**Introduction**						**Periods:9**	
History of Software Defined Networking (SDN) - Modern Data Center - Traditional Switch Architecture - Evolution of Switches and Control Planes, Data Center Needs, The Evolution of Networking Technology, Evolution of SDN - SDN Working - Centralized and Distributed Control and Data Planes								**CO1**
UNIT-II	**Open Flow & SDN Controllers**						**Periods:9**	
OpenFlow Overview - Potential Drawbacks of Open SDN - OpenDaylight - Floodlight controllers - SDN via APIs - SDN via Hypervisor - Based Overlays - SDN via Opening Up the Device - Alternatives Overlap and Ranking								**CO2**
UNIT-III	**Emerging Protocol, Controller, and Application Models**						**Periods:9**	
Expanded Definitions of SDN - SDN Protocol Models - SDN Controller Models - Application Models - New Approaches to SDN Security - The P4 Programming Language - SDN programming interfaces								**CO3**
UNIT-IV	**Data Center**						**Periods:9**	
Data Center Definition - Data Center Demands - Tunneling Technologies for the Data Center - Path Technologies in the Data Center - Ethernet Fabrics in the Data Center - SDN Use Cases in the Data Center - Comparison of Open SDN - Overlays and APIs - Real-World Data Center Implementations								**CO4**
UNIT-V	**SDN in Other Environments**						**Periods:9**	
Wide Area Networks - Service Provider and Carrier Networks - Campus Networks - Hospitality Networks - Mobile Networks - Optical Networks - SDN vs P2P/Overlay Networks - Network Function Virtualization - SDN Platforms -Juniper - IETF								**CO5**
Lecture Periods:45		**Tutorial Periods: -**		**Practical Periods:-**			**Total Periods:45**	

Text Books

1. P. Goransson, C. Black, T. Culver," Software Defined Networks - A Comprehensive Approach", 2nd Edition, Elsevier, October 20, 2016
2. Siamak Azodolmolky, "Software Defined Networking with OpenFlow", Packt, October 2013
3. Patricia A. Morreale, James M. Anderson," Software Defined Networking", CRC Press, 2014

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1. Anand Nayyar (Editor), Bhawna Singla (Editor), Preeti Nagrath (Editor), "Software Defined Networks: Architecture and Applications", Wiley, June 2022
2. Doug Marschke, Jeff Doyle, Pete Moyer, "Software Defined Networking (SDN): Anatomy of OpenFlow", Volume I, Lulu Publishing Services, April 3, 2015
3. Paul Goransson, Chuck Black, Timothy Culver, "Software Defined Networks: A Comprehensive Approach",2nd Edition,2016

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1. https://sdn.systemsapproach.org/
2. https://www.ciscopress.com/articles/article.asp?p=3145761&seqNum=4

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
2	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
3	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
4	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
5	2	1	2	1	2	1	1	-	-	2	1	1	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	10		5	5	5	75	100

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITEC02**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Natural Language Processing**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Common to IT and CCE								
Prerequisite	Engineering Mathematics, Artificial Intelligence, Machine Learning							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain the Fundamental Models in NLP	**K2**
	CO2 Describe various Language Models in NLP	**K2**
	CO3 Perform POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language	**K3**
	CO4 Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology	**K3**
	CO5 Apply learning algorithms for various NLP applications	**K3**

Unit-I	**Introduction to NLP**	**Periods:09**
Introduction to NLP - Various stages of NLP - The Ambiguity of Language: NLP Is Difficult. Parts of Speech: Nouns and Pronouns, Words: Determiners and adjectives - verbs - Phrase Structure. Statistics Essential Information Theory: Entropy – perplexity - The relation to language - Cross entropy		**CO1**
Unit-II	**Language Modelling**	**Periods:09**
Words: Collocations - Frequency-Mean and Variance - Hypothesis testing: The t test, Hypothesis testing of differences, Pearson's chi-square test, Likelihood ratios. Statistical Inference: n - gram Models over Sparse Data: Bins: Forming Equivalence Classes - N gram model - Statistical Estimators - Combining Estimators		**CO2**
Unit-III	**Markov Model and POS Tagging**	**Periods:09**
Markov Model: Hidden Markov model - Fundamentals - Probability of properties - Parameter estimation - Variants - Multiple input observation. The Information Sources in Tagging: Markov model taggers - Viterbi algorithm - Applying HMMs to POS tagging - Applications of Tagging		**CO3**
Unit-IV	**Probabilistic Context Free Grammars and Probabilistic parsing**	**Periods:09**
The Probability of a String - Problems with the Inside-Outside Algorithm - Parsing for disambiguation - Tree banks - Parsing models vs. language models - Phrase structure grammars and dependency - Lexicalized models using derivational histories, Dependency - models.		**CO4**
Unit-V	**NLP Applications**	**Periods:09**
Text Alignment - Word Alignment - Clustering - Vector Space Model - Term Distribution Model - Latent Semantic Indexing - Discourse Segmentation - Decision Trees - Maximum Entropy Modeling - k- Neighbor Classification		**CO5**

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

Text Books

1. Christopher D. Manning and Hinrich Schutze, "Foundations of Natural Language Processing", 6th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
2. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 3rd Edition, Prentice Hall, 2024
3. T V Geetha," Understanding Natural Language Processing", Pearson,2024

Reference Books

1. NitinIndurkhya, Fred J. Damerau "Handbook of Natural Language Processing", 2nd Edition, CRC Press, 2010
2. James Allen "Natural Language Understanding", Pearson Publication, 8th Edition, 2012
3. Chris Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd Edition, MIT Press Cambridge, MA, 2003
4. Hobson lane, Cole Howard, Hannes Hapke, "Natural Language Processing in Action", MANNING Publications, 2019
5. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012

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1. https://machinelearningmastery.com/natural-language-processing/
2. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1
3. https://www.nlp.com/what-is-nlp/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
2	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
3	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
4	1	2	2	2	1	-	-	-	-	1	-	-	3	1	-
5	3	1	2	2	1	-	-	-	-	1	-	-	3	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	**Management Studies**	Programme : B.Tech						
Semester	**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: -**	**Practical Periods: -**	**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.

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

6. Ulrich KT, Eppinger SD. Product design and development. 7th edition. McGraw-Hill Education; 2020.
7. Crawford CM, Di Benedetto A. New products management. 11th edition. McGraw-Hill Education; 2014.
8. 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.

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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

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	-	-	2
CO2	1	-	2	1	3	-	-	1	-	1	-	3	-	2	-
CO3	1	1	3	-	2	-	1	-	2	-	1	2	2	-	-
CO4	3	-	1	1	3	1	-	1	2	-	1	1	2	-	2
CO5	1	-	3	-	3	-	-	-	2	-	1	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	**Management Studies**	Programme : B.Tech						
Semester	**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: -**	**Practical Periods: -**	**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

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	-	-	2
CO2	1	2	1	-	1	2	1	2	-	3	1	-	2	-	-
CO3	-	3	3	-	1	3	1	2	-	3	1	1	-	-	2
CO4	1	2	-	2	1	1	2	1	1	2	1	-	-	2	2
CO5	-	3	-	-	2	3	2	2	1	2	2	3	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	**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.

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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

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	--	-	2	2
CO2	1	1	1	2	2	2	2	--	--	3	3	3	2	-	2
CO3	1	1	1	2	-	2	2	--	--	3	-	3	-	-	2
CO4	1	1	-	2	2	2	2	2	--	3	3	3	-	2	-
CO5	1	1	1	2	2	-	2	2	--	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	Management Studies	Programme: B. Tech						
Semester	VI	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

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
CO 2	1	2	1	-	1	2	1	2	-	2	1	1	2	2	-
CO 3	1	2	3	-	1	2	1	2	-	2	1	1	2	-	2
CO 4	1	1	3	-	2	1	2	1	1	2	2	1	-	2	2
CO 5	1	3	2	2	2	3	2	2	1	2	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	**Information Technology**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PC**		*End Semester Exam Type:**TE**		
Course Code	**U23ITB603**			Periods/Week			Credit	Maximum Marks
				L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**IoT Programming**			**2**	**-**	**2**	**3**	**50**	**50**	**100**
				IT						
Prerequisite	Basics of Programming in Python									

Course Outcomes	**On completion of the course, the students will be able to**		**BT Mapping (Highest Level)**
	CO1	Recognize the IoT's underlying technology and architecture.	**K2**
	CO2	Explain the basic concepts of IoT devices using popular IoT platforms.	**K2**
	CO3	Apply IoT protocols, Networking and Troubleshooting techniques.	**K3**
	CO4	Develop simple and practical IoT solutions using Python for real-world applications.	**K3**
	CO5	Understand and apply sensor data reading and actuator control in IoT systems using Python.	**K3**

UNIT-I	**IoT Fundamentals**	**Periods:10**
Introduction to IoT, IoT architecture, IoT Levels and deployment template, Physical Design of IoT - Things in IoT - Logical Design of IoT, IoT security and privacy, IoT standards and ecosystems.		**CO1**
UNIT-II	**IoT Platforms and Programming**	**Periods:10**
Introduction to popular IoT platforms, programming IoT devices working with sensors and actuators, IoT device management, IoT device lifecycle, IoT edge computing, IoT cloud computing, applications of IoT in various fields like healthcare, agriculture, transportation, smart cities, industrial IoT.		**CO2**
UNIT-III	**IoT Protocols, Networking and Troubleshooting**	**Periods:10**
Introduction to IoT protocols, MQTT, CoAP, HTTP, WebSocket's, IoT data protocols, IoT networking, IoT network security, analyzing IoT systems, troubleshooting common IoT issues, IoT testing and debugging.		**CO3**
UNIT-IV	**IoT Applications**	**Periods:15**
List of Exercises 1. Write a Python program that uses classes and objects to simulate a simple IoT device. 2. Develop a Python program that uses classes and objects to create a virtual environment for an IoT device. 3. Implement a Python program that uses classes and objects to simulate a network of IoT device. 4. Develop an IoT system to create a traffic light system using LEDs in the Raspberry Pi kit. 5. Implement an IoT system to create a LED light show using Python and Raspberry Pi. 6. Create a smart door lock system using IoT which can be controlled remotely using Python.		**CO4**
UNIT-V	**IoT Troubleshooting**	**Periods:15**
List of Exercises 1. Develop a simple IoT system to monitor soil moisture for smart agriculture using Python. 2. Develop a simple IoT system to monitor humidity using a humidity sensor and Python. 3. Write a Python program to read data from a temperature sensor connected to an IoT device. 4. Implement a Python program to measure speed using an ultrasonic sensor in an IoT device. 5. Develop a Python program for basic image detection using a camera module in an IoT device. 6. Implement a Python program to debug and troubleshoot an IoT application.		**CO5**

LecturePeriods:30	**Tutorial Periods:**	**Practical Periods:30**	**Total Periods:60**

Text Books

1."Internet of Things: A Hands-On Approach", Arshdeep Bahga and Vijay Madisetti, Universities Press, 2014.
2."Programming the Internet of Things: An introduction to building integrated, device-to-cloud IoT solutions", Dawid Borycki, Microsoft Press, 2020.
3."Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Daniel Minoli, Wiley, 2013.

Reference Books

1. "Internet of Things: Principles and Paradigms", Rajkumar Buyya and Amir Vahid Dastjerdi, Morgan Kaufmann, 2016.
2. "Designing the Internet of Things", Adrian McEwen and Hakim Cassimally, Wiley, 2013.
3. "Architecting the Internet of Things", Dieter Uckelmann, Mark Harrison, and Florian Michahelles, Springer, 2011.
4. "Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud", Cuno Pfister, O'Reilly Media, 2011.
5. "Enterprise IoT: Strategies and Best Practices for Connected Products and Services", Dirk Slama, Frank Puhlmann, Jim Morrish, and Rishi M Bhatnagar, O'Reilly Media, 2015

Web References

1. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
2. https://developer.mozilla.org/en-US/docs/Web/API/WebSockets_API
3. https://www.eclipse.org/paho/index.php?page=clients/python/index.php
4. https://www.postscapes.com/internet-of-things-protocols/
5. https://www.iotforall.com/iot-applications-in-agriculture/

COs/POs/PSOs Mapping

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

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	**Information Technology**	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	Engineering Mathematics, Artificial Intelligence, Data Analytics							

Course Outcomes	**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

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

Web References

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	-	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	**Information Technology**			Programme: **B. Tech.**				
Semester	**VI**			Course Category Code: **PC**			*End Semester Exam Type: **LE**	
Course Code	**U23ITP605**			Periods / Week			Credit	Maximum Marks
				L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Mobile Application Development Laboratory**			**0**	**0**	**2**	**1**	**50**	**50**	**100**
IT								
Prerequisite	Programming in Java							
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Develop mobile applications using GUI and Layouts.						**K2**
	CO2	Develop mobile applications using Event Listener.						**K3**
	CO3	Develop mobile applications using Databases.						**K3**
	CO4	Develop mobile applications using RSS Feed, SMS, Multithreading and GPS.						**K3**
	CO5	Analyze and discover own mobile app for simple needs.						**K4**

List of Exercises

1. Develop an application that uses GUI components, Font and Colors
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen
4. Develop an application that makes use of databases.
5. Write a mobile application that makes use of RSS feed
6. Develop an application that makes use of Notification Manager
7. Implement an application that uses Multi-threading
8. Develop a native application that uses GPS location information
9. Implement an application that creates an alert upon receiving a message
10. Develop a mobile application to send an email.
11. Create an application using Sensor Manager
12. Create an android application that converts the user input text to voice

Develop a Mobile application for simple needs (Mini Project)

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

Reference Books

1. Dr.K. Venkata Nagendra, “Mobile Application Development - Practical Approach”, 2020
2. Michael Gregg ,“Build Your Own Security Lab”,Wiley India, 2012

Web References

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	2	-	3	2	3	3	3
2	3	2	1	1	3	-	-	-	2	-	3	2	3	3	3
3	3	2	1	1	3	-	-	-	2	-	3	2	3	3	3
4	3	2	1	1	3	-	-	-	2	-	3	2	3	3	3
5	3	2	2	2	3	-	-	-	2	-	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	**Information Technology**		Programme: **B.Tech.**					
Semester	**VI**		Course Category Code: **PC**			*End Semester Exam Type: **LE**		
Course Code	**U23ITP606**		Periods / Week			Credit	Maximum Marks	
			L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Blockchain Technology Laboratory**		**0**	**0**	**2**	**1**	**50**	**50**	**100**
IT								
Prerequisite	Database Management Systems, Information and Network Security							
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Perform the operations on the Ethereum blockchain						**K3**
	CO2	Illustrate about Web3.js to interact with Smart Contracts						**K3**
	CO3	Creating and Deploying Hyperledger Fabric network						**K3**
	CO4	Create Smart Contract and Transactions using Solidity						**K3**
	CO5	Create Smart Contract and Transactions using Remix IDE						**K3**

List of Exercises

1a) Generate Public private key pairs for Bitcoin and Ethereum addresses

b) Connect to the Public/Testnet Ethereum Blockchain network using popular wallets (Metamask, Brave browser) and understand various terminologies like gas, gas fee, gas price, priority fee

2. Send test ether from one account to another

3. Send test ether to smart contract

4. Create a Private Ethereum Blockchain network

5. Using Web3.js to Transfer Ether from one account to another account

6. Using Web3.js to Interact with Smart Contracts

7. Create a Hyperledger Fabric Permissioned blockchain network

8. Write, deploy and execute chain code in Hyperledger Fabric network

9. Creating Smart Contract using Solidity and Remix IDE

10. Creating Transactions using Solidity and Remix IDE

11. Embedding wallet and transaction using Solidity

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

Web References

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	-	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	**Information Technology**	Programme: **B. Tech.**						
Semester	**VI**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23ITW602**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Mini Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
IT								
Prerequisite	Programming Languages, IT Essentials							

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	**Information Technology**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **AEC**			End Semester Exam Type: -			
Course Code	**U23ITC6XX**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Certification Course - VI**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
IT								
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	**Information Technology**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **MC**			End Semester Exam Type : -			
Course Code	**U23ITM606**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Gender Equality**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

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
5. https://wcd.nic.in

COs/POs/PSOs Mapping

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

Department	**Information Technology**		Programme: **B.Tech.**					
Semester	**VII**		Course Category Code: **PC**			*End Semester Exam Type: **TE**		
Course Code	**U23ITT710**		Periods / Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Neural Network and Deep Learning**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT									
Prerequisite	Computer Networks								
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)	
	CO1	To understand Neural Network basics and Types						**K2**	
	CO2	To understand various neural network models						**K2**	
	CO3	Implement the deep learning techniques using software tools.						**K3**	
	CO4	To analyze the Spin Glass Model and Deep Belief Networks						**K2**	
	CO5	To Develop smart applications for various domains						**K3**	

Unit- I	**Neural Networks**	**Periods: 09**	
Overview of biological neurons: Structure of biological neuron - neurobiological analogy - Biological neuron equivalencies to artificial neuron model - Evolution of neural network. Terminologies: Learning rate - Bias - Variance - underfitting - Overfitting. Activation Function: Binary step – Linear – ReLU – LeakyReLU – Sigmoid – Tanh – Softmax – Gradient Descent and Stochastic Gradient Descent - ANN Architecture: Feed forward network - Feed backward network - Single and multilayer network - fully recurrent network			**CO1**
Unit- II	**Models of Neural Network**	**Periods: 09**	
McCulloch and Pits Neural Network (MCP Model): Architecture - Solution of AND, OR function using MCP model - Hebb Model: Architecture - training and testing - Hebb network for AND function. Perceptron Network: Architecture – training – Testing - single and multi-output model - Perceptron for AND function			**CO2**
Unit- III	**Deep Learning**	**Periods: 09**	
Deep Learning - Different types of Deep Neural Networks - CNN - RNN - LSTM - forward propagation - Cost function - backpropagation. APIs using Softwares Tensorflow and Keras			**CO3**
Unit- IV	**Boltzmann Machines**	**Periods: 09**	
Introduction to Boltzmann Machine - Energy-Based Models - Restricted Boltzmann Machine - Contrastive Divergence - Deep Belief Networks - Deep Boltzmann Machine - Basics of Generative adversarial Networks and Autoencoders			**CO4**
Unit- V	**Smart Applications**	**Periods: 09**	
Smart Agriculture - Smart Transportation and Autonomous Vehicles - Smart Homes - Smart Cities - Image Processing - Natural Language Processing - Speech Recognition - Video Analytics			**CO5**

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

Text Books

1. Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, "Dive into Deep Learning", Amazon Science,2022.
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
3. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
4. AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017.

Reference Books

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
2. 2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.
3. 3. Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016.

Web References

1. https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/
2. https://www.coursera.org/learn/neural-networks-deep-learning
3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
2	3	3	3	-	3	2	-	-	-	-	-	-	3	2	2
3	3	3	2	2	2	-	-	-	-	-	-	-	3	2	1
4	3	2	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
Course Code	**U23ITT711**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cloud Computing and Virtualization**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								

Prerequisite	Internet Programming, Data communication and Computer Networks	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 To understand the fundamentals of Cloud Computing and its evolution	**K2**
	CO2 To understand the cloud infrastructures	**K2**
	CO3 To gain knowledge on the concept of virtualization that is fundamental to cloud computing	**K3**
	CO4 To learn programming and software environments for cloud	**K2**
	CO5 To understand the security issues in cloud computing	**K3**

Unit- I	**Introduction**	**Periods: 09**	
Technologies for Network based systems - System Models for Distributed and Cloud Computing - NIST Cloud Computing Reference Architecture - Reference Architectural Components - Cloud Computing and Service Models - Cloud Computing Characteristics - Cloud Services - Cloud Models (IaaS, PaaS, SaaS) - Cloud Ecosystem and enabling technologies			**CO1**
Unit- II	**Cloud Infrastructure**	**Periods: 09**	
Architectural Design of Compute and Storage Clouds - Layered Cloud Architecture Development - Design Challenges - Inter Cloud Resource Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources			**CO2**
Unit- III	**Virtualization**	**Periods: 09**	
Introduction - Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU - Memory and I/0 Devices - Virtual Cluster and Resource Management - Virtualization for Data Center Automation – Hypervisor- VMware			**CO3**
Unit- IV	**Cloud Programming and Software Environments**	**Periods: 09**	
Parallel and Distributed Programming paradigms – Programming on Amazon AWS and Microsoft Azure – Programming support of Google App Engine – Emerging Cloud software Environment.			**CO4**
Unit- V	**Security**	**Periods: 09**	
Security management in Peer-to-Peer networks - Peer trust and Reputation Systems - Trust overlay and DHT implementation - Power Trust - Securing Overlays. Cloud Security and Trust Management - Defense Strategies - Distributed Intrusion Detection - Data and Software Protection Techniques			**CO5**

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

Text Books

1. Douglas Comer, "The Cloud Computing Book - The Future of Computing Explained", CRC Press, 1st Edition, 2021.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012.
3. Barrie Sosinsky, "Cloud Computing Bible", John Wiley & Sons, 2010.
4. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, 2009.

Reference Books

1. Chris Dotson ,"Practical Cloud Security: A Guide For Secure Design and Deployment",1st Edition,2019.
2. Michael Wittig and Andreas Wittig," Amazon Web Services in Action",2nd Edition,2018.
3. Arshdeep Bahga and Vijay Madisetti," Cloud Computing: A Hands-On Approach",1st Edition,2013.

Web References

1. https://www.simplilearn.com/tutorials/cloud-computing-resources/cloud-computing-material/
2. https://www.ncsc.gov.uk/collection/cloud/choosing-a-cloud-provider/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	2	-	-	-	-	-	3	3	3
2	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
3	3	3	2	2	2	2	-	-	-	-	-	2	3	2	1
4	3	2	2	2	3	2	-	-	-	-	-	2	3	1	1
5	3	2	2	2	3	3	2	-	-	-	-	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
CourseCode	**U23ITT712**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	IT Operations and Management	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Operating Systems, Database Management Systems							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Identify the commands to manage user and group administrative structure, File system, devices and kernels in a standalone or network system	**K1**
	CO2 Apply the essential Windows administration concepts for given scenario.	**K3**
	CO3 Describe the functionalities, Configuration, monitoring and Power budget for different types of servers	**K2**
	CO4 To Explain various storage networking and virtualization technologies	**K2**
	CO5 Review backup and restore strategy used in a system or enterprise	**K2**

Unit-I	**Linux Administration**	**Periods:09**
Essential duties of system admin-Scripting – Shell - Shell Configuration - Access control and Root powers- Adding new users- Controlling Process- File system- Devices- Modules- Drivers and kernel - Network file system - sharing system files		**CO1**
Unit-II	**Windows Administration**	**Periods:09**
Managing account policies and service accounts- Configuring Name resolution- Active directory- Network policies- Remote access- Managing File services		**CO2**
Unit-III	**Server Management**	**Periods:09**
Types of servers - Roles of Server - Web Server Management – Mail server Management - Setup - Monitoring - Optimization - Power and Heat budgeting		**CO3**
Unit-IV	**Storage Management**	**Periods:09**
Information availability - Networked Storage Infrastructures (NAS, SAN) - RAID - Storage Virtualization		**CO4**
Unit-V	**Business Continuity**	**Periods:09**
System Backup management- Enterprise Back-up and Recovery: Considerations , Operations - Backup Granularity, Methods, Technologies - Replication - Business Continuity Planning		**CO5**

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

Text Books

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, “UNIX and Linux System Administration Handbook”, 5th edition, Pearson education,2017.
2. Orin Thomas, “Administering Windows Server 2012 – Training guide”, O’Reilly Media, 2014
3. EMC Education Services,” Information Storage and Management”, Wiley, 2nd edition, 2012
4. Gilbert Held, "Server Management (Best Practices Book 9)", Auerbach Publications, 1st edition.2000

Reference Books

1. Robert Spalding, “Storage Networks :The Complete Reference”, Tata McGraw Hill,Osborne,2017.
2. Matthias KalleDalheimer, Matt Welsh, ”Running Linux”, Om books, Fifth Edition, 2006.
3. Nicholas Wells, “Guide to Linux Installation and Administration”, Course Technology Inc; 2nd Revised edition, 2003.

Web References

1. Backup management-https://www.baculasystems.com/training
2. System administration and engineering training - https://www.cbtnuggets.com/it training/systems-administration-engineering
3. System administration certification - https://www.koenig solutions.com/specialization/system-administration-training-courses.aspx

COs/POs/PSOs Mapping

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	-	3	-	-	-	-	-	-	1	2	2
2	3	2	1	-	-	2	-	1	-	-	-	-	1	2	2
3	3	2	1	-	-	2	-	-	-	-	-	-	1	2	2
4	3	2	1	-	-	3	-	-	-	-	-	-	1	2	2
5	3	2	1	-	-	-	2	2	-	2	-	-	1	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE714**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Six Sigma**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								

Prerequisite	Software Engineering and Project Management	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Identify the roles and responsibilities of different Six Sigma professionals	**K2**
	CO2 Identify customer requirements, select and scope Six Sigma projects	**K2**
	CO3 Gain proficiency in basic statistical concepts	**K3**
	CO4 Understand how to conduct Regression Analysis and Correlation for process improvement.	**K3**
	CO5 Analyze case studies on successful Six Sigma implementations and apply lessons learned to real-world scenarios.	**K4**

Unit- I	**Introduction to Six Sigma and Quality Management**	**Periods: 09**
Evolution of Quality Management (TQM, Lean, Six Sigma) - Basics of Six Sigma: Definition, Principles, and Benefits - Overview of DMAIC & DMADV Methodologies - Cost of Poor Quality (COPQ) and Defect Reduction - Roles and Responsibilities in Six Sigma (Green Belt, Black Belt, Master Black Belt) - Six Sigma Metrics: DPMO, Sigma Level, Yield, RTY.		**CO1**
Unit- II	**Define Phase**	**Periods: 09**
Identifying Customer Requirements (Voice of the Customer - VOC) - Project Selection and Scoping - Critical to Quality (CTQ) Characteristics - SIPOC (Suppliers, Inputs, Process, Outputs, Customers) Model - Problem-Solving Tools: Flowcharts, Pareto Charts - Project Charter and Goal Setting.		**CO2**
Unit- III	**Measure Phase**	**Periods: 09**
Data Collection Techniques and Measurement Scales - Measurement System Analysis (MSA): Gage R&R - Basic Statistical Concepts: Mean, Median, Mode, Variance, Standard Deviation - Statistical Process Control (SPC) & Control Charts - Process Capability Analysis: Cp, Cpk, Pp, Ppk - Understanding Process Variability and Defect Measurement.		**CO3**
Unit- IV	**Analyze and Improve Phase**	**Periods: 09**
Root Cause Analysis (5 Whys, Fishbone Diagram) - Hypothesis Testing (t-test, ANOVA, Chi-square) - Regression Analysis and Correlation - Design of Experiments (DOE) – Full Factorial and Fractional Factorial Designs - Introduction to Lean Principles: 5S, Waste Reduction, Value Stream Mapping - Improvement Strategies: Kaizen, Poka-Yoke, SMED.		**CO4**
Unit- V	**Control Phase and Implementation**	**Periods: 09**
Control Plans and Documentation - Statistical Process Control (SPC) and Control Charts (X-Bar, R, P, C Charts) - Failure Mode and Effects Analysis (FMEA) - Risk Assessment and Mitigation Strategies - Six Sigma Certification Levels and Industry Applications - Case Studies on Successful Six Sigma Implementations.		**CO5**

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

Text Books

1. Douglas C. Montgomery, “Introduction to Statistical Quality Control”, 8th Edition, Wiley, 2019.
2. Thomas Pyzdek & Paul Keller, “The Six Sigma Handbook”, 5th Edition, McGraw Hill, 2018.
3. Craig Gygi, Bruce Williams, Neil DeCarlo, “Six Sigma for Dummies”, 2nd Edition, Wiley, 2017.

Reference Books

1. John Morgan & Martin Brenig-Jones, “Lean Six Sigma for Dummies”, 3rd Edition, For Dummies, 2015.
2. Joseph M. Juran & Joseph A. Defeo, “Juran's Quality Handbook”, 6th Edition McGraw-Hill Education, 2010.
3. Michael L. George, “Lean Six Sigma: Combining Six Sigma Quality with Lean Production Speed”, NIBM E-Library, 2002.

Web References

1. https://www.asq.org/
2. https:// www.isixsigma.com/
3. https:// www.lean.org/
4. https:// www.nist.gov/
5. https://www.coursera.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	-	-	-	-	-	-	3	-	3	3	3	3
2	3	3	3	-	2	-	-	-	3	3	2	3	3	3	3
3	3	3	2	2	2	-	-	-	-	3	3	3	3	3	3
4	3	2	2	2	2	3	3	-	3	3	3	3	3	3	3
5	3	2	2	2	2	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
	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	**VII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITE715**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cyber Security and Forensics**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								

Prerequisite	Data Communication and Computer Networks	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Apply appropriate security controls and authentication measures to protect computer systems and user data, considering common threats and vulnerabilities.	**K2**
	CO2 Understand and implement privacy measures in cyberspace, incorporating principles of confidentiality, integrity, and availability.	**K2**
	CO3 Identify and mitigate cyber threats and understanding of various attack methods, tools, and security measures. Develop strategies to secure networks, cloud environments and web applications.	**K2**
	CO4 Acquire knowledge and skills in utilizing different types of computer forensics, Understand the importance of data recovery, backup, and evidence capture in forensic investigations.	**K2**
	CO5 Develop the ability to conduct effective computer forensics analysis and validation.	**K2**

Unit- I	**Introduction to Cybersecurity**	**Periods: 09**
Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication -Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks		**CO1**
Unit- II	**Privacy in Cyberspace**	**Periods: 09**
Identifying Customer Requirements (Voice of the Customer - VOC) - Project Selection and Scoping - Critical to Quality (CTQ) Characteristics - SIPOC (Suppliers, Inputs, Process, Outputs, Customers) Model - Problem-Solving Tools: Flowcharts, Pareto Charts - Project Charter and Goal Setting.		**CO2**
Unit- III	**Cyber Crimes and Cyber Security**	**Periods: 09**
Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security.		**CO3**
Unit- IV	**Types of Computer Forensics Technology**	**Periods: 09**
Types of Computer Forensics Technology: - Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology, Types of Business Computer Forensic Technology. Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data - Recovery Solution.		**CO4**
Unit- V	**Computer Forensics Analysis and Validation**	**Periods: 09**
Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data -Recovery Solution. Computer forensic analysis and validation: Determining what data to collect and analyse, validating forensic data, addressing data-hiding techniques, performing remote acquisitions..		**CO5**

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

Text Books

1. Charles P. Pleeger Shari Lawrence Pleeger Jonathan Margulies, Security in Computing, 7th Edition , Pearson Education , 2022
2. Computer Forensics, Computer Crime Investigation by John R,Vacca, Firewall Media, New Delhi. First Edition 2015
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.

Reference Books

1. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015.
2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
3. Nelson Phillips and Eninger Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.

Web References

1. https://www.nist.gov/cyberframework
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/
3. https://www.cisa.gov/
4. https://owasp.org/
5. https://www.eff.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	3	-	-	2	2	-	2	3	3	2	3	3	3	3
3	3	3	-	2	2	3	3	3	-	3	3	3	3	3	3
4	3	3	3	3	2	3	-	3	3	3	3	3	3	3	3
5	3	2	2	2	2	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
	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	**Electronics and Communication Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PE**			End Semester Exam: **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**
Common to ECE and IT								
Prerequisite	Basic Electronics, Computer Networks, Embedded Systems and Programming Knowledge.							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Describe the basics of digital image processing, including acquisition and sampling.	**K1**
	CO2 Explain image transforms like Fourier, Walsh, and Discrete Cosine Transform.	**K2**
	CO3 Apply spatial and frequency domain methods for image enhancement.	**K3**
	CO4 Explain techniques for image restoration and segmentation.	**K2**
	CO5 Describe compression methods, including error-free and lossy techniques.	**K1**

UNIT-I	**DIGITAL IMAGE FUNDAMENTALS**	**Periods:9**
Digital Image Fundamentals: Origins of Digital Image Processing- Fundamental Steps in Digital Image Processing- Components of an Image Processing System- Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels.		**CO1**
UNIT-II	**IMAGE TRANSFORMS**	**Periods:9**
2-D Fourier Transform-Walsh Transform-Hadamard Transform- Discrete Cosine Transform-Haar transform- Slant transform-Hotelling transform.		**CO2**
UNIT-III	**IMAGE ENHANCEMENT**	**Periods:9**
Enhancement in Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Filters. Enhancement in Frequency Domain: **Introduction to Fourier Transform:** Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering.		**CO3**
UNIT-IV	**IMAGE RESTORATION AND SEGMENTATION**	**Periods:9**
Image Restoration- Model of the Image Degradation/Restoration Process, Noise Models, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering. **Image Segmentation**-Detection of discontinuities - Edge linking and boundary detection - Thresholding: Global and Optimal Thresholding – Region based segmentation.		**CO4**
UNIT-V	**IMAGE COMPRESSION**	**Periods:9**
Fundamentals: Coding, Interpixel, Psycho visual Redundancies, Fidelity Criteria – Image Compression Models- Error Free Compression: Arithmetic coding, Huffman coding- Lossy and Lossless Predictive Coding-JPEG 2000 Standards.		**CO5**

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

Textbooks

1. Kenneth R. Castleman, Digital Image Processing Pearson, 2nd Edition, 2020.
2. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", 2nd Edition, PHI Learning Pvt. Ltd., 2019.
3. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, 4th Edition, 2018.

Reference Books

1. John C. Russ, F. Brent Neal-The Image Processing Handbook, 7th Edition, CRC Press, Taylor & Francis Group. 2016
2. William K. Pratt, Digital Image Processing John Wiley, New York, 2002
3. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999
4. D.E.Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.

Web References

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

COs/POs/PSOs Mapping

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	2	3
2	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
3	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3
4	3	2	3	2	-	-	-	-	-	-	-	-	3	2	3
5	3	2	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**				*End Semester Exam Type: **TE**		
Course Code	**U23ITE716**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Intrusion Detection System**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								

Prerequisite	Operating Systems and Computer Networks	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Explain the basic concepts of intrusion detection systems.	**K2**
	CO2 Understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.	**K2**
	CO3 Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.	**K2**
	CO4 Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.	**K3**
	CO5 Build agent development for intrusion detection and architectural models of IDs and IPs.	**K3**

Unit- I	**Introduction**	**Periods: 09**
History of Intrusion Detection: Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.		**CO1**
Unit- II	**Intrusion Prevention Systems**	**Periods: 09**
Network IDs protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis.		**CO2**
Unit- III	**Introduction to Snort**	**Periods: 09**
Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.		**CO3**
Unit- IV	**Snort Rules**	**Periods: 09**
Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL.		**CO4**
Unit- V	**Snort Snarf with Snort**	**Periods: 09**
Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.		**CO5**

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

Text Books

1. Rafeeq Ur Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

Reference Books

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

Web References

1. https://www.udemy.com/course/snort-ids/
2. https://www.coursera.org/articles/intrusion-detection-system
3. https://en.wikipedia.org/wiki/Intrusion_detection_system
4. https://www.techtarget.com/searchsecurity/definition/intrusion-detection-system

COs/POs/PSOs Mapping

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	-	-	-	-	2	2	2	2
2	2	2	2	3	-	3	2	-	-	-	-	2	2	2	2
3	2	2	2	3	2	2	3	-	-	-	-	2	3	2	2
4	2	2	2	3	2	2	3	-	-	-	-	2	3	2	2
5	2	2	2	3	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
	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	**VII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ITEC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Robotic Process Automation**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
	Common to IT and CCE							
Prerequisite	IT Essentials							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Understand the basics of Robotic Process Automation and UiPath Studio	**K2**
	CO2 Apply the different types of variables, control flow and data manipulation techniques	**K3**
	CO3 Manipulate the controls available in UiPath and extract data	**K3**
	CO4 Use events handling and exception handling	**K3**
	CO5 Explain the code management, deployment and maintenance of the bot	**K2**

UNIT-I	**Introduction to Robotic Process Automation**	**Periods:9**
Scope and techniques of automation, Robotic process automation - Benefits of RPA - Components of RPA - RPA platforms - The future of automation - UiPath stack- Learning UiPath Studio- Task Recorder		**CO1**
UNIT-II	**Automation Process Activities**	**Periods:9**
Sequence, Flowchart & Control Flow: Sequencing the Workflow – Activities – Flowchart - Control Flow for Decision making. Data Manipulation: Variables – Collection – Arguments - Data Table - Clipboard management - File operations - CSV/Excel to data table and vice versa		**CO2**
UNIT-III	**Controls**	**Periods:9**
Finding and attaching windows - Finding the control - waiting for a control - Act on a control - UiExplorer - Handling Events - Recorder: Desktop recording - Web recording - Screen Scraping - OCR		**CO3**
UNIT-IV	**Handling Events and Exceptions**	**Periods:9**
Assistant bots, Monitoring triggers - Launching an assistant bot on a keyboard event. Exception Handling - Common exception handling - Loggin and taking screenshots - Debugging techniques - Collecting crash dumps - Error reporting.		**CO4**
UNIT-V	**Code Management, Deployment and Maintenance**	**Periods:9**
Project Organization, Nesting workflows - Reusablity of workflows – Templates - Commenting techniques - State Machine. Publishing using publish utility - Orchestration Server - Control bots - Orchestration Server to deploy bots - License management - Publishing and managing updates.		**CO5**

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

Text Books

1. Tom Taulli , “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems”, Apress publications, 2020.
2. Alok Mani Tripathi, Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath, Packt Publishing, 2018.

Reference Books

1. Nandan Mullakara, Arun Kumar Asokan, Robotic Process Automation Projects, Packt Publishing, ISBN: 9781839217357, May 2020
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018

Web References

1. https://www.scribd.com/document/442266295/Sanet-st-Learning-Robotic-Proc-pdf
2. https://www.uipath.com/rpa/robotic-process-automation/
3. https://www.academy.uipath.com/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	2	2	-
2	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
3	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
4	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
5	2	1	-	-	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	10		5	5	5	75	100

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **OE**			*End SemesterExamType:**TE**			
Course Code	**U23ITOC03**	Periods/Week			Credit	MaximumMarks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Essentials of Data Science**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
EEE,ECE,ICE,CCE,BME,CIVIL,MECH,MCTR								
Prerequisite	Mathematics							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Ability to have a broad insight, understanding and intuition of the data science life cycle	**K2**
	CO2 Create artful graphs to visualize complex data sets and functions.	**K3**
	CO3 Discuss in depth a variety of data mining techniques, and their applicability to various problem domains	**K2**
	CO4 Select and apply data mining technique to a practical case study	**K2**
	CO5 Understand the concept, challenge and technology of big data	**K2**

Unit-I	**Introduction to Data Science**	**Periods:09**	
Introduction: Need for data science – Benefits and uses – Facets of data-Data science process: Retrieving data – Cleansing, integrating, and transforming data – Data analysis – Build the models -Epicycles of Analysis- Exploratory Data Analysis- Using Models to Explore Data- Inference: A Primer- Formal Modeling-Inference vs. Prediction : Implications for Modeling Strategy -Interpreting results.			**CO1**
Unit-II	**Data Analytics Using R**	**Periods:09**	
Introduction to R: Data structures, vectors, matrices, data frames–Exploratory Data Analysis: Descriptive statistics, Data visualization with ggplot2, Correlation and covariance analysis Statistical – Hypothesis testing- Analysis of variance (ANOVA)- Regression analysis- Processing and analyzing text data -Association rule mining - Clustering techniques			CO2
Unit-III	**Supervised Learning**	**Periods:09**	
Regression - Linear Regression - Logistic Regression - Reasons to Choose and Cautions - Additional Regression Models - Classification - Decision Trees – Na'ive Bayes – Diagnostics of Classifiers – Additional Classification Methods – Time Series Analysis – Overview of Time Series Analysis – ARIMA Model			**CO3**
Unit-IV	**Unsupervised Learning**	**Periods:09**	
Clustering - Overview of Clustering – K-means - Additional Algorithms –Association Rules- Overview - A priori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Validation and Testing – Diagnostics - Text Analysis – Text Analysis Steps – Collecting Raw Text – Representing Text – Term Frequency-Inverse Document Frequency (TFIDF) - Categorizing Documents by Topics –Determining Sentiments – Gaining Insights			**CO4**
Unit-V	**Big Data Analytics**	**Periods:09**	
Data science in a Big Data world - Benefits and uses of data science and Big Data - Facets of data - The Big Data ecosystem and data science – Introduction of Hadoop - Handling large data on a single computer - The problems in handling large data - General techniques for handling large volumes of data - General programming tips for dealing with large datasets- Case study : Predicting malicious URLs, Recommender system - Steps in Big Data - Distributing data storage and processing with frameworks - Case study: Assessing loan risk.			**CO5**

LecturePeriods:45	**TutorialPeriods:**	**PracticalPeriods:-**	**TotalPeriods:45**

TextBooks

1. Peng, R. D., & Matsui. E, The Art of Data Science- A Guide for Anyone Who Works with Data, Skybrude Consulting, 2015.
2. David Dietrich, Barry Heller & Beibei Yang, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, John Wiley & Sons, 2015.
3. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

ReferenceBooks

1. Steven S. Skiena, The Data Science Design Manual, First Edition, Springer, 2017.
2. Davy Cielen, Arno Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Manning Publications, 2016.
3. Joel Grus, Data science from scratch: first principles with python, O'Reilly Media, Inc., 2015.
4. Martin Czygan, Phuong Vo.T.H, Getting Started with Python Data Analysis, Packt Publishing, 2015.

Web References

1. www.ibm.com/Data Analytics/
2. https://www.coursera.org/learn/r-programming
3. https://www.ijser.org/researchpaper/Importance-of-Clustering-in-Data-Mining.pdf
4. https://datafloq.com/read/7-innovative-uses-of-clustering-algorithms/6224
5. https://publications.waset.org/10011058/improving-fake-news-detection-using-k-means-and-support- vector-machine-approaches
6. https://statisticsbyjim.com/regression/when-use-regression-analysis/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	-	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	2	2	-	-	-	-	-	-	3	2	3
3	3	3	3	2	2	3	3	-	-	-	-	-	3	2	1
4	3	2	2	2	2	3	-	-	-	-	-	-	3	2	1
5	3	2	2	2	2	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
	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	**VII**		Course Category Code:**OE**			*End SemesterExamType:**TE**		
CourseCode	**U23ITOC04**		Periods/Week			Credit	MaximumMarks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Big Data Technologies**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
EEE,ECE,ICE,CCE,BME,CIVIL,MECH,MCTR									
Prerequisite	Fundamental knowledge in Computing Technologies								

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Build distributed data processing applications using Apache Hadoop and Spark	**K3**
	CO2	Develop a streaming application using Apache Spark in teams	**K3**
	CO3	Experiment with Apache Kafka for processing stream data	**K3**
	CO4	Big Data Frameworks in teams applying best practice	**K3**
	CO5	Integrating Machine Learning Integration and Data Security	**K2**

Unit-I	**INTRODUCTION TO BIG DATA TECHNOLOGOY**	**Periods:09**
Introduction – Understanding Big Data – Big Data: Benefiting – Managing – Organizing and Analyzing Big Data: Learning and Analytics; Technology Challenges for Big Data- Distributed File System – HDFS Design Goals – MapReduce Overview – Writing and Testing MapReduce Programs – Installing Spark and Setting up Spark Cluster – Spark Shell-Creating Spark Session Object – Resilient Distributed Datasets (RDD) – Manipulating RDD – NoSQL – SparkSQL – GraphX.		**CO1**
Unit-II	**STREAM PROCESSING**	**Periods:09**
Stream Processing Concepts – Distributed Stream Processing – Stream Processing Model – Streaming Architecture – Lamda and Kappa Architecture – Structured streaming – Spark Streaming – Spark Streaming Programming Model – Other Distributed Real Time Stream Processing Systems		**CO2**
Unit-III	**STREAMING PROCESSING USING KAFKA**	**Periods:09**
Apache Kafka – Ins talling Kafka – Producers and Consumers – Kafka Internals – Building Data Pipelines – Cross Cluster Data Mirroring – Administering and Monitoring Kafka – Getting started with Kafka Streams – Kafka Streams Development – Applications with Kafka Streams		**CO3**
Unit-IV	**BIG DATA FRAMEWORKS**	**Periods:09**
Apache Flume – Overview and Architecture – Quick Start Guide to Flume – Basics of Sqoop Integrating Sqoop with Hadoop – Getting to Grips with Zookeeper – Getting Started with Zookeeper API – Machine Learning using Apache Mahout – Clustering & Classification Algorithms in Mahout-Extending Spark with H2O – H2O..		**CO4**
Unit-V	**MACHINE LEARNING INTEGRATION AND SECURITY**	**Periods:09**
Machine learning algorithms in autonomous system – MLlib in Apache Spark for distributed machine learning – Challenges and opportunities in deploying ML models in autonomy –Security considerations for autonomous data –Ethical implications in handling large datasets in autonomous engineering		**CO5**

LecturePeriods:45	**TutorialPeriods:**	**PracticalPeriods:-**	**TotalPeriods:45**

TextBooks

1. Neha Narkhede, Gwen Shapira, and Todd Palino, “Kafka – Definitive Guide”, 2017.
2. Krishna Sankar, “Fast Data Processing using Spark 2”, 3rd Edition, Packt Publishers, 2016.
3 Mike Frampton, “Mastering Apache Spark”, Packt Publishers, 2015.

ReferenceBooks

1. Gerald Maas, Francois Gorillot, “Stream Processing with Apache Spark”, O’Reilly Media, 2019.
2. William P Bejeck Jr, “Kafka Streams in Action”, Manning Publications, 2018.
3. Jayani Withanawasam, “Apache Mahout Essentials”, Packt Publishers, 2015.
4. Steve Hoffman, “Apache Flume: Distributed Log Collection for Hadoop”, 2nd Edition, Packt Publishers, 2015.
5. Flavio Junqueira, Benjamin Reed, “ZooKeeper: Distributed Process Co-ordination Pa- perback”, O’Reilly Media, 2014.
6. Gaurav Vaish, “Getting Started with NoSQL”, Packt Publishing Ltd, 2013.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	-	-	-	-	-	-	-	3	3	3
2	3	3	2	-	-	2	-	-	-	-	-	-	3	2	1
3	3	3	2	2	2	3	3	-	-	-	-	-	3	2	2
4	3	2	1	2	2	3	-	-	-	-	-	-	3	1	1
5	3	2	1	2	2	3	-	-	-	-	-	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITP707**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Neural Network and Deep Learning Laboratory**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
IT								

Prerequisite	Machine Learning	
Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Implement various Activation functions	**K3**
	CO2 Develop various NN models	**K3**
	CO3 Design and configure Neural Networks for various real world applications	**K3**
	CO4 To design various neural networks	**K3**
	CO5 To create convolution neural network model for image classification	**K3**

List of Exercise

1. Plotting of Activation Functions: Threshold functions, Signum function, Sigmoid function, Tan-hyperbolic function, Ramp function, Identity function.
2. Implementation of some basic model like MCP with suitable example.
3. Implementation of Hebb model with suitable example.
4. Write a program for Time-Series Forecasting with the LSTM Model.
5. Build a feed forward neural network for prediction of logic gates.
6. Write a program to implement deep learning Techniques for image segmentation
7. Write a program to predict a caption for a sample image using LSTM.
8. Write a program for character recognition using CNN.
9. Build a Convolutional Neural Network for Cat vs Dog Image Classification
10. Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.

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

Text Books

1. Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, “Dive into Deep Learning”, Amazon Science,2022.
2. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018
3. AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O’Reilly Media,2017
4. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017

Reference Books

1. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018
2. 2. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018
3. 3. Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016

Web References

1. https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/
2. https://www.coursera.org/learn/neural-networks-deep-learning
3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	2	-	-	1	2	-	-	3	3	3	3
2	3	3	2	-	2	-	-	2	2	-	-	3	3	3	3
3	3	3	3	-	2	-	-	2	2	-	-	3	3	3	3
4	3	3	3	-	3	-	-	2	2	-	-	3	3	3	3
5	3	3	3	2	3	-	-	2	2	-	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITP708**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cloud Computing and Virtualization Laboratory**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
IT								

Prerequisite	Computer Networks, Virtualization	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 To provide hands-on experience with cloud computing platforms, virtualization technologies	**K3**
	CO2 To provide hands-on experience with cloud-based software development	**K3**
	CO3 To learn how to configure, deploy, and manage cloud services	**K3**
	CO4 To provide hands-on experience with virtualization tools	**K3**
	CO5 To understand the security Policies in Cloud Environments	**K3**

List of Exercise

1. Installation and Configuration of CloudSim
2. Exploring Cloud Service Models
3. Exploring and Setting up a Private Cloud using OpenStack
4. Implement Resource Provisioning in the Cloud
5. Installation and Configuration of Virtual Machine Creation using VMware/Virtual Box
6. Working with Docker Containers
7. Implement Kubernetes for Container Orchestration
8. Build a Hadoop and HDFS environment
9. Write a MapReduce Programs
10. Deploying Applications on Microsoft Azure and Google Cloud
11. Configuring security groups and IAM roles in AWS/Azure
12. Implementing multi-factor authentication.

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

Text Books

1. Kris Jamsa ,Cloud Computing, Jones & Bartlett Learning,2022.
2. Dac-Nhuong Le, “Cloud Computing and Virtualization”, Wiley-Scrivener, 2018
3. Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, Joe Topjian, OpenStack Operations Guide, O'Reilly Media,2014.
4. Matthew Portnoy, Virtualization Essentials, Published by Sybex,2012.

Reference Books

1. Rodrigo N. Calheiros, Rajiv Ranjan, Anton Beloglazov, Cesar A. F. De Rose, and Rajkumar Buyya, CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms, Software: Practice and Experience, Volume 41, Number 1, Pages: 23-50, ISSN: 0038-0644, Wiley Press, New York, USA, January 2011.
2. Rajkumar Buyya, Rajiv Ranjan and Rodrigo N. Calheiros, Modeling and Simulation of Scalable Cloud Computing Environments and the CloudSim Toolkit: Challenges and Opportunities, Proceedings of the 7th High Performance Computing and Simulation Conference (HPCS 2009, ISBN: 978-1-4244-4907-1, IEEE Press, New York, USA), Leipzig, Germany, June 21 - 24, 2009.

Web References

1. https://www.openstack.org
2. https://hadoop.apache.org
3. https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html
4. https://aws.amazon.com/free/
5. https://azure.microsoft.com/en-us/free/
6. https://cloud.google.com/free

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	2	-	-	1	2	-	-	3	3	3	3
2	3	3	2	-	2	-	-	2	2	-	-	3	3	3	3
3	3	3	3	-	2	-	-	2	2	-	-	3	3	3	3
4	3	3	3	-	3	-	-	2	2	-	-	3	3	3	3
5	3	3	3	2	3	-	-	2	2	-	-	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PA**				*End Semester Exam Type: **LE**		
Course Code	**U23ITW703**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**PROJECT PHASE-I**	**0**	**0**	**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	***Information Technology***	*Programme:* ***B.Tech.***						
Semester	***VII***	*Course Category Code:* ***PA***				**End Semester Exam Type:* ***-***		
Course Code	***U23ITW704***	*Periods / Week*			*Credit*	*Maximum Marks*		
		L	***T***	***P***	***C***	***CAM***	***ESE***	***TM***
Course Name	***INTERNSHIP/INPLANT TRAINING***	***0***	***0***	***2***	***1***	***100***	***-***	***100***
IT								

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.