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

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

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**

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

SEMESTER – I										
Sl. No.	**Course Code**	**Course Title**	**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	U23XXO5XX	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	U23XXO6XX	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	U23XXO7XX	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	Data Visualization
3	U23ITE508	Software Testing
4	U23ITE509	Automation Techniques and Tools
5	U23CBEC01	Business Intelligence and Applications
Professional Elective - III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23ITE610	Quantum Computing
2	U23ITE611	Full Stack Development
3	U23ITE612	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	U23ITE713	Six Sigma
2	U23ITE714	Cyber Security and Forensics
3	U23ITE715	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

ANNEXURE – III

DEPARTMENT OF IT

OPEN ELECTIVE COURSES

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

Annexure – IV

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

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

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Branch Manager
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Trainlab – Coordinator

Dr J. Madhusudanan
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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)

ANNEXURE - IV

ABILITY ENHANCEMENT COURSES - (B) SKILL ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1.	U23ITS301	Skill Enhancement Course 1: Technical Seminar
2.	U23ITS402	Skill Enhancement Course 2: NPTEL/MOOC

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

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

(Common to ALL Branches Except CSBS)

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

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

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

Text Books

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

Reference Books

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

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

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

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

Section A – Electrical Engineering

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

Section B – Electronics Engineering

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

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

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

(Common to All Branches Except CSBS and FT)

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

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

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

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8thEdition,2019.
2. 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	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

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

Evaluation Methods

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

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

Department	**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 Outcome	**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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1. it-ebooks.org
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	10		5	5	5	75	100

Department	**Information Technology**	Programme: **B. Tech.**						
Semester	**I / II**	Course Category: **HS**			End Semester Exam Type: **TE**			
Course Code	**U23HSTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Universal Human Values – II**	**2**	**-**	**-**	**2**	**25**	**75**	**100**
(Common to all Branch)								
Prerequisite	**UHV – I**							

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

UNIT - I	**Introduction to Value Education**	**Periods: 06**
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Understanding Value Education - Self-exploration as the Process for Value Education - Basic Human Aspirations - Happiness and Prosperity - Current Scenario- Method to Fulfil the Basic Human Aspirations		**CO1**
UNIT - II	**Harmony 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 print Publisher, 2009.
5. E. F Schumacher, "Small is Beautiful", Vintage Publisher, 1993.
6. Cecile Andrews, "Slow is Beautiful", New Society Publishers, 2006.
7. J C Kumarappa, "Economy of Permanence", Sarva Seva Sangh Prakashan, 2017.
8. Pandit Sunderlal, "Bharat Mein Angreji Raj", Prabhat Prakashan Publisher, 2021.
9. Dharampal, "Rediscovering India", Stosius Inc/Advent Books Division Publisher, 1983.

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

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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	10		5	5	5	75	100

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

Department	**English**	Programme: **B.Tech.**						
Semester	**I**	Course Category 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		
Listening (L)*	10	Listening (L)*	10	40
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

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

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I / II**	Course Category: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Electrical and Electronics Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to CSE, IT, MECH, CIVIL, MCTR, CCE, AI&DS, FT, CSBS Branches)								
Prerequisite	Mathematics and Physics							

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

List of Experiments

Section– A Electrical Experiments

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

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

Section – B Electronics Experiments

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

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

(Common to All Branches Except CSBS and FT)

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

List of Exercises

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

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

Department	**Mechanical Engineering**		Programme : **B.Tech.**					
Semester	**I / II**		Course Category: **ES**			End Semester Exam Type: **LE**		
Course Code	**U23ESPC03**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Graphics Using AutoCAD**		**-**	**-**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches)									
Prerequisite	Nil								
Course Outcomes	**On completion of the course, the students will be able to**						BT Mapping (Highest Level)		
	CO1	Familiarize with the fundamentals and standards of engineering graphics.					**K3**		
	CO2	Perform drawing of basic geometrical constructions and multiple views of objects.					**K2**		
	CO3	Visualize the isometric and perspective sections of simple solids.					**K3**		
	CO4	Connect side view associate on front view.					**K4**		
	CO5	Correlate sectional views and lateral surface developments of various solids.					**K4**		

List of Experiments

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

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

Reference Books

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

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 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	**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 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	**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 parts) - Definite integrals. Simple definite integrals - Properties of Definite integrals - Reduction formulae - Area and volume - Length of curve - surface area of a solid. **C Programming:** Features of C and its basic Structure - Keywords - constants - variables - operators - Data types - Formatted input and output statements - Control and Looping statement - Arrays - Functions - Strings - writing simple C programs.			**CO3**

UNIT- IV	**Literary Activities**	**Periods: 12**	
Team building activities - Quiz - Oral Exercises - Group discussion, Debate, Extempore, Role play, சிறப்பு சொற்பொழிவு - தமிழர் மரபு மற்றும் தமிழர் தொழில்நுட்பம்.			**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 வரலாறு - மக்களும் பண்பாடும், பிள்ளை, கே. கே. , சென்னை : உலகத் தமிழாராய்ச்சி நிறுவனம் , 2002.
10. கணினித்தமிழ் - முனைவர் இல.சுந்தரம், விகடன் பிரசுரம்.
11. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம், தமிழக தொல்லியல் துறை

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

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

Text Books

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

Reference Books

1. N.P. Bali and Dr. Manish Goyal, "A Textbook of Engineering Mathematics", University Science Press, India, 8th Edition, 2016.
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearson India Education services Pvt. Ltd, India 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	**I/II**	Course Category : **BS**				End Semester Exam Type: **TE**		
Course Code	**U23BSTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Physical Science for Engineers**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to all Branches)

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

SECTION A - PHYSICS

UNIT - I	**Magnetic, Dielectric and Superconducting Materials**	**Periods: 8**
Introduction to magnetic materials, Ferromagnetism- Domain theory-Types of energy-Hysteresis-Hard and Soft magnetic materials-ferrites-Dielectric materials-Types of polarization – Langevin-Debye equation-Frequency effects on polarization-Dielectric breakdown- Ferroelectric materials-Superconducting materials and their properties.		**CO1**
UNIT - II	**Quantum Mechanics**	**Periods: 7**
Matter Waves - de Broglie Wavelength - Uncertainty Principle –Physical Significance of wave functions - Schrodinger wave Equation - Time Dependent - Time Independent - Application to Particle in a One Dimensional Box - Tunnel Diode.		**CO2**
UNIT - III	**Laser and Fiber Optics**	**Periods: 7**
Lasers - Principles of Laser - Spontaneous and Stimulated Emissions - Einstein's Coefficients - Population Inversion and Laser Action –components of laser - Types of Lasers - NdYAG, 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 using hard water in boiler - Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment–Ion exchange demineralization and zeolite process.		**CO4**
UNIT - V	**Electrochemical Cells and Storage Devices**	**Periods: 8**
Galvanic cells, single electrode potential, standard electrode potential, electrochemical series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen, calomel and Ag/AgCl. Batteries and fuel cells: Types of batteries- alkaline battery-lead storage battery- nickel-cadmium battery- fuel cell 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/III**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ADTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Python**	**3**	**-**	**-**	**3**	**25**	**75**	**100**
(Common to All Branches)								
Prerequisite	NIL							

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

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

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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/III**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC03**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures**	**3**	**-**	**-**	**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 Search and Binary Search Techniques. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort. Performance and Comparison among the sorting methods.		**CO1**
UNIT - II	**Stack and Queue Operations**	**Periods: 09**
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.		**CO2**
UNIT - III	**Linked List Operations**	**Periods: 09**
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.		**CO3**
UNIT - IV	**Trees**	**Periods: 09**
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree- Red Black Tree.		**CO4**
UNIT - V	**Graphs, Tables and Sets**	**Periods: 09**
Graph: Basic Terminologies and Representations – Graph traversal algorithms. Tables: Different types of tables – Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.		**CO5**

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

Text Books

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

Reference Books

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

(Common to CSE and IT)

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

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

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

Text Books

1. M. Morris Mano and Michael Ciletti, Digital Design, Sixth Edition, Pearson India Education Services, Pvt. Ltd., 2018
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, 2012.
3. M. Moris Mano, Computer System Architecture, Third Edition, Pearson Education,2017: The Complete Reference", McGraw Hill, FourthEdition,2014

Reference Books

1. Tocci R J and Widmer N S, "Digital Systems - Principles and Applications", Prentice Hall of India, New Delhi,11th Edition, 2010.
2. John.F.Wakerly,"Digital Design Principles and Practices", Pearson Education,4th Edition, 2006.
3. Carl Hamacher, 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 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	**Mechanical Engineering**	Programme: **B.Tech.**						
Semester	**I/II**	Course Category: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23ESPC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design Thinking and IDEA Lab**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
(Common to ALL Branches)								
Prerequisite	Basic Knowledge of Science							

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

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

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

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

List of Lab Activities and Experiments

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

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Reference Books

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

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: 3 0**	**Total Periods: 30**

Reference Books

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**II**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23ITPC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Digital Design and System Architecture Laboratory**	**-**	**-**	**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. HDL code to realize all the logic gates
2. Design and Simulation of adder, Serial Binary Adder, Multi Precession Adder, Carry Look Ahead Adder.
3. Design of 2-to-4 decoder
4. Design of 8-to-3 encoder (without and with parity)
5. Design of flip flops: SR, D, JK, T
6. Design of a N- bit Register of Serial- in Serial –out, Serial in parallel out, Parallel in Serial out and Parallel in Parallel Out.
7. Design of ALU to Perform – ADD, SUB, AND-OR, 1's and 2's Compliment,
8. Design of ALU to Perform – Multiplication, and Division.
9. Memory unit design and perform memory operations.
10. 8-bit simple ALU design
11. 8-bit simple CPU design
12. Interfacing of CPU and Memory

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

Reference Books

1. J. Bhasker, "Verilog Hdl Synthesis, a Practical Primer", Trade Paperback, 2018.
2. Massimo Alioto, Elio Consoli, Gaetano Palumbo, "Flip-Flop Design in Nanometer CMOS",Springer, 2015.
3. Charles Platt, "Make: More Electronics",Make:community, 2014.
4. M K Gooroochurn," Introduction to Digital Logic & Boolean Algebra",Paperback, 2018.
5. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", fifth edition, Tata McGraw Hill Education, 2011.

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	**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.

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

Text Books

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

Reference Books

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

Unit- I	**Introduction to Operating Systems**	**Periods: 09**
Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.		**CO1**
Unit- II	**Process Management and Scheduling Algorithms**	**Periods: 09**
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. **Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. **Scheduling algorithms:** Pre-emptive and non-pre-emptive, FCFS, SJF, RR.		**CO2**
Unit- III	**Process Synchronization, Threads and Deadlocks**	**Periods: 09**
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem. **Concurrent Programming:** Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection, and recovery. **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. **Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention and **Deadlock Avoidance:** Banker's algorithm, Deadlock detection and Recovery.		**CO3**
Unit- IV	**Memory Management**	**Periods: 09**
Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction. **Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First In First Out (FIFO, Not Recently Used (NRU) and Least Recently Used (LRU).		**CO4**
Unit- V	**File, I/O and Device Management**	**Periods: 09**
File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. **I/O Hardware:** I/O devices, Device controllers, Direct Memory Access, Principles of I/O. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN.		**CO5**

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

Text Books

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

Reference Books

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

Web References

4. https://nptel.ac.in/courses/106108101/
5. http://www.tcyonline.com/tests/operating-system-concepts
6. http://www.galvin.info/history-of-operating-system-concepts-textbook
7. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
8. 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	**Third**	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**

Prerequisite	Discrete Mathematics, Design and Analysis of Algorithms		
Course Outcome	**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 - convert CFG to PDA – PDA to CFG – Deterministic Pushdown Automata.			**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) – Pumping lemma for CFL – Closure properties of Context Free Languages – Turing Machine : Basic model – definition and representation – Instantaneous Description – Turing Machine for accepting Regular languages – TM as Computer of Integer functions(Addition & subtraction) – Programming techniques for Turing machines: Storage on Finite control - subroutine			**CO4**
UNIT-V	**UNDECIDABILITY**	**Periods:9**	
Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine – Introduction to Tractable and Intractable problems - P and NP completeness – Kruskal's algorithm – Travelling Salesman Problem- 3-CNF SAT problems.			**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	3	2	3	-	-	-	-	1	1	2	3	1	3	2
2	2	2	3	2	1	-	-	-	3	3	2	3	3	1	2
3	2	2	3	2	1	-	-	-	1	3	1	2	1	2	2
4	2	2	2	1	-	-	-	-	1	3	3	2	1	3	2
5	2	2	2	1	1	-	-	-	1	1	3	2	3	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	**Information Technology**	Programme: **B.Tech.**						
Semester	**Third**	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**

Prerequisite	Basic Computer Knowledge, IT Essentials	
Course Outcome	**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

3. Roger Pressman, Bruce Maxim, “Software Engineering - A Practitioner’s Approach”, 9th Edition, McGraw Hill International Edition, 2019.
4. Rajib Mall, “Fundamentals of Software Engineering”, Fifth Edition, PHI Learning Private Limited, 2018.
5. 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

5. https://archive.nptel.ac.in/courses/106/105/106105182/
6. https://www.coursera.org/learn/introduction-to-software-engineering
7. 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	-	-	-	-	-	-	2	-	-	-	1	2	2	2
2	3	2	1	1	-	-	-	-	-	-	-	1	2	2	2
3	3	2	1	1	-	-	-	-	-	-	-	1	2	2	2
4	2	-	-	-	-	-	-	-	-	-	-	1	2	2	2
5	2	-	-	-	-	-	-	-	3	3	3	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	**Third**	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**

Prerequisite	Digital Design and System Architecture		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	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*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

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

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

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

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

Reference Books

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

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

COs/POs/PSOs Mapping

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	**Third**	Course Category Code: **BS**			*End Semester Exam Type: **LE**			
Course Code	**U23MAPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ENGINEERING MATHEMATICS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS)

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

List of Experiments:

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

Lecture Periods:- Nil	**Tutorial Periods:- Nil**	**Practical Periods: 3 0**	**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	**Third**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Database Management Systems Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

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

List of Exercises

Structured Query Language:

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

PL/SQL:

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

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	**Computer Science and Engineering**			Programme: **B.Tech.**				
Semester	**Third**			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	**Third**	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**

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

UNIT-I	**ATMOSPHERE AND ITS COMPONENTS**	**Periods:06**	
Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.			**CO1**
UNIT-II	**GLOBAL CLIMATE**	**Periods:06**	
Account of past climate- Environmental indicators and instrumental records – Human Footprints on global warming-Predicting future climates- Temperature regime – Extreme climate events.			**CO2**
UNIT-III	**IMPACTS OF CLIMATE CHANGE**	**Periods:06**	
Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.			**CO3**
UNIT-IV	**OBSERVED CHANGES AND ITS CAUSES**	**Periods:06**	
Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-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)- International and Regional cooperation- Remedial measures.			**CO5**

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

Text Books

1. Joan Fitzgerald, “Greenovation: Urban Leadership on Climate Change”, Oxford University Press, 2020.
2. 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 University press, 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	**Fourth**	Course Category Code: BS			*End Semester Exam Type:**TE**			
Course Code	**U23MATC05**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DISCRETE MATHEMATICS AND GRAPH THEORY**	**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to CSE, IT, AI&DS and CCE)								

Prerequisite	Basic Mathematics	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Construct Mathematical arguments using logical connectives and truth tables.	**K3**
	CO2 Verify the correctness of an argument predicate logic and quantifiers.	**K3**
	CO3 Solve problems using counting techniques in Lattices.	**K3**
	CO4 Familiarize the different types of Graphs.	**K3**
	CO5 Understand the Applications of Shortest path algorithms.	**K3**

UNIT – I	**LOGICS AND PROOFS**	**Periods:12**
Introduction – Connectives – Statement formulae – Truth table – Tautologies – Equivalence of Statement formulae – NAND and NOR Connectives – Implications – Principal conjunctive and disjunctive normal forms.		**CO1**
UNIT – II	**PREDICATE AND QUANTIFIERS**	**Periods:12**
Predicate and Quantifiers – Rules of Inference theory – Conditional proof – Indirect method of proof.		**CO2**
UNIT – III	**LATTICES**	**Periods:12**
Partially Ordering – Posets – Hasse Diagram – Lattices as Posets – Properties of Lattices – Sub lattices – Complemented and Distributive lattices.		**CO3**
UNIT – IV	**GRAPH THEORY**	**Periods:12**
Graphs and types of Graphs – Matrix representation of graphs – Isomorphism – Connected graphs – Euler graphs – Hamilton paths and circuits.		**CO4**
UNIT – V	**TREES**	**Periods:12**
Trees – Properties of Trees – Algorithm – Kruskal's algorithm.		**CO5**

LecturePeriods:45	**TutorialPeriods:15**	**Practical Periods:-**	**TotalPeriods:60**

Text Books

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

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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.

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

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

Unit- I	**INTRODUCTION**	**Periods: 09**
Introduction: Java: History – Features – JVM - JRE – JDK – Java Compilation and Execution – Data Types - Variables, Types, Expressions, Assignment Statements, Input/Output Statements: Scanner/System class, Type Casting (Primitives to Primitives), Conditional and Iterative Control Structures - Arrays **OOPs with Java:** Introduction to OOPs Concepts - Class – Objects – Methods - Access Modifiers – Creating Class and Objects, Object Life-Cycle - Garbage Collection-Constructors - this – static – Array of Objects – Nested Classes. **String**: String Class– Built-in Methods – StringBuilder - StringBuffer		**CO1**

Unit- II	**INHERITANCE, INTERFACES AND PACKAGES**	**Periods: 09**
Inheritance: Types of Inheritance – is-a Relationship, has-a Relationship – super keyword – final keyword – Polymorphism - Method overloading and Method overriding – Abstract Class **Interfaces:** Define – Extend – Implement – Access - Interfaces vs Abstract classes, Type Conversions (Primitives to Objects vice-versa): Autoboxing and Auto unboxing **Packages:** Define – Create – Access – Import		**CO2**

Unit- III	**EXCEPTION HANDLING AND MULTITHREADING**	**Periods: 09**
Exception Handling: Exception Hierarchy – Checked and Unchecked Exceptions – try, catch, throws, throw and finally – User Defined Exceptions. **Multithreading:** Thread – Life cycle – Defining and Running – Implementation Types – Thread Priorities – Thread Synchronization - Inter-Thread Communication		**CO3**

Unit- IV	**COLLECTIONS AND I/O STREAMS**	**Periods: 09**
Collections: List: ArrayList and LinkedList. Set: HashSet and TreeSet. Map: HashMap – Stack – Queue. Lambda Expressions. **I/O Streams:** Streams – Byte Streams and Character Streams – FileInputStream and FileOutputStream – FileReader and FileWriter. Object Serialization : ObjectInputStream and ObjectOutputStream		**CO4**

Unit- V	**GUI and JDBC**	**Periods: 09**
AWT: Components – Controls – Event Handling **SWING**: Swing Components – Layout Management. **JDBC:** JDBC Architecture – JDBC Driver Types – Implementation of JDBC.		**CO5**

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**Fourth**	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**

Information Technology

Prerequisite	**Programming and Data Structures**	
Course Outcome	**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 its properties 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's algorithm	**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– Knapsack Problem.	**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

5. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.
6. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, Galgotia Publications, Pvt. Ltd., 2008.
7. 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, Pearson Education, 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	**Fourth**	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 Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Analyze the functioning of data communication and computer network and select relevant transmission media and switching techniques as per need.	**K4**
	CO2 Analyze the transmission errors with respect to IEEE standards.	**K4**
	CO3 Configure the network component and assign IP address.	**K3**
	CO4 Articulate the significance of various Flow control and Congestion control Mechanisms	**K3**
	CO5 Illustrate the Functioning of various Application layer Protocols.	**K3**

Unit- I	**Data Communications**	**Periods: 09**
Components – Data flow – Networks: Components and Categories – Types of Connections – Topologies – The Internet - Protocols and Standards – Network Models: ISO / OSI model – Other Wired Networks: ATM - Frame Relay - ISDN Physical layer: Transmission modes – Multiplexing - Transmission Media – Switching - Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks.		**CO1**
Unit- II	**Data Link Layer**	**Periods: 09**
Introduction – Framing - and Error – Detection and Correction – Parity – LRC – CRC Hamming code - Flow and Error Control - Noiseless Channels - Noisy Channels – HDLC - Point to Point Protocols - Medium Access sub layer: ALOHA - CSMA/CD - LAN – Ethernet IEEE 802.3 - IEEE 802.5 – IEEE 802.11 - Random access - Controlled access - Channelization.		**CO2**
Unit- III	**Network Layer**	**Periods: 09**
Logical Addressing – Internetworking – Tunneling - Address mapping – ICMP – IGMP – Forwarding - Uni-Cast Routing Protocols - Multicast Routing Protocols – Next Generation IP.		**CO3**
Unit- IV	**Transport Layer**	**Periods: 09**
Process to Process Delivery - UDP and TCP protocols - Data Traffic – Congestion - Congestion Control – QoS - Integrated Services - Differentiated Services - QoS in Switched Networks.		**CO4**
Unit- V	**Application Layer**	**Periods: 09**
Domain Name System - DNS in Internet - Electronic Mail – SMTP – FTP – WWW – HTTP - SNMP.		**CO5**

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

Text Books

5. Andrew S Tanenbaum, Computer Networks, Pearson Education, 6th Edition, 2022.
6. Behrouz A. Forouzan, Data Communications and Networking, TMH, 5th Edition, 2012
7. 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	**Fourth**	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**

Prerequisite	**Software Engineering and Project Management**	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	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 POS system.		**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, relationships attributes, methods for ATM banking system.		**CO3**
Unit- IV	**Object Oriented Design**	**Periods: 09**
Object oriented design process-Design axioms-Designing Classes, Methods-Access layer: object storage 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-High Cohesion-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 Software Architecture, 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 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	**Fourth**			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**
Information Technology								

Prerequisite	IT Essentials ,Basic Programming Knowledge		
Course Outcome	**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 - Form Submission.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

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

Reference Books

5. Richard Blum,“PHP, MySQL & JavaScript All-in-One”, John Wiley &Sons,2018
6. 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	**Fourth**	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**

Prerequisite	Mathematics, Computer Networks	
Course Outcome	**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

7. https://nptel.ac.in/courses/117101053/Information Theory and Coding/
8. https://www.elprocus.com/modulation-with-its-block-diagram/
9. 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	**Fourth**	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**
Information Technology								

Prerequisite	Software Engineering and Project Management	
Course Outcome	**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 Framework for 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	**Fourth**	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**

Prerequisite	Database Management Systems	
Course Outcome	**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 – Support Vector Machines.			**CO3**
Unit- IV	**Clustering**	**Periods: 09**	
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.			**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.

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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	**Fourth**	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**
Information Technology								

Prerequisite	Basics of Programming Languages		
Course Outcome	**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**

LecturePeriods: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”

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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/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	-	-	-	-	-	-	-	2	-	-
2	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	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)		
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

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

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

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

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	2	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	**Fourth**	Course Category Code: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PROGRAMMING IN JAVA LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to All Branches)

Prerequisite	Programming Skills		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Apply and practice logical formulations to solve simple problems leading to specific applications.	**K3**
	CO2	Demonstrate the use of inheritance, interface and package in relevant applications	**K3**
	CO3	Implement robust application programs in Java using exception handling and multithreading	**K3**
	CO4	Build java distributed applications using Collections and IO streams.	**K3**
	CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java.	**K3**

List of Exercises

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

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

Reference Books

1. Allen B. Downey and Chris Mayeld, “Think Java - How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2020
2. Sagayaraj, Denis, Karthik, Gajalakshmi, “JAVA Programming for core and advanced learners”, Universities Press Private Limited, 2018
3. Cay.S.Horstmann and Gary Cornell, “Core Java 2”, Vol 2, Advanced Features, Pearson Education, 7th Edition, 2010

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**Fourth**	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 Outcome	**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 sorted and 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's algorithm.
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 suitable message 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 number of 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

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

Web References

6. https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/
7. https://archive.nptel.ac.in/courses/106/105/106105082/
8. https://archive.nptel.ac.in/courses/106/105/106105183/
9. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
10. 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, 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	**Fourth**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITP402**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DATA COMMUNICATION AND COMPUTER NETWORKS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Information Technology								

Prerequisite	Digital Design and System Architecture	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Design and implement socket programs for Echo, Ping, and Talk commands.	**K3**
	CO2 Implement various error handling techniques in networking.	**K3**
	CO3 Demonstrate data transmission and flow control in networking.	**K3**
	CO4 Implement TCP module, services and protocols	**K3**
	CO5 Analyze the routing algorithm performance and select best routing algorithm.	**K4**

List of Exercises

12. Write a socket Program for Echo/Ping/Talk commands.
13. Create a socket (TCP) between two computers and enable file transfer between them.
14. Write a program to implement Remote Command Execution (Two M/Cs may be used).
15. Write a program to implement CRC and Hamming code for error handling.
16. Write a code simulating Sliding Window Protocols.
17. Create a socket for HTTP for web page upload & Download.
18. Write a program for TCP module Implementation (TCP services).
19. Write a program for File Transfer in client-server architecture using TCP/IP
20. Write a program to implement RMI (Remote Method Invocation).
21. Write a program to implement the following routing methods
    a. Shortest path routing
    b. Flooding

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

Reference Books

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

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12. https://archive.nptel.ac.in/courses/106/105/106105082/
13. https://archive.nptel.ac.in/courses/106/105/106105183/
14. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
15. https://www.telecomtrainer.com/dcn-dedicated-core-network/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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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
	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	**Fourth**	Course Category : MC			End Semester Exam Type:**TE**			
Course Code	**U23ITM404**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**RIGHT TO INFORMATION AND GOOD GOVERNANCE**	**2**	**-**	**-**	**-**	**100**	**-**	**100**

(Common to ALL Branches except CSBS)

Prerequisite: -

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

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

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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