HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF INFORMATION TECHNOLOGY

Curriculum and ODD Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

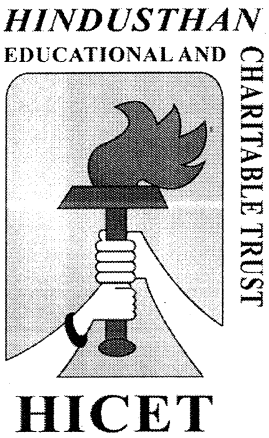
2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 18.05.2024)

(Academic Council Meeting held on 21.06.2024)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi& Accredited by NAAC with 'A ++' Grade)
Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu

B.TECH. INFORMATION TECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for ODD Semester

Academic Year 2024-2025

Institution Vision and Mission

Vision

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

Mission

M1: To provide academic excellence in technical education through novel teaching methods.
M2: To empower students with creative skills and leadership qualities.
M3: To produce dedicated professionals with social responsibility.

Department Vision and Mission

Vision

To produce Information Technology professionals with robust technical knowledge, creative thinking, and high ethical standards to address global challenges.

Mission

DM1: To prepare the students to excel in the dynamic realm of Information Technology througha conducive learning environment.

DM2: To equip the students with essential innovative skills to solve technical issues andeffectively promote interdisciplinary collaboration.

DM3: To instill ethical integrity in students for successful professional careers andentrepreneurial ventures.

Program Educational Objectives (PEO)

PEO1: Graduates of the program will be proficient in the identification, formulation, and solution of complex problems by applying their knowledge of mathematics, science, and Information Technology principles.

PEO2: Graduates of the program will be capable of analyzing, designing, implementing and managing software projects through continuous learning and using modern tools to meet real-world constraints.

PEO3: Graduates of the program will exhibit professionalism with ethical attitudes, communication, teamwork, and will contribute to societal needs.

Program Outcome (PO)	
PO-01	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO-02	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO-03	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
PO-04	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
PO-05	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
PO-06	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
PO-07	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
PO-08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO-09	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO-10	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
PO-11	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
PO-12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
Program Specific Outcomes (PSOs) of B.Tech. Information Technology	
PSO-01	Able to design and develop software solutions by employing appropriate problem-solving strategies, including logically thinking, creating a user interface and writing code to connect a front-end user interface with a backend database using a contemporary object-oriented language.
PSO-02	Ability to design and develop mobile applications and web-based applications, coupled with testing skills fostering employability and entrepreneurship skills
PSO-03	Apply the appropriate techniques and modern engineering hardware and software tools to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

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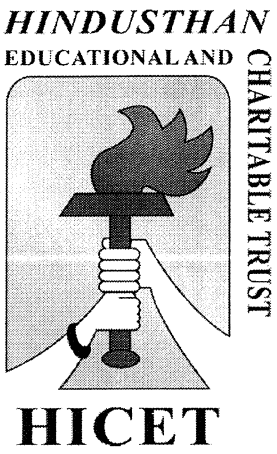

CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for ODD Semester

Academic Year 2024-2025

BATCH 2024-2028

CURRICULUM
R2022

HICET

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

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Coimbatore - 641032.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2024-2025 and onwards

SEMESTER I – 18 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA1101	Matrices-and Calculus	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2.	22CY1152	Basics of Chemistry for Computational Sciences	BSC	2	0	2	3	4	50	50	100
3.	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
4.	22CS1151	Problem solving using C programming	ESC	2	0	2	3	4	50	50	100
5.	22IT1152R	Introduction to web Application Development	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	1	0	0	0	1	100	0	100
MANDATORY COURSE											
8.	22MC1093/ 22MC1094	தமிழர்மரபு / Heritage of Tamil	MC	1	0	0	1	2	40	60	100
9.	22MC1095	Universal Human Values	MC	1	0	0	0	2	100	0	100
		TOTAL		**15**	**1**	**8**	**18**	**20**	**480**	**320**	**800**

SEMESTER II -23 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2103	Differential Equations and Linear Algebra	BSC	3	1	0	4	4	40	60	100
2.	22PH2101	Introduction to Information Technology	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH2151	Physics for Circuit Engineering Programme/Physics for Engineers	BSC	2	0	2	3	4	50	50	100
4.	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
5.	22IT2251	Python programming and Practices	PCC	2	0	2	3	4	50	50	100
6.	22IT2253	Dynamic Web Design	PCC	2	0	2	2	3	50	50	100

PRACTICAL											
7.	**22ME2001**	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE2071**	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	**22HE2072**	Soft Skills and Aptitude	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2094/ 22MC2095**	Tamil and Technology	MC	2	0	0	1	2	40	60	100
11.	**22MC2093**	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**18**	**1**	**12**	**23**	**29**	**580**	**420**	**1000**

SEMESTER III– 25 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA3101**	Applied Statistics and Queuing Theory	BSC	3	1	0	4	4	40	60	100
2.	**22IT3201**	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	**22IT3202**	Operating System	PCC	3	1	0	4	4	40	60	100
4.	**22IT3203**	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT3251**	Java Programming	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
6.	**22IT3001**	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	**22IT3002**	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE3071**	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	**22IT3003**	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10.	**22MC3191**	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV–23 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22IT4201**	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	**22IT4202**	Computer Networks	PCC	3	0	0	3	3	40	60	100

4.	22IT4203	Object Oriented Software Engineering	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22IT4251	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	22IT4252	Database Management System	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	22IT4001	Case Tools Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	22IT4002	Network Laboratory	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills and Aptitude -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**16**	**0**	**12**	**23**	**29**	**480**	**420**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V–22 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT5201	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	22IT5202	Embedded System and IOT	PCC	3	0	0	3	3	40	60	100
3.	22IT53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	22IT53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22IT53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITHLABCOMPONENT											
6.	22IT5251	Application Development	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22IT5001	Artificial Intelligence and Machine Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE5071	Soft Skills -4/ Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	18	1	6	22	25	410	390	800

SEMESTER VI–24 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT6201	Foundations of Data Science	PCC	3	0	0	3	3	40	60	100
2.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3.	22IT63XX	**Professional Elective -4**	PEC	3	0	0	3	3	40	60	100
4.	22IT63XX	**Professional Elective-5**	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	**Open Elective–1***	OEC	3	0	0	3	3	40	60	100

6.	22XX64XX	**Open Elective–2***	OEC	3	0	0	3	3	40	60	100
7.	22CY6101	Environmental Science	ESC	2	0	0	2	3	40	60	100
PRACTICAL											
8.	22IT6001	Internet of Things Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII–20 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT7201	Cryptography and Network Security	PCC	3	0	0	3	3	40	60	100
2.	22IT7202	Quantum Computing	PCC	3	1	0	4	4	40	60	100
3.	22IT73XX	**ProfessionalElective-6**	PEC	3	0	0	3	3	40	60	100
4.	22XX74XX	**Open Elective–3***	OEC	3	0	0	3	3	40	60	100
5.	22XX74XX	**Open Elective–4***	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22IT7001	Cryptography and Network Security Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22IT7701	Internship - II*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII–10 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22IT8901	Project Work	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22AI6451**	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	**22CS6451**	Block Chain Technology	OEC	2	0	2	4	3
3	**22EC6451**	Cyber security	OEC	2	0	2	4	3
4	**22EC6452**	IoT Concepts and Applications	OEC	2	0	2	4	3
5	**22IT6451**	Data Science and Analytics	OEC	2	0	2	4	3
6	**22BM6451**	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22AE6401**	Space Science	OEC	3	0	0	3	3
2	**22MT6401**	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	**22MT6402**	Industrial Safety and Environment	OEC	3	0	0	3	3
4	**22CE6401**	Climate Change and its Impact	OEC	3	0	0	3	3
5	**22CE6402**	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	**22ME6401**	Renewable Energy System	OEC	3	0	0	3	3
7	**22ME6402**	Additive Manufacturing systems	OEC	3	0	0	3	3
8	**22EI6401**	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	**22EI6402**	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	**22AU6401**	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	**22AU6402**	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	**22EE6401**	Digital Marketing	OEC	3	0	0	3	3
13	**22EE6402**	Research Methodology	OEC	3	0	0	3	3
14	**22FT6401**	Traditional Foods	OEC	3	0	0	3	3
15	**22AG6401**	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	**22CH6401**	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22IT7401**	Disaster Management	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22LS7401**	General studies for competitive examinations	OEC	3	0	0	3	3
2	**22LS7402**	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	**22LS7403**	Indian ethos and Human values	OEC	3	0	0	3	3
4	**22LS7404**	Financial independence and management	OEC	3	0	0	3	3
5	**22LS7405**	Yoga for Human Excellence	OEC	3	0	0	3	3
6	**22LS7406**	Democracy and Good Governance	OEC	3	0	0	3	3
7	**22LS7407**	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Data Science	**Vertical II Full Stack Development for IT**	**Vertical III Cloud Computing and Data Centre Technologies**	**Vertical IV Internet of things**	**Vertical V Creative Media**	**Vertical VI Emerging Technologies**
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing andAutomation	**22IT5307** Data Warehousing and Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22 IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cyber security
22IT5303 Computer Vision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry 4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** Stream Processing	**22IT6307** Fog Computing & Energy Management In Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big Data Analytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT cloud and data analytics	**22IT6310** Video Creation and Editing	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and videoanalytics	**22IT7302** Security and Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304** IOT Security	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Image and video analytics	PEC	3	0	0	3	3

Details of Vertical II: FullStackDevelopmentfor IT

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Security and Privacy in Cloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software Defined Networks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22IT5310**	Design of Smart Cities	PEC	3	0	0	3	3
2.	**22IT5311**	IoT Architectures and Protocols	PEC	3	0	0	3	3
3.	**22IT5312**	Industry 4.0	PEC	3	0	0	3	3
4.	**22IT6307**	Fog Computing & Energy Management in IoT Devices	PEC	3	0	0	3	3
5.	**22IT6308**	IoT cloud and data analytics	PEC	3	0	0	3	3
6.	**22IT7304**	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22IT5313**	Multimedia Data Compression and Storage	PEC	3	0	0	3	3
2.	**22IT5314**	Multimedia and Animation	PEC	3	0	0	3	3
3.	**22IT5315**	Digital Marketing	PEC	3	0	0	3	3
4.	**22IT6309**	UI and UX Design	PEC	3	0	0	3	3
5.	**22IT6310**	Video Creation and Editing	PEC	3	0	0	3	3
6.	**22IT7305**	Visual Effects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22IT5316**	Augmented Reality	PEC	3	0	0	3	3
2.	**22IT5317**	Cybersecurity	PEC	3	0	0	3	3
3.	**22IT5318**	Tamil Computing	PEC	3	0	0	3	3
4.	**22IT6311**	Robotic Process Automation	PEC	3	0	0	3	3
5.	**22IT6312**	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	**22IT7306**	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22IT5601**	Sem5: Database System	MDC	3	0	0	3	3
2.	**22IT6601**	Sem6: Fundamentals of Data Science	MDC	3	0	0	3	3
3.	**22IT6602**	Sem6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3
4.	**22IT7601**	Sem7: Data Exploration and Visualization	MDC	3	0	0	3	3
5.	**22IT7602**	Sem7: Business Intelligence	MDC	3	0	0	3	3
6.	**22IT8601**	Sem8: Cyber Security	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I **Fintech and Block Chain**	**Vertical II** **Entrepreneurship**	**Vertical III** **Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

B Tech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22IT5203	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	22IT6203	Applied NLP	PC	3	0	0	3	4	40	60	100
3.	22IT6204	AI-Knowledge Representation and Reasoning	PC	3	0	0	3	4	40	60	100
4.	22IT7203	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	22IT7204	Gaming Theory	PC	3	0	0	3	4	40	60	100
6.	22IT8201	Generative AI	PC	3	0	0	3	4	40	60	100

B Tech (Hons) Information Technology with Specialization in Cyber Security

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22IT5204	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	22IT6205	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	22IT6206	Social Network Security	PC	3	0	0	3	3	40	60	100
4.	22IT7206	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	22IT7207	Cryptocurrency and Block chain Technologies	PC	3	0	0	3	3	40	60	100
6.	22IT8202	Network Security	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Information Technology with Specialization in Block Chain Technology

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22IT5205	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	22IT6207	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	22IT6208	Building Private Block chain	PC	3	0	0	3	3	40	60	100
4.	22IT7208	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	22IT7209	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	22IT8203	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	2	-	-	17
4	PCC	-	3	13	20	12	5	9	-	62
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	6	6	-	12
7	EEC	1	3	3	1	1	2	2	10	23
8	MCC	1	1	-	-	-	-	-	-	02
Total		18	23	25	23	22	24	20	10	165

CREDIT DISTRIBUTION R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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SYLLABUS

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22MA1101	MATRICES AND CALCULUS (Common to all Branches)	3	1	0	4

Course Objective

The learner should be able to

1. Construct the characteristic polynomial of a matrix and use it to identify Eigen values and Eigenvectors
2. Impart the knowledge of single variate calculus.
3. Familiarize the student with functions of several variables.
4. Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
5. Make a vector differential operator for vector function and theorems to solve engineering problems

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem – Lagrange's Mean Value Theorem - Maxima and Minima – Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives - Total derivative - Jacobians – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates – Area enclosed by plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl vectors - Green's theorem - Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
CO2: Apply the concept of differentiation to identify the maximum and minimum values of curve.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply multiple integral ideas in solving areas, volumes and other practical problems.
CO5: Apply the concept of vector calculus in two and three-dimensional spaces.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10th edition, 2019.
T2 - K. P. Uma and S. Padma, "Engineering Mathematics I (Matrices and Calculus) ", Pearson Ltd,2022.

REFERENCE BOOKS:

R1 - Jerrold E. Marsden, Anthony Tromba, "Vector Calculus", W.H.Freeman, 2003-Strauss M. J, G. L Bradley and K. J .Smith, "Multivariable calculus", 6th edition, Prentice Hall, 2011.
R2 - Veerarajan T, "Engineering Mathematics", 5th edition, Mc Graw Hill Education(India) Pvt Ltd, New Delhi, 2016.
R3 - G. B. Thomas and R. L. Finney, "Calculus and Analytical Geometry", 9th Edition, Addison Wesley Publishing Company, 2016.

Co-Po Mapping:

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	-	-	1	2	2	-	-	1
CO2	3	3	3	3	2	2	2	-	-	1	2	2	-	-	1
CO3	3	3	3	3	2	2	2	-	-	1	2	2	-	-	1
CO4	3	3	3	3	2	2	2	-	-	1	2	2	-	-	1
CO5	3	3	3	3	2	2	2	-	-	1	2	2	-	-	1
AVG	3	3	3	3	2.2	2	2	-	-	1	2	2	-	-	1

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THEORY WITH LAB COMPONENT

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22CY1152	CHEMISTRY FOR COMPUTATIONAL SCIENCES (AIML,CSE,IT & CS)	2	0	2	3

Course Objective

The learner should be able to

1. Inculcate sound understanding of water quality parameters and water treatment techniques.
2. *Apply electrochemical basics to the field of battery technology and the main components*, fundamental aspects of biosensors.
3. Acquire knowledge on the concepts of chemistry involved in display systems and conducting polymer materials.
4. Acquire the concept and working principle of spectral analytical instruments and applications.
5. Understand and gain the knowledge of electronic waste management.

Unit	Description	Instructional Hours
I	**WATER SCIENCE** Impurities in Water, Hardness of Water and Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- - Softening Methods - Ion-Exchange Method, Desalination of Brackish Water - Reverse Osmosis. **Estimation of hardness of water by EDTA.** **Determination of Dissolved Oxygen in sewage water by Winkler's method.** **Estimation of alkalinity of water sample by indicator method.**	6+9
II	**BATTERIES AND SENSORS:** Batteries - battery characteristics- classification of batteries: primary, secondary - Applications –Alkaline Battery – Lead-Acid Battery – Lithium Ion Batteries – Fuel Cells –Hydrogen Oxygen fuel cell and Solar cells – Advantages. Sensors - Biosensors - application and advantages. **Estimation of Ferrous iron by Potentiometry**	6+3
III	**ORGANIC ELECTRONIC MATERIALS** Conducting Polymers types and mechanism – Organic Semiconducting materials – Fullerenes – C60- Organic dielectric materials- definition – working principle – Polystyrene, PMMA- Properties & Applications in Liquid Crystal Display (LCDS) - Principle - construction – working and applications.	6
IV	**SPECTRAL ANALYSIS** Introduction- UV- Visible Spectroscopy- Beer – Lambert's Law- IR-Spectroscopy, principles – instrumentation (block diagram only)and applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry **Determination of Fe^{2+} by colorimetric method.**	6
V	**ELECTRONIC WASTE MANAGEMENT** E-waste - Introduction - Definition – Sources - Effects of E-waste on environment and human health - need for E-waste management - Extraction Gold and copper from printed circuit boards (PCBs) - Disposal treatment methods of E-waste - recycling of E-waste. **Estimation of copper by EDTA method.**	6+3
	Total Instructional Hours	45

Course Outcome

At the end of the course, the learner will be able to

CO1: Explain the basic properties of water and its usage in domestic and industrial purposes

CO2: Describe the fundamentals of battery and its types, and to attain basic knowledge about sensors.

CO3: Utilize the electronic materials for various applications.

CO4: Extend the knowledge on the concepts of spectroscopy and its applications on analytical instrumentation.

CO5: Understand the environmental impacts of electronic-waste

TEXT BOOKS

T1 - P. C. Jain& Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi, 17th edition, (2022).

T2 -O. G. Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCE BOOKS:

R1 – Shikha Agarwal "Engineering Chemistry -Fundamentals and Applications, Cambridge University , Press, Delhi, 2019

R2 - S. S. Dara "A Text book of Engineering Chemistry" S. Chand& Co. Ltd., New Delhi (2018).

Co-Po Mapping

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	1	1	1	-	1	-	1	2	-	-	1
CO2	2	3	2	1	1	1	1	-	1	-	1	2	-	-	1
CO3	2	2	2	2	1	1	1	-	1	-	1	2	-	-	1
CO4	2	2	2	2	1	1	1	-	1	-	1	2	-	-	1
CO5	2	3	2	-	-	-	3	-	-	-	-	-	-	-	1
AVG	2	2.6	2.2	1.5	1	1	1.4	-	1	-	1	2	-	-	1

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22HE1151	ENGLISH FOR ENGINEERS (Common to all Branches)	2	0	2	3

Course Objective

The student should be able

1. To help the students of engineering and technology develop a strong base in the use of English.
2. To help learners use language effectively in professional writing.
3. To impart basic English grammar and essentials of important language skills
4. To impart knowledge about the importance of vocabulary and grammar
5. To develop the communication skills of the students in both formal and informal situations

Unit	Description	Instructional Hours
I	**Language Proficiency:** Parts of Speech, Degrees of Comparison, Abbreviation& Acronyms **Writing**: Process Description, Instructions. **Vocabulary** – Words on Environment. **Practical Component: Listening**- Watching Short Videos and answer the questions, **Speaking**- Self introduction , Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing of documentaries / podcasts / interviews **Reading**- Purpose of Reading - Churning & Assimilation, Interpreting Ideas - Interpreting Graphs in Technical Writing.	7+2
II	**Language Proficiency**: Types of Sentences, Framing Question, One Word Substitution **Writing:** Writing Checklist, Reading Comprehension. **Vocabulary**– Words on Entertainment. **Practical Component: Listening**-Comprehensions based on TED talks **Speaking**- Story Telling **Reading** - Skimming – Scanning – Reading: Scientific Texts	7+2
III	**Language Proficiency:** Tenses, Conditional Clause ('If' clause), Active and Passive voices, **Writing:** Formal letter (invitation, acceptance, decline, Congratulation) Cloze test. **Vocabulary** – Words on Tools. **Practical Component: Listening**-Listening pre-recorded English language learning programme **Speaking** - Just a minute **Reading**- Reading feature articles (from newspapers and magazines) -Reading to identify point of view and perspective (opinion pieces, editorials etc.)	5+4
IV	**Language Proficiency:** Subject Verb Concord, Articles, The Use of Prefixes and Suffixes **Writing:** Preparing Agenda &Minutes, Writing Recommendations. **Vocabulary**– Words on Engineering process. **Practical Component: Listening**-An interview with someone who works for recruitment personnel. **Speaking**-Presentation on a general topic. **Reading**- Reading Comprehension - Literary Texts.	5+4
V	**Language Proficiency:** Prepositions, Phrasal Verbs, Modal Auxiliaries, **Writing:** Letter to the Editor, Sequencing of Sentences **Vocabulary** –Words on Engineering material **Practical Component: Listening**- Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking**- Preparing posters and presenting as a team. **Reading**- Biographies, Travelogues, Technical blogs.	6+3
	Total Instructional Hours	45

Course Outcome

After completion of the course the learner will be able

CO1: Understand English and converse effectively.
CO2: Enable the students to write coherently and cohesively.
CO3: Enable the development of basic grammar to enhance language for a better communication
CO4: Use suitable vocabulary and grammar with confidence and express their ideas both in speech and writing.
CO5: Follow the etiquettes in formal and informal communication.

TEXT BOOKS:

T1- Raymond Murphy, "English Grammar in Use"-5thedition CambridgeUniversityPress, 2019.
T2-Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.

REFERENCE BOOKS:

R1- Kapoor A.N., Business Letters for Different Occasions, New Delhi: S. Chand & Co. Pvt. Ltd., 2012.
R2-RaymondMurphy, " English Grammar For ESL Learners - Premium Fourth Edition.
R3- McCarthy, Michael et.al (2011) English Vocabulary in Use – advanced, Cambridge University Press.

Co-Po Mapping

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	-	3	2	1	-	-	1
CO2	-	-	-	-	2	3	2	3	1	3	1	-	-	-	1
CO3	-	-	-	3		2	-	2	2	3	2	2	-	-	1
CO4	-	-	-	-	-	2	-	2	1	3	1	1	-	-	1
CO5	-	-	-	2	-	-	-	2	3	3	3	1	-	-	1
AVG	-	-	-	2.5	2	2.3	2	2.2	1.8	3	1.8	1.3	-	-	1

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Programme	Course code	Name of the course	L	T	P	C
B.E./B.Tech	22CS1151	PROBLEM SOLVING USING C PROGRAMMING (EEE, EIE, CSE, IT &CS)	2	0	2	3

The student should be able to

Course Objective

1. To develop simple algorithms for arithmetic and logical problems
2. To understand and implement the fundamental concepts in a program.
3. To enable how to implement conditional branching, iteration and recursion
4. To understand how to decompose a problem into functions and synthesize a complete program and to enable them to use arrays, pointers, strings and structures in solving problems.
5. To understand the use files to perform read and write operations

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMPUTERS** Computer Systems – Computing Environments – Computer Language – Creating and Running programs – Computer Numbering System – Storing Integers and Real Numbers – Algorithms - Flowchart. **INTRODUCTION TO C LANGUAGE** Character set - C Tokens, Identifiers and Keywords - Constants, Variables - Data types – Text Input / Output – Operators - Expressions – Precedence and Associativity – Evaluating Expressions – Type Conversions.	7
II	*Illustrative program: 1) Josh went to the market to buy N apples. He found two shops, shop A and B, where apples were being sold in lots. He can buy any number of the complete lot(s) but not loose apples. He is confused with the price and wants you to figure out the minimum cost to buy exactly N apples. Write an algorithm for Josh to calculate the minimum cost to buy exactly N apples.* ***Input Format:*** • *The first line of the input consists of an integer – N, representing the total number of apples that Josh wants to buy.* • *The second line consists of two space-separated positive integers – M1 and P1, representing the number of apples in a lot and the lot's price at shop A, respectively.* • *The third line consists of two space-separated positive integers-M2 and P2, representing the number of apples in a lot and lot's price at shop B, respectively.* ***Output Format:*** *Print a positive integer representing the minimum price at which Josh can buy the apples.* *2) Chaman planned to choose a four-digit lucky number for his car. His lucky numbers are 3,5 and 7. Help him find the number, whose sum is divisible by 3 or 5 or 7. Provide a valid car number, fails to provide a valid input then display that number is not a valid car number. Note: The input other than 4 digit positive number[includes negative and 0] is considered as invalid.*	6+4

DECISION MAKING, ARRAYS, STRINGS AND POINTERS

Two-way selection – Multi-way selection – Concept of a Loop – Pre-test and Post-test Loops – Initialization and Updating – Controlled Loops – Other Statements Related to Looping – Looping Application - Arrays - Strings - Pointers – Pointer Applications – Processor Commands.

Illustrative program: 1) You are playing an online game. In the game, a list of N numbers is given. The player has to arrange the numbers so that all the odd numbers of the list come after the even numbers. Write an algorithm to arrange the given list such that all the odd numbers of the list come after the even numbers.

Input

- *The first line of the input consists of an integer number, representing the size of the list(N).*
- *The second line of the input consists of N space-separated integers representing the values of the list*

Output

Print N space-separated integers such that all the odd numbers of the list come after the even numbers

III *2) Given an integer matrix of size N x N. Traverse it in a spiral form.*

Input:

The first line contains N, which represents the number of rows and columns of a matrix. The next N lines contain N values, each representing the values of the matrix.

Output:

A single line containing integers with space, representing the desired traversal.

Constraints: 0 < N < 500

3) A digital machine generates binary data which consists of a string of 0s and 1s. A maximum signal M, in the data, consists of the maximum number of either 1s or 0s appearing consecutively in the data but M can't be at the beginning or end of the string. Design a way to find the length of the maximum signal. 6+4

Input

The first line of the input consists of an integer N, representing the length of the binary string. The second line consists of a string of length N consisting of 0s and 1s only.

Output

Print an integer representing the length of the maximum signal.

4) Given a string S(input consisting) of '' and '#'. The length of the string is variable. The task is to find the minimum number of '*' or '#' to make it a valid*

string. The string is considered valid if the number of '' and '#' are equal. The '*' and '#' can be at any position in the string.*

Note : The output will be a positive or negative integer based on number of '' and '#' in the input string.*

(>#): positive integer*

(#>): negative integer*

(#=): 0*

FUNCTIONS, STRUCTURES AND UNION

Designing Structured Programs – Functions in C – User defined functions – Inter-Function Communication – Standard Function – Passing Arrays to Functions – Passing Pointers to Function – Recursion – Passing an array to a function – typedef – Enumerated types - Structure – Union – Programming Application.

IV *Illustrative program: 1) The Caesar cipher is a type of substitution cipher in which each alphabet in the plaintext or messages is shifted by a number of places down the alphabet. For example, with a shift of 1, P would be replaced by Q, Q would become R, and so on. To pass an encrypted message from one person to another, it is first necessary that both parties have the 'Key' for the cipher, so that the sender may encrypt and the receiver may decrypt it. Key is the number of OFFSET to shift the cipher alphabet. Key can have basic shifts from 1 to 25 positions as there are 26 total alphabets. As we are designing custom Caesar Cipher, in addition to alphabets, we are considering numeric digits from 0 to 9. Digits can also be shifted by key places. For Example, if a given plain text contains any digit with values 5 and keyy =2, then 5 will be replaced by 7, "-"(minus sign) will remain as it is. Key value less than 0 should result into "INVALID INPUT". Write a function CustomCaesarCipher(int key, String message) which will accept plaintext and key as input parameters and returns its cipher text as output.* 5+4

Enter your PlainText: All the best

Enter the Key: 1

The encrypted Text is: BmmuifCftu

BINARY INPUT / OUTPUT

Defining and Opening a file, closing a file - input/output operations on files - error handling during I/O operations - random access to files - Text versus Binary Streams – Standard Library Functions for Files – Converting File type.

V *Illustrative program: 1) Write a C Program to merge contents of two files into a third file. 2) Write a program in C to delete a specific line from a file.* 6+3

Total Instructional Hours **45**

Course Outcome

CO1 Develop simple algorithms for arithmetic and logical problems.

CO2 Test and execute the programs and correct syntax and logical errors

CO3 Implement conditional branching, iteration and recursion

CO4 Decompose a problem into functions and synthesize a complete program and use

arrays, pointers, strings and structures to formulate algorithms and programs.

CO5 Use files to perform read and write operations

TEXT BOOKS:

T1 Behrouz A. Forouzan, Richard F. Gilberg, J. Jaya, S. Shankar, I. Jasmine Selvakumari Jeya, M. Ramya Devi, "Computer Programming in C", Cengage Learning, 2022.

T2 Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017.

REFERENCE BOOKS:

R1 Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th edition, 2014.

R2 R. S. Bichkar, "Programming with C", Universities Press, 2nd edition 2012.

R3 Yashvant Kanetkar, "Exploring C", BPB Publishers, 2nd edition, 2003.

R4 W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd edition, 1988

Co-Po Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	-	-	-	3	-	3	-	3	2	2
CO2	2	2	2	2	2	3	-	1	2	-	3	2	3	1	2
CO3	3	2	1	2	2	3	-	1	2	-	2	2	3	2	2
CO4	3	1	2	2	-	3	-	1	-	-	2	2	3	2	2
CO5	3	1	2	1	2	-	-	-	-	-	2	3	2	1	2
Avg	2.8	1.4	2	2	2	-	-	1	2.3	-	2.4	2.3	2.8	1.6	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22IT1152R	INTRODUCTION TO WEB APPLICATION DEVELOPMENT(IT/CSE/AIML)	2	0	2	3

The learner should made

Course Objectives

1. To understand the fundamental building blocks of web pages,
2. To develop common HTML form elements for user input.
3. To analyse the basic building blocks of CSS and how to style HTML elements.
4. To apply fundamental CSS concepts for styling text, backgrounds, borders, and layout.
5. To understand different software development methodologies and their characteristics.

Unit	Description	Instructional Hours
I	**Hyper Text Markup Language-1** Web Essentials: Clients, Servers, Basic Terminologies-HTML Basic Tags – Elements - Attributes - Basic Formatting, Fonts and Colors-Hyperlink-Images- Tables - cell spanning, cell spacing- Table contents, Border. List –ordered List-Unordered List-Definition List.	06
II	**Hyper Text Markup Language-II** Frames-HTML Forms - Single line text field, Text area, Check box, Radio buttons, Password fields, Pull-down menus, File selector dialog box–HTML 5 features.	06
III	**Cascading Style Sheet-I** Introduction - CSS Syntax -Type of CSS Selector-Simple Selectors, Universal Selector, ID Selector, Class selector and Pseudo Classes – Style Specification Formats-Inline Style-Embedded Style sheet- External Style sheet.	06
IV	**Cascading Style Sheet-II** Font properties-List properties- Background properties-Colors RGB and RGBA, HSL and HSLA, Borders, Rounded Corners, Applying Shadows in border- Padding, Margin-CSS Layout- Normal Flow Layout-Relative positioning-Float positioning-Absolute positioning.	06
V	**Software Development Life Cycle** Software Development Model -Waterfall Model- Incremental Process Models-Evolutionary Process Models- Spiral Model-Agile Software Development –Agile process-Agility principles-Introduction Github.	06
	Total Instructional Hours (Theory)	30
	Total Instructional Hours (Practical)	30
	Total Instructional Hours	60

Laboratory Practical Exercises

1. Create a basic HTML page to provide a description of yourself, using fundamental HTML tags.
2. Create a web page that embeds an image using the <img> tag and includes a hyperlink to your 'About Me' page.
3. Create an HTML web page to display a list of courses available in your department and prepare a timetable for them.
4. Create an HTML web page for a quiz program using various types of input options.
5. Develop an HTML webpage for a student registration form, incorporating various input fields and form elements.
6. Develop a basic HTML webpage for a simple calculator using inline and embedded CSS.
7. Create an HTML webpage for a Personal Portfolio using external CSS.
8. Create an HTML webpage to display a product report with a suitable background color and an image. Use various text properties and padding to enhance the layout.
9. Develop an HTML webpage to create a simple college website and utilize a software development process tool for its development.
10. Create a GitHub account, then create a new repository. Develop an HTML code to display your name.

At the end of the course, the learner will be able to

Course Outcomes

CO1	Describe the roles of clients and servers, explain basic web terminologies, and apply HTML tags, attributes, and CSS to format and structure web content.

CO2	Design web pages with frames, integrate HTML forms with single-line text fields, text areas, checkboxes, radio buttons, password fields, pull-down menus, and file selector dialog boxes.
CO3	Analyse and apply fundamental CSS syntax including selectors and style specification formats to achieve desired webpage aesthetics.
CO4	Apply fundamental CSS styling concepts to create visually appealing and well-structured web pages.
CO5	Develop a critical understanding of various software development and their core principles to effectively select and implement an approach for project management.

TEXT BOOKS:

T1 - Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
T2 – J.Jaya, S.Shankar, M.Ganesan, M.Umapriya"Introduction To Web Application Development",schand publications,2023
T3 - Roger S.Pressman, Bruce R. Maxim, Software engineering- "A practitioner's Approach, McGraw-Hill International Edition", 8thedition (2015). ISBN: 9789353165710

REFERENCES:

R1 - Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
R2- Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.

WEB RESOURCES:

https://www.w3schools.com/html/default.asp
https://html.com/
https://www.geeksforgeeks.org/html-tutorial/

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	3	-	-	-	1	1	2	1	1	3	1
CO2	1	1	3	-	3	-	-	-	1	1	2	1	1	3	1
CO3	2	2	3	3	3	-	-	-	1	1	2	1	1	3	1
CO4	2	2	3	-	3	-	-	-	1	1	3	1	1	3	1
CO5	2	2	1	1	1	-	-	1	2	2	3	2	2	1	3
AVG	1.4	1.2	2.3	-	2.6	-	-	1	1.2	1.2	3	1.2	1.2	2.6	1.4

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EEC COURSES

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22HE1072	ENTREPRENEURESHIP AND INNOVATION (Common to all Branches)	1	0	0	1

Course Objectives

The student should be made

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize these innovations.
3. To plan specific and detailed method to exploit these opportunities.
4. To acquire the resources necessary to implement these plans.
5. To make students understand organizational performance and its importance.

Module	Description
1	**Entrepreneurial Thinking**
2	**Innovation Management**
3	**Design Thinking**
4	**Opportunity Spotting / Opportunity Evaluation**
5	**Industry and Market Research**
6	**Innovation Strategy and Business Models**
7	**Financial Forecasting**
8	**Business Plans/ Business Model Canvas**
9	**Entrepreneurial Finance**
10	**Pitching to Resources Providers / Pitch Deck**
11	**Negotiating Deals**
12	**New Venture Creation**
13	**Lean Start-ups**
14	**Entrepreneurial Ecosystem**
15	**Velocity Venture**
	TOTAL INSTRUCTIONAL HOURS 15

Course Outcome

At the end of the course, the learner will be able to

CO1: Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2: Understand the processes by which innovation is fostered, managed, and commercialized.
CO3: Remember effectively and efficiently the potential of new business opportunities.
CO4: Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5: Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXT BOOKS

T1:Arya Kumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson,SecondEdition(2012).
T2: Emrah Yayici "Design Thinking Methodology", Artbiztech, First Edition sss(2016).

REFERENCE BOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).
R2: Thomas Lock Wood & Edger Papke "Innovation by Design", Career Press.com, Second Edition (2017).
R3: Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition (2010).

WEB RESOURCES

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

Co-Po Mapping

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	1	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	1	2	1
CO3	3	3	3	2	3	-	-	-	-	-	-	2	1	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2	1
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1	2	1

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Programme/ Semester	Course Code	Course Title	L	T	P	C
B.E./B.Tech/I	22HE1073	INTRODUCTION TO SOFT SKILLS	2	0	0	0

Course Objectives:

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice.
2. To enhance the students ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills.

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	2
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement – Punctuations	4
	Total Instructional Hours	**30**

Course Outcome

CO1	Students will analyze interpersonal communication skills. public speaking skills.
CO2	Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
CO5	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

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MANDATORY COURSE

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22MC1094	HERITAGE OF TAMIL (Common to all Branches)	2	0	0	1

Course Objective

The learner should be able to

1. Introduce students to the great History of Tamil literature.
2. Establish the heritage of various forms of Rock art and Sculpture art.
3. To study and understand the various folk and Martial arts of Tamil culture
4. Introduce students to Ancient Tamil concepts to understand the richness of Tamil literature.
5. To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**Language and Literature** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**Heritage _ Rock Art Paintings to Modern Art – Sculpture** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari. Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temples in social and economic life of Tamils.	6
III	**Folk and Martial Arts** Therukoothu, Karagattem, Villupattu, Kaniyankoothu, Oyilattam, Leather puppertry, Silambattam.,Valari Tiger dance – Sports and Games of Tamils.	6
IV	**Thinai Concept of Tamils** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**Contribution of Tamils to Indian National Movement and Indian Culture** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able to

CO1: Learn about the works pertaining to Sangam age
CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture.
CO4: Appreciate the intricacies of Tamil literature that had existed in the past.
CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXT BOOKS:

T1- Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
T2- Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
T3- Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCE BOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu TextBookand Educational Services Corporation, Tamil Nadu)
R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

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Programme/ sem	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22MC1093	தமிழர்மரபு	2	0	0	1

Unit	Description	Instructional Hours
I	**அலகு I மொழி மற்றும் இலக்கியம்:** 3 இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	3
II	**அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	3
III	**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	3
IV	**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3 தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	3
V	**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3 இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	3
	Total Instructional Hours	15

TEXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

Co-Po Mapping

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	2			2
CO2	2	3	3	-	-	-	-	-	2			2
CO3	2	3	3	-	-	-	-	-	2			2
CO4	2	3	-	-	-	-	-	-	2			2
CO5	2	3	-	-	-	-	-	-	2			2
AVG	2	3	1.8	-	-	-	-	-	2			2

Chairman - BoS

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech /I	**22MC1095**	**UNIVERSAL HUMAN VALUES (COMMON TO ALL BRANCHES)**	2	0	0	0

Course Objectives

The student should be made

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. TofsacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. TohighlightplausibleimplicationsofsuchaHolisticunderstandingIntermsofethicalhumanconduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** 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	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction. Values in Human to Human Relationship 'Trust' – the Foundational Value in Relationship Values in Human to Human Relationship 'Respect' – as the Right Evaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature. Inter connectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasive space Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct A 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	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able

CO1: To become more aware of holistic vision of life - themselves and their surroundings.

CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions.

CO3: To sensitive towards their commitment towards what they understood towards environment and Socially responsible behavior.

CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.

CO5: To develop competence and capabilities for maintaining Health and Hygiene.

Reference Books:

R1- A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3-JeevanVidya: E k Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.

R4- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Co-Po Mapping:

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	2	-	-	-	2	-	-	2	-	-	1
CO2	2	3	3	-	2	-	-	-	2	-	-	2	-	-	1
CO3	2	3	3	-	2	-	-	-	2	-	-	2	-	-	1
CO4	2	3	3	-	2	-	-	-	2	-	-	2	-	-	1
CO5	2	3	3	-	2	-	-	-	2	-	-	2	-	-	-
AVG	2	3	3	-	2	-	-	-	2	-	-	2	-	-	1

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SERVICE COURSE

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22IT1151R	**PYTHON PROGRAMMING AND PRACTICES** (AERO, AIML, CHEM, CIVIL, MECH, ECE, BME, MTS)	2	0	2	3

The learner should be made:

Course Objectives

1. To understand and be aware of algorithmic problem solving
2. To read, understand and write simple Python programs
3. To develop Python functions/programs with conditionals and loops
4. To use Python data structures — lists, tuples, dictionaries
5. To do input and output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion) **Illustrative problems: Finding LCM/GCD, Fahrenheit to Celsius conversion, Performing Matrix addition.**	6
II	**DATA, STATEMENTS and CONTROL FLOW** Data Types, Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass. **Illustrative problems: Area of the polygon, check the given year is Leap year or not, Factorial of a Number, Fibonacci series generation**	6
III	**FUNCTIONS and STRINGS** Functions, parameters and arguments; Fruitful functions: retsurn values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module. **Illustrative programs: Perform Linear Search, Selection sort, Sum of all elements in a List, Pattern Programs**	6
IV	**LISTS, TUPLES and DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension. **Illustrative programs: List and Dictionary manipulation, Finding Maximum/minimum/average in a List, String processing.**	6
V	**FILES, MODULES and PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages **Illustrative programs: Creating/Reading/writing in a file, word count, Handling Exceptions scenarios with simple examples**	6
	Total Instructional Hours (Theory)	**30**
	Total Instructional Hours (Practicals)	**30**
	Total Instructional Hours	**30 + 30**

Laboratory (Practical) Exercises **30 hours**

(The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)

2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of *n* variables, distance between two points).

3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)

4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)

5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)

6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)

7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)

8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)

9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)

10. Implementing real-time/technical applications using Exception handling. (divide by zero error,voter's age validity, student mark range validation)

11. Exploring Pygame tool.

12. Developing a game activity using Pygame like bouncing ball, car race etc

Course Outcomes

At the end of the course, the learner will be able to

CO1: Design effective algorithms to solve computational problems by utilizing building blocks like statements, control flow, functions, and employing problem-solving techniques with iteration and recursion.

CO2: Develop fundamental Python programs that utilize data types, operators, control flow with conditionals and iteration, while incorporating comments for readability.

CO3: Construct Python functions that process and manipulate strings using parameters, return values, and understand its scope.

CO4: Utilize Python's built-in data structures like lists, tuples, and dictionaries to effectively store, manipulate, and access data.

CO5: Create robust Python programs that interact with the file system by reading and writing text files.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, - An Introduction to Python (Revised and updated for Python 3.6.2), Schroff Publishers, First edition, 2017.

T2: S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, - Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019.

REFERENCE BOOKS:

R1:M.Sabrigiriraj, K.Manoharan – Programming Prowess: Conquering 110 coding challenges illustrated with Python code, Publisher: Hindusthan Educational Institutions, 2024

R2: Charles Dierbach —Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

R3:Robert Sedgewick, Kevin Wayne, Robert Dondero —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

Web Links for Programming Practice:

1. **https://www.hackerrank.com/domains/python**
2. **https://leetcode.com/problemset/**

CO-PO Mapping

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	3	2	1	-	-	-	-	2	-	2	3	1	2
CO2	1	1	3	1	1	-	-	-	-	2	-	2	2	1	1
CO3	2	2	3	1	2	-	-	-	-	2	-	2	2	-	1
CO4	2	2	3	1	3	-	-	-	-	2	1	2	2	-	1
CO5	2	2	3	1	3	-	-	-	-	2	1	2	2	-	1
AVG	1.8	2	3	1.2	2	-	-	-	-	2	1	2	2.2	1	1.2

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SYLLABUS REVISION DETAILS FOR THE REGULATION 2022–ACADEMIC YEAR 2024-25 ODD SEMESTER

S. No	Year	Semester	Course Code and Course Name	Existing content (in academic Year 2023-24)	Revised Content (for 2024-25)	Percentage of Revision
1	I	I	**22IT1151R Python Programming and Practices** (AERO, AIML, CHEM, CIVIL, MECH, ECE, BME, MTS)	**COURSE CODE:22IT1151** 1. Read NAME, REG NO, PHYSICS, CHEMISTRY, MATHS MARKS and calculate cutoff marks out of 200 print the cutoff marks of the student 2. Take two numbers of int data type, two numbers of float data type as input. Print the sum and difference of two int variable on a new line Print the sum and difference of two-float variable rounded to one decimal place on a new line. 3. Get two integer inputs from user as dividend named as x and y. Find out Greatest Common Divisor Between both of the above two dividends 4. Tony's Maths teacher ask him to solve an exponential problem but he don't know how to solve. Teacher gives two values as named base and exponent value ask tony to find the factor. Help him to do his task. 5. Read four inputs from the user named X1, X2, Y1, Y2 and compute to find a distance between two points. 6. Read the five different subject marks of the student, calculate total marks and print the total marks, grade. 7. Given the age input as N from the user and check whether user is eligible for voting or not	**COURSE CODE:22IT1151R** **Laboratory (Practical) Exercises** **(The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.)** 1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.) 2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of *n* variables, distance between two points). 3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern) 4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples) 5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.-	20

				using if condition and print Eligible or Not Eligible. Hint: The minimum age to vote is 18 years 8. Write a program that reads a integer value as N from the user and then produces n lines of output 9. The first line contains 1 star,the second line contains 2 stars and so on until the last line which should have N stars.can you Write this using single loop? Hint: remember what the expression ' +' *5 does. 10. A year is a leap year if it is divisible by 4, unless it is divisible by 100 and not by 400. Write a function that takes an integer value representing a year , and returns a Boolean result indicating whether or not the year is a leap year 11. sheela wants to convert time into minutes but she have no idea about it. Create a function named time() and get the input from the user as two integers hours, minutes and print the minutes as output. Help sheela to do this conversion 12. Get the two different matrix elements for (2x2) matrix. Perform addition operation and subtraction operation and print the result in matrix format using nested loop in python. 13. Read the input from the user for no of elements as N and then append it into the list. Write a python program to find the maximum element in the list. 14. Read the N no of elements from the user and append it into the list, perform linear search operations using python programming List operations 15. Read the List of Numbers from the user with N elements and perform Selection sorting operation using python programming. 16. Write a python program to take input as filename with extension, perform reading and writing operations in the file.	operations of Sets & Dictionaries) 6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape) 7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters) 8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy) 9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word) 10. Implementing real-time/technical applications using Exception handling. (divide by zero error,voter's age validity, student mark range validation) 11. Exploring Pygame tool. 12. Developing a game activity using Pygame like bouncing ball, car race etc	

2	I	I	**22IT1152 Introduction to Web Application Development**	**COURSE CODE: 22IT1152** 1. Designing a web page using HTML basic tags. 2. Developing web site with suitable contents and links. 3. Designing web pages using lists and tables 4. Designing a web page using images and embed an image map in a web page 5. Designing the Login form with username, password and submit field. 6. Designing a course registration form. 7. Developing a web application using internal, external and embedded style sheet. 8. Applying style specification in HTML page using CSS. 9. Developing a web application using CSS Positioning.	**COURSE CODE: 22IT1152R** 1. Create a basic HTML page to provide a description of yourself, using fundamental HTML tags. 2. Create a web page that embeds an image using the <img> tag and includes a hyperlink to your 'About Me' page. 3. Create an HTML web page to display a list of courses available in your department and prepare a timetable for them. 4. Create an HTML web page for a quiz program using various types of input options. 5. Develop an HTML webpage for a student registration form, incorporating various input fields and form elements. 6. Develop a basic HTML webpage for a simple calculator using inline and embedded CSS. 7. Create an HTML webpage for a Personal Portfolio using external CSS. 8. Create an HTML webpage to display a product report with a suitable background color and an image. Use various text properties and padding to enhance the layout. 9. Develop an HTML webpage to create a simple college website and utilize a software development process tool for its development. 10. Create a GitHub account, and then create a new repository. Develop an HTML code to display name.	25

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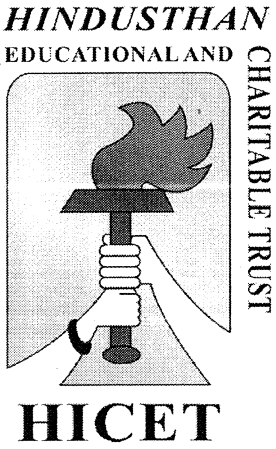
COIMBATORE - 641 032.

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi& Accredited by NAAC with 'A ++' Grade)
Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu

B.TECH. INFORMATION TECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the ODD semester

Academic year 2024-2025

BATCH 2023-2027

CURRICULUM
R2022

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS CBCS PATTERN
UNDERGRADUATE PROGRAMME
B.TECH.INFORMATIO TECHNOLOGY (UG)
REGULATION-2022
For the students admitted during the academic year 2023-2024

SEMESTER I – 18 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	Matrices-and Calculus	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2.	22CY1151	Chemistry for Circuit Engineers	BSC	2	0	2	3	4	50	50	100
3.	22CS1151	Problem solving using C programming	HSC	2	0	2	3	4	50	50	100
4.	22HE1151	English for Engineers	ESC	2	0	2	3	4	50	50	100
5.	22IT 1152	Introduction to web Application Development	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	2	0	0	0	1	100	0	100
MANDATORY COURSE											
8.	22MC1093/ 22MC1094	தமிழர்மரபு / Heritage of Tamil	MC	2	0	0	1	2	40	60	100
9.	22MC1095	Universal Human Values	MC	2	0	0	0	2	100	0	100
		TOTAL		**16**	**1**	**8**	**18**	**20**	**480**	**320**	**800**

SEMESTER II - 23 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2103	Differential Equations And Linear Algebra	BSC	3	1	0	4	4	40	60	100

2.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH2151	Physics for Circuit Engineering Programme/Physics for Engineers	BSC	2	0	2	3	4	50	50	100
4.	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
5.	22IT2251	Python programming and Practices	PCC	2	0	2	3	4	50	50	100
6.	22IT2253	Dynamic Web Design	PCC	2	0	2	2	3	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2094/ 22MC2095	Tamil and Technology	MC	2	0	0	1	2	40	60	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**18**	**1**	**12**	**23**	**29**	**580**	**420**	**1000**

SEMESTER III– 25 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3101	Applied Statistics and QueuingTheory	BSC	3	1	0	4	4	40	60	100
2.	22IT3201	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	22IT3202	Operating System	PCC	3	1	0	4	4	40	60	100
4.	22IT3203	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22IT3251	Java Programming	PCC	3	0	2	4	4	50	50	100
PRACTICAL											

6.	**22IT3001**	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	**22IT3002**	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE3071**	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	**22IT3003**	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10.	**22MC3191**	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV – 23 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22IT4201**	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	**22IT4202**	Computer Networks	PCC	3	0	0	3	3	40	60	100
4.	**22IT4203**	Object Oriented Software Engineering	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT4251**	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	**22IT4252**	Database Management System	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	**22IT4001**	Case Tools Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	**22IT4002**	Network Laboratory	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE4071**	Soft Skills and Aptitude –III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**16**	**0**	**12**	**23**	**29**	**480**	**420**	**900**

Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V – 22 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT5201**	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	**22IT5202**	Embedded System and IOT	PCC	3	0	0	3	3	40	60	100
3.	**22IT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22IT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22IT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	**22IT5251**	Application Development	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22IT5001**	Artificial Intelligence and Machine Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills -4/ Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	18	1	6	22	25	410	390	800

SEMESTER VI – 24 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT6201**	Cyber Security	PCC	3	0	0	3	3	40	60	100
2.	**22HE6101**	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3.	**22IT63XX**	**Professional Elective -4**	PEC	3	0	0	3	3	40	60	100
4.	**22IT63XX**	**Professional Elective-5**	PEC	3	0	0	3	3	40	60	100
5.	**22XX64XX**	**Open Elective–1***	OEC	3	0	0	3	3	40	60	100

6.	22XX64XX	Open Elective–2*	OEC	3	0	0	3	3	40	60	100
7.	22CY6101	Environmental Science	ESC	2	0	0	2	3	40	60	100
PRACTICAL											
8.	22IT6001	Internet of Things Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII – 20 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT7201	Cryptography and Network Security	PCC	3	0	0	3	3	40	60	100
2.	22IT7202	Data Warehousing and Data Mining	PCC	3	1	0	4	4	40	60	100
3.	22IT73XX	**Professional Elective-6**	PEC	3	0	0	3	3	40	60	100
4.	22XX74XX	**Open Elective–3***	OEC	3	0	0	3	3	40	60	100
5.	22XX74XX	**Open Elective–4***	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22IT7001	Cryptography and Network Security Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22IT7701	Internship - II*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII – 10 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC COURSES (SE/AE)											
1.	22IT8901	Project Work	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6451	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6451	Block Chain Technology	OEC	2	0	2	4	3
3	22EC6451	Cyber security	OEC	2	0	2	4	3
4	22EC6452	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6451	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6451	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3

6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	22CH6401	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme. (Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22IT7401	Disaster Management	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3

6	**22LS7406**	Democracy and Good Governance	OEC	3	0	0	3	3
7	**22LS7407**	NCC Level – II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Data Science	**Vertical II Full Stack Development for IT**	**Vertical III Cloud Computing and Data Centre Technologies**	**Vertical IV Internet of things**	**Vertical V Creative Media**	**Vertical VI Emerging Technologies**
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing and Automation	**22IT5307** Data Warehousingand Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22 IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cyber security
22IT5303 ComputerVision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry 4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** StreamProcessing	**22IT6307** Fog Computing & Energy Management In Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big DataAnalytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT cloud and dataanalytics	**22IT6310** Video Creation and Editing	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and video analytics	**22IT7302** Securityand Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304 IOT Security**	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Image and video analytics	PEC	3	0	0	3	3

Details of Vertical II: Full Stack Development for IT

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Security and Privacy in Cloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software Defined Networks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5310	Design of Smart Cities	PEC	3	0	0	3	3
2.	22IT5311	IoT Architectures and Protocols	PEC	3	0	0	3	3
3.	22IT5312	Industry 4.0	PEC	3	0	s0	3	3
4.	22IT6307	Fog Computing & Energy ManagementIn IoT Devices	PEC	3	0	0	3	3
5.	22IT6308	IoT cloud and data analytics	PEC	3	0	0	3	3
6.	22IT7304	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5313	Multimedia Data Compression and Storage	PEC	3	0	0	3	3
2.	22IT5314	Multimedia and Animation	PEC	3	0	0	3	3
3.	22IT5315	Digital marketing	PEC	3	0	0	3	3
4.	22IT6309	UI and UX Design	PEC	3	0	0	3	3
5.	22IT6310	Video Creation and Editing	PEC	3	0	0	3	3
6.	22IT7305	Visual Effects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5316	Augmented Reality	PEC	3	0	0	3	3
2.	22IT5317	Cyber security	PEC	3	0	0	3	3

3.	22IT5318	Tamil Computing	PEC	3	0	0	3	3
4.	22IT6311	Robotic Process Automation	PEC	3	0	0	3	3
5.	22IT6312	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	22IT7306	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. **Clause 4.10** of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree.

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5601	Sem5: Database System	MDC	3	0	0	3	3
2.	22IT6601	Sem6: Fundamentals of Data Science	MDC	3	0	0	3	3
3.	22IT6602	Sem6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3
4.	22IT7601	Sem7: Data Exploration and Visualization	MDC	3	0	0	3	3
5.	22IT7602	Sem7: Business Intelligence	MDC	3	0	0	3	3
6.	22IT8601	Sem8: Cyber Security	MDC	3	0	0	3	3

MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Block chain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

B Tech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5203	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	22IT6203	Applied Natural Language Processing	PC	3	0	0	3	4	40	60	100
3.	22IT6204	AI-Knowledge Representation and Reasoning	PC	3	0	0	3	4	40	60	100
4.	22IT7203	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	22IT7204	Gaming Theory	PC	3	0	0	3	4	40	60	100
6.	22IT8201	Generative AI	PC	3	0	0	3	4	40	60	100

B Tech (Hons) Information Technology with Specialization in Cyber Security

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5204	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	22IT6205	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	22IT6206	Social Networks Security	PC	3	0	0	3	3	40	60	100
4.	22IT7206	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100

5.	22IT7207	Cryptocurrency and Block chain Technologies	PC	3	0	0	3	3	40	60	100
6.	22IT8202	Network Security	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Information Technology with Specialization in Block Chain Technology

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5205	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	22IT6207	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	22IT6208	Building Private Block chain	PC	3	0	0	3	3	40	60	100
4.	22IT7208	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	22IT7209	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	22IT8203	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	2	-	-	17
4	PCC	-	3	13	20	12	5	9	-	62
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	6	6	-	12
7	EEC	1	3	3	1	1	2	2	10	23
8	MCC	1	1	-	-	-	-	-	-	02
Total		18	23	25	23	22	24	20	10	165

CREDIT DISTRIBUTION R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

Chairman – BoS

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Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

ACADEMIC COUNCIL Chairman

SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22MA3101	APPLIED STATISTICS AND QUEUEING THEORY (IT)	3	1	0	4

Course Objective

The learner should be able to

1. Construct a well-defined knowledge of statistics.
2. Introduce Correlation and Regression concepts.
3. Describe some basic concepts of statistical methods for testing the hypothesis.
4. Analyze the design of experiment techniques to solve various engineering problems.
5. Familiarize the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

Unit	Description	Instructional Hours
I	**DESCRIPTIVE STATISTICS** Descriptive statistics - Measures of central tendency - Mean – Median –Mode - Measures of dispersion - Range – Quartile deviation – Standard deviation – Coefficient of variation.	12
II	**CORRELATION AND REGRESSION** Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines (problems based on Raw data only).	12
III	**TESTING OF HYPOTHESIS** Large sample test based on Normal distribution – Test of significance for single mean and difference of means - Tests based on t (for single mean and difference of means) - F distribution for testing difference of variance – Chi-Square test for Contingency table (Test for Independency) – Goodness of fit.	12
IV	**ANALYSIS OF VARIANCE** Introduction - Assumptions of analysis of variance - Completely randomized design - Randomized block design - Latin square design.	12
V	**QUEUEING THEORY** Markovian models: Single and Multiple server - Queueing models (Excluding proof) – (M/M/1):(∞/FCFS), (M/M/1):(N/FCFS), (M/M/C):(∞/FCFS) and (M/M/C):(N/FCFS).	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Use the concepts of statistics.
CO2: Compute correlation and predict unknown values using regression.
CO3: Use the concepts of statistical methods for testing the hypothesis.
CO4: Apply Design of Experiment techniques to solve various engineering problems.
CO5: Identify the queuing models in the given system, find the performance measures and analyse the result.

TEXT BOOKS:

T1 - Gupta S. P, "Statistical Methods", 31st edition, Sultan Chand & Sons Publishers, 2019.
T2 - Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2016.

REFERENCE BOOKS:

R1 - Applied statistics and Probability for Engineers by C. Mont Gomery, 7th Edition, Wiley Publications, 2018.
R2 - A.O. Allen, "Probability, Statistics and Queueing Theory with Computer Applications", Elsevier, Second Edition, 2001.
R3 - Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education Inc, 9th edition, 2016.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	-	1	-	-	1	2	2	2	3	3
CO2	3	3	3	3	3	-	1	-	-	1	3	2	2	3	3
CO3	3	3	3	3	2	-	1	-	-	1	3	2	2	2	2
CO4	3	3	3	2	2	-	1	-	-	1	3	2	2	2	2
CO5	3	3	3	2	2	-	1	-	-	1	3	2	2	3	3
Avg	**3**	**3**	**3**	**2.6**	**2.4**	**-**	**1**	**-**	**-**	**1**	**2.8**	**2**	**1.8**	**2.6**	**2.6**

Chairman - Board of Studies

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HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT3201	DATA STRUCTURES	3	0	0	3

Course Objective

The student should be made to:

1. To understand the concept of ADT and list operations
2. To learn linear data structures – Stack and Queue
3. To gain expertise in various searching, sorting and hashing algorithms
4. To apply tree data structure in various applications
5. To understand the graph data structure and its applications

Unit	Description	Instructional Hours
I	**LIST** Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation –Singly linked lists- Doubly-linked lists - Circularly linked lists – Applications of lists.	9
II	**STACK AND QUEUE** Stack: Array and Linked Stacks – Applications: Balancing Symbols, Infix to Postfix conversion, Evaluating Postfix expression, Recursion – Queue: Array and Linked Queue, Circular Queue – Double Ended Queue – Applications.	9
III	**SEARCHING, SORTING AND HASHING TECHNIQUES** Introduction to searching - Types of search -Linear Search-Binary Search- Sorting: Bubble sort-Insertion sort- Selection sort-Shell sort- Merge sort – Hashing: Hash table – Hash functions –Resolving Collision Techniques: Separate chaining – Open addressing –Double hashing.	9
IV	**TREE STRUCTURES** Tree Terminologies – Binary tree: Representation - Tree traversal: In-order, Pre-order, Post order, Level order – Binary Search Tree: Representation – Operations– AVL Tree – B-Tree– Applications: Expression tree.	9
V	**GRAPH STRUCTURES** Graph: Terminologies – Representation of Graph - Graph traversal –Breadth-first traversal – Depth-first traversal-Topological sort – Shortest path algorithm-Dijkstra's algorithm- Minimum spanning tree algorithm	9
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, students would be able to:

CO1	**Evaluate and implement** the effectiveness of various list ADT (Abstract Data Type) implementations, including array-based, singly linked, doubly linked, and circularly linked lists, for different applications.
CO2	**Compare and implement stack** and queue (array-based and linked) operations, applying them to solve problems like expression manipulation, recursion, and double-ended queue functionality.
CO3	**Identify and apply** searching (linear & binary) and sorting (common algorithms) methods, along with basic hashing concepts, for data organization.
CO4	Understand key tree concepts, build and navigate binary trees, and **apply them** to represent data (including expressions) using Binary Search Trees (BSTs).
CO5	Understand graphs, build and explore them using BFS and DFS, and **apply** algorithms to find shortest paths and efficient connections.

TEXTBOOKS

T1 Mark A.Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2010

T2 Seymour Lipschutz, "Data Structures using C", First Edition, McGraw Hill Education, 2017.

REFERENCES:

R1 Salaria R S, "Data Structues and Algorithms using C", Fifth Edition, Khanna Book Publishing, New Delhi, 2012

R2 Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019.

R3 Venkatesan R and Lovelyn Rose S, "Data Structures", Wiley India Pvt.Ltd., New Delhi, 2015.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	1	2	-	-	-	1	1	-	2	2	-	1
CO2	3	3	3	-	2	-	-	-	1	1	-	2	3	1	2
CO3	3	2	2	1	1	-	-	-	1	1	-	1	2	-	2
CO4	3	2	1	1	1	-	-	-	1	1	-	1	1	-	1
CO5	2	3	2	1	2	-	-	-	1	1	-	1	2	1	2
Avg	**2.8**	**2.6**	**2.2**	**1**	**1.6**	-	-	-	**1**	**1**	-	**1.4**	**2**	**1**	**1.6**

Chairman - Board of Studies

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ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT3202	OPERATING SYSTEM	3	1	0	4

Course Objective

The student should be made to:

1. Study the basic concepts and Understand the structure of Operating Systems
2. Learn about Processes, Scheduling algorithms
3. Explore Deadlocks and various Memory Management schemes
4. Study about Storage Management systems
5. Learn Virtual Machine Concepts

Unit	Description	Instructional Hours
I	**OPERATING SYSTEMS OVERVIEW** Introduction: Operating System Structure–Operating System Operations–Process Management– Memory Management– Storage Management. System Structures: Operating System Services – System Calls –Types of System Calls –System Programs– System Boot.	12
II	**PROCESS MANAGEMENT** Process Concept– Inter-process Communication – Threads: Overview– Multithreading Models. Synchronization: The Critical-Section Problem – Mutex Locks - Semaphores– Process Scheduling: Basic Concepts– Scheduling Criteria– Scheduling Algorithms.	12
III	**DEADLOCK & MEMORY MANAGEMENT** Deadlocks: System Model–Deadlock Characterization–Deadlock Prevention – Deadlock Avoidance – Deadlock Detection– Recovery from Deadlock. Memory Management Strategies: Swapping – Contiguous Memory Allocation– Segmentation –Paging. Virtual Memory Management: Demand Paging–Page Replacement.	12
IV	**STORAGE MANAGEMENT** Mass-Storage Structure: Disk Scheduling, RAID Structure, File System: File Concept– Access Methods–Directory and Disk Structure–Protection – File System Implementation: File System Structure– Allocation Methods– Free-space Management.	12
V	**VIRTUAL MACHINES** Overview– Building Blocks –Types of Virtual Machines and Their Implementations –Virtualization– Virtual Machine Examples.	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, students would be able to:

CO1	Explain the structure and operations of operating systems, including process, memory, and storage management, as well as system services, system calls, system programs, and the system boot process.
CO2	Analyze process concepts, inter-process communication, threading and multithreading models, synchronization mechanisms, and process scheduling techniques.
CO3	Evaluate deadlock concepts, prevention, avoidance, detection, and recovery methods, and various memory management strategies, including swapping, contiguous memory allocation, segmentation, paging, and virtual memory management.

CO4	Assess mass-storage structures, including disk scheduling and RAID structures, and understand file system concepts, access methods, directory and disk structures, protection mechanisms, and file system implementation techniques.
CO5	Differentiate between types of virtual machines and their implementations, understand virtualization concepts, and provide examples of virtual machines.

TEXTBOOKS

T1 Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012. ISBN:9781118063330

T2 Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach —, Tata McGraw Hill Edition, 2010

REFERENCES:

R1 Andrew S.Tanenbaum, Modern Operating Systems,4/E,Pearson Publications,

R2 Harvey M.Deitel-Operating systems, Third Edition, Pearson/Prentice Hall,2004. ISBN 0-13-124696

R3 William Stallings, Operating Systems –Internals and Design Principles, 8/E, Pearson Publications

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	1	-	1	2	2	1	2	3	3	2
CO2	3	3	2	3	2	1	-	1	3	2	1	2	3	3	2
CO3	3	3	2	3	2	1	-	1	3	2	1	2	3	3	2
CO4	3	2	2	2	2	1	-	1	2	2	1	2	3	3	2
CO5	2	3	3	2	3	1	-	1	2	2	1	3	3	3	3
Avg	**2.8**	**2.6**	**2.2**	**2.4**	**2.2**	**1**	**-**	**1**	**2.8**	**2**	**1**	**2.2**	**3**	**3**	**2.2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT3203	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	3	0	0	3

Course Objective

The student should be made to:

1. To study combinational circuits.
2. To learn synchronous sequential circuits.
3. To understand the different development stages of digital computer.
4. To expose the students about Parallelism using the concept of Pipelining.
5. To familiarize the Hierarchical Memory System and Accessing I/O devices.

Unit	Description	Instructional Hours
I	**COMBINATIONAL LOGIC** Combinational Circuits – Karnaugh Map -Analysis and Design Procedures–Binary Adder – Subtractor – BCD Adder-Magnitude Comparator–Decoder–Encoder–Multiplexers-Demultiplexers.	9
II	**SYNCHRONOUS SEQUENTIAL LOGIC** Introduction to Sequential Circuits–Flip-Flops–SR,JK,T,D-Operation and Excitation tables, Analysis and design of clocked sequential circuits–Design–Moore/Mealy models, State minimization, State assignment-Shift registers– Design of Counters- Ripple Counters.	9
III	**COMPUTER FUNDAMENTALS** Functional Units of a Digital Computer: Von-Neumann Architecture–Operation and Operands of Computer Hardware Instruction–Instruction Set Architecture (ISA): Memory Location, Address and Operation–Instruction and Instruction Sequencing– Addressing Modes, Encoding of Machine Instruction–Interaction Between Assembly and High Level Language.	9
IV	**PROCESSOR** Instruction Execution–Building a Data Path–Designing a Control Unit–Hardwired Control, Microprogrammed Control–Pipelining–Data Hazard–Control Hazards.	9
V	**MEMORYAND I/O** Memory Concepts and Hierarchy–Memory Management–Cache Memories: Mapping and Replacement Techniques–Virtual Memory–DMA–I/O–Accessing I/O: Parallel and Serial Interface–Interrupt I/O–Interconnection Standards: USB, SATA	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze and Design combinational circuits using Karnaugh maps, including adders, subtractors, comparators, decoders, encoders, multiplexers, and demultiplexers.
CO2	Analyze and Design fundamental sequential circuits including flip-flops, Moore/Mealy models, and counters using excitation tables, state minimization, and state assignment techniques.
CO3	Analyze the functional components of a computer system based on the Von Neumann architecture, including instruction sets, addressing modes, and the interaction between assembly and high-level languages.
CO4	Analyze and Synthesize the components of instruction execution (data path, control unit, pipelining), including their design considerations (hardwired vs. microprogrammed control) and potential hazards (data and control) to effectively evaluate and optimize processor architectures.
CO5	Analyze the trade-offs between different memory organizations (hierarchy, caches, virtual memory), I/O techniques (parallel, serial, interrupt-driven), and interconnection standards (USB, SATA) to design and optimize computer systems for performance and efficiency.

TEXTBOOKS:

T1 M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

T2 David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

T3 V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation and Embedded systems", VIth edition, McGraw-Hill Inc, 2012. ISBN 9781283394772

REFERENCES:

R1 Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization andEmbedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

R2 William Stallings, "Computer Organization and Architecture–Designing for Performance",Tenth Edition, Pearson Education, 2016.

R3 M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	1	1	1	1	2	2	2	3	3	3
CO2	3	3	3	3	3	1	1	1	1	2	2	2	3	3	3
CO3	3	3	2	2	2	1	1	1	1	2	2	2	3	3	3
CO4	3	3	2	3	2	1	1	1	1	2	2	2	3	3	3
CO5	3	3	2	2	2	1	1	1	1	2	2	2	3	3	3
Avg	**3**	**3**	**2.4**	**2.6**	**2.4**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**3**	**3**

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THEORY WITH LAB COMPONENT

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT3251	JAVA PROGRAMMING	3	0	2	4

Course Objective

The student should be made to:

1. Learn the basics of Java programming language
2. Discuss about classes and object in Java Programming.
3. Understanding Interface and package in Java Programming
4. Learn about Exception handling and IO Streams
5. Understanding about Multithreading and Applet

Unit	Description	Instructional Hours
I	**INTRODUCTION TO O JECT ORIENTED PROGRAMMING** Basic Concepts of Object-oriented Programming- Object and classes –Abstraction and Encapsulation-Inheritance-Polymorphism-Dynamic binding-Message Communication. Introduction to Java programming-Features of Java Language –The Java Environment-Primitive Data types-variables - operators –control statements Array-Strings.	12
II	**CLASS AND OBJECT** Classes and objects –Methods-Access Specifier -constructor-Method overloading static members -Inheritance – overriding methods – final keyword – abstract classes.	12
III	**INTERFACE AND PACKAGE** Interfaces-Defining Interface-Extending Interface -Implementing interface-Accessing Interface Variables. Packages-creating a package-accessing package –using package	12
IV	**EXCEPTION HANDLING AND IO STREAMS** Managing Error and exception-Exception-Syntax of Exception handling-Multiple catch statements-finally statements-Throwing our own exception -I/O basics- reading console input-writing console output-reading and writing files-Serialization.	12
V	**MULTITHREADING AND APPLET** Creating Threads- Extending thread class-Stopping and Blocking Thread-Life cycle – Using Thread methods - Thread priority- Runnable Interface-Thread Class –Inter thread communication-Applet Introduction-Applet Life Cycle-Creating and Executing an Applet.	12
	Total Instructional Hours	**60**

S.No	List of Experiments
1	If the appraisal rating is between 1 and 3, the increment is 10% of the salary. If the appraisal rating is between 3.1 and 4, the increment is 25% of the salary. If the appraisal rating is between 4.1 and 5, the increment is 30% of the salary. Help them to do this, by writing a Java program that displays the incremented salary. Note: If either the salary is 0 or negative (or) if the appraisal rating is not in the range 1 to 5 (inclusive), then the output should be "Invalid Input".
2	A year is a leap year if it is divisible by 4, unless it is divisible by 100 and not by 400. Write a Java Program that takes an integer value representing a year, and returns a Boolean result indicating whether or not the year is a leap year.
3	Write a Java program to check whether a given substring is present in the given string
4	The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non-recursive methods to print the nth value in the Fibonacci sequence.
5	Write a Java program to calculate the volume of a box using class, objects and methods.
6	Write a Java program to create an abstract class named Shape that contains an empty method named number Of Sides (). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides () that shows the number of sides in the given geometrical figures.
7	Develop a calculator application should be able to perform arithmetic operations such as addition, subtraction, multiplication, and division. The calculator class will have multiple methods to handle different types of inputs and return the appropriate result. (Hint: Use Method loading)
8	In the online shopping system, there are various types of customers: regular customers and premium customers. Both types of customers have a unique identifier, name, and contact information. Premium customers, however, have additional benefits such as free shipping and discounts. Design a class hierarchy to model these customers using inheritance.
9	Create a Java package Compare with a class to calculate minimum and maximum value in tan array and import the package to perform the above operations.
10	Design an interface shape with a method to calculate area. Inherit these interfaces through class circle, square, rectangle, cylinder, and sphere and display the area.
11	Design a Java Program that implements following exception

a. Divide by Zero
b. Array Index Out of Bounds
c. Multiple Catch Blocks.

12 Write a program to input name and balance of customer and create a user defined exception "Minimum Balance", which has to be thrown if the balance is less than 1500.

13 Develop a Java application that reads the content of one file and copy to another file.

14 Build a Java application to implement multithreading by printing the time, date and year.

15 Design an Applet that performs Arithmetic operation and displays the result.

At the end of the course, students would be able to:

Course Outcome

CO1 Apply object-oriented design principles and develop Java programs using fundamental syntax and control flow.

CO2 Design and implement classes with methods, inheritance, and polymorphism in Java.

CO3 Utilize interfaces, packages, and advanced object-oriented concepts to structure and enhance Java applications.

CO4 Develop robust Java programs by handling exceptions, utilizing I/O streams for data input/output, and potentially employ object serialization for data persistence

CO5 Implement concurrent and interactive Java applications by utilizing multithreading and Applets.

TEXT BOOK:

T1 Herbert Schildt, Java: The Complete Reference, Twelfth edition, McGraw – Hill 2021. ISBN: 978-1-26-046342-2

REFERENCES:

R1 E. Balagurusamy, Programming with java A Primerl, fifth edition, McGraw – Hill 2014 ISBN: 9789351343202.

R2 H.M. Deitel, P.J. Deitel, "Java: how to program", Fifth edition, Prentice Hall of India private limited, 2003.ISBN: 9780131016217

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	1	3	1	1	2	2	2	2	3	3	1	2
CO2	3	2	3	2	3	1	1	2	2	2	2	3	3	3	2
CO3	3	2	3	2	3	1	1	2	2	2	2	3	3	3	2
CO4	3	2	3	2	3	1	1	2	2	2	2	3	3	2	3
CO5	3	2	3	2	3	1	1	2	2	2	2	3	3	2	3
Avg	**3**	**2**	**3**	**1.8**	**3**	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**3**	**2.2**	**2.4**

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LABORATORY

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT3001	OPERATING SYSTEM LABORATORY	0	0	4	2

Course Objective

The student should be made to:

1. Learn shell programming and the UNIX environment
2. Be exposed to programming in C using system calls
3. Learn to use the file system related system calls
4. Be exposed to process creation and inter process communication.
5. Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

Exp. No	Description of the Experiments
1	Study of Basic UNIX commands and its uses
2	Shell programming using operators and decision making statements
3	Implementation of CPU scheduling algorithms
4	Implementation of file allocation strategies
5	Implementation of Semaphores
6	Implementation of File Organization Techniques
7	Implementation of Bankers Algorithm for Dead Lock Avoidance
8	Implementing an Algorithm for Dead Lock Detection
9	Implementation of Page replacement algorithms
10	Implementation of IPC using Shared memory
11	Implementation Paging Technique for memory management

Total Instructional Hours 60

Course Outcome

At the end of the course, students would be able to:

- CO1 Define and implement UNIX Commands.
- CO2 Compare the performance of various CPU Scheduling Algorithms.
- CO3 Compare and contrast various Memory Allocation Methods.
- CO4 Define File Organization and File Allocation 2Strategies.
- CO5 Implement various Disk Scheduling Algorithm.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	3	-	-	-	2	2	1	3	3	2	3
CO2	3	3	3	2	2	-	-	-	2	2	2	3	2	2	3
CO3	3	3	3	2	2	-	-	-	2	2	2	3	2	2	3
CO4	3	2	2	2	2	-	-	-	2	2	1	3	2	2	3
CO5	3	3	3	2	3	-	-	-	2	2	2	3	3	3	3
Avg	3	2.6	2.6	2	2.4	-	-	-	2	2	1.6	3	2.4	2.2	3

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT3002	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION LABORATORY	0	0	4	2

Course Objective

The student should be made:

1. To understand different methods used for the simplification of Boolean functions
2. To study combinational circuits
3. To learn synchronous sequential circuits.
4. To understand about Shift registers.
5. To understand the basic concepts of Computer Organizations.

Exp. No	Description of the Experiments
1	Verification of Boolean theorems using logic gates.
2	Design and Implementation of Half Adder and Half Subtractor using basic gates.
3	Implementation of 4-bit binary adder/subtractor circuits.
4	Implementation of Code converters.
5	Implementation of Magnitude Comparator.
6	Implementation of Multiplexer using logic gates.
7	Implementation of Encoder and Decoder circuits.
8	Implementation of the synchronous counters.
9	Implementation of Shift Register.
10	Simulator based study of Computer Architecture.

Total Instructional Hours 60

Course Outcome

At the end of the course, students would be able to:

CO1	Construct digital circuits (half adder, half subtractor) using basic logic gates to verify Boolean theorems.
CO2	Implement multi-bit arithmetic circuits (4-bit adder/subtractor) and code converters using logic design principles.
CO3	Implement combinational circuits for magnitude comparison and data selection using multiplexers and basic logic gates.
CO4	Implement digital circuits for data encoding/decoding and synchronous counting using logic gates.
CO5	Evaluate the functionality of a shift register through hands-on implementation and analyze computer architecture concepts using a simulator.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	-	-	1	1	-	2	2	2	2
CO2	3	2	3	2	3	1	-	-	1	1	-	2	3	3	2
CO3	3	2	3	2	3	1	-	-	1	1	-	2	3	3	2
CO4	3	2	3	2	3	1	-	-	1	1	-	2	3	3	2
CO5	3	2	3	2	3	1	-	-	1	1	-	2	2	2	3
Avg	**3**	**2**	**3**	**2**	**2.8**	**1**	**-**	**-**	**1**	**1**	**-**	**2**	**2.6**	**2.6**	**2.2**

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EEC COURSES (SE / AE)

Programme	Course code	Name of the course	L	P	T	C
BE/BTECH	22HE3071	SOFT SKILLS AND APTITUDE – II	0	0	0	1

The student should be able

Course Objective

1. Solve Logical Reasoning questions of easy to intermediate level
2. Solve Quantitative Aptitude questions of easy to intermediate level
3. Solve Verbal Ability questions of easy to intermediate level
4. Display good writing skills while dealing with essays

Unit	Description
I	**LOGICAL REASONING** Clocks - Calendars - Direction Sense - Cubes - Data Interpretation: Tables, Pie Chart,Bar Graph - Data Sufficiency
II	**QUANTITATIVE APTITUDE** Time and work: Work with different efficiencies, Pipes and cisterns, Work equivalence, Division of wages - Time, Speed and Distance: Basics of time, speed and distance, Relative speed, Problems based on trains, Problems based on boats and streams, - Profit and loss, Basicterminologies in profit and loss - Averages -Weighted average
III	**VERBAL ABILITY** Sentence Correction: Subject-Verb Agreement, Modifiers, Parallelism, Pronoun- Anteceden Agreement, Verb Time Sequences, Comparisons, Prepositions, Determiners - Sentence Completion and Para-jumbles: Pro-active thinking, Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues), Fixed jumbles, Anchored jumbles.
IV	**WRITING SKILLS FOR PLACEMENTS** Essay writing: Idea generation for topics, Best practices, Practice and feedback
	Total Instructional Hours

Course Outcome

CO1	Students will avoid the various fallacies that can arise through the misuse of logic.
CO2	Students would opt for alternate methods to solve the problems rather than conventional methods.
CO3	Students will heighten their awareness of correct usage of English grammar in writing and speaking
CO4	Students will be concise and clear, using professional language for placements.

REFERENCES:

R1 A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali

R2 How to prepare for data interpretation for CAT by Arun Sharma.

R3 How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.

R4 Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

R5 Word Power Made Easy by Norman Lewis

R6 Six weeks to words of power by Wilfred Funk

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT3003	DATA STRUCTURES LABORATORY	0	0	4	2

Course Objective

The student should be made

1. To understand the linear data structures and its types
2. To learn linear data structures – stack and queue
3. Be exposed to sorting, searching, hashing algorithms
4. To learn tree data structure and its applications
5. To understand the various graph representation and its use

Exp. No	Description of the Experiments
1	Program to implement list using arrays
2	Implementation of Singly Linked List
3	Implement Doubly linked list with all its basic operations
4	Implementation of Stack
5	Implementation of Queue
6	Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
7	Develop a program to perform a linear and binary search
8	Program to sort the elements in ascending order using selection sort, insertion sort, bubble sort
9	Program to sort the elements in ascending order using Merge sort
10	Write a program to implement Hash Table with Quadratic Probing.
11	Implementation of Binary Search Trees
12	Program to construct expression tree for a given expression and perform various tree traversal Methods
13	Implementation of the following graph traversal algorithms: a) Depth first traversal b) Breadth first traversal
14	Implementation of Dijkstra's algorithm for a graph.
15	Implementation of Prim's algorithm for a graph.
	Total Instructional Hours **60**

Course Outcome

At the end of the course, students would be able to:

- CO1 Demonstrate the various Linear data structures using simple applications.
- CO2 Apply the linear data structures – stack and queue for real world problems
- CO3 Implement various Sorting and Searching and Hashing Techniques.
- CO4 Implement non linear data structure – Tree
- CO5 Employ graph data structure for solving real world problems

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	1	1	2	2
CO2	3	2	2	1	2	-	-	-	-	-	-	1	1	2	1
CO3	2	2	1	1	1	1	-	-	-	-	-	1	1	2	1
CO4	2	2	1	1	2	1	-	1	-	-	-	1	1	1	1
CO5	3	2	3	1	2	1	-	1	-	-	-	1	1	1	1
Avg	2.4	2	1.6	1	1.6	1	-	1	-	-	-	1	1	1.6	1.2

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MANDATORY COURSE

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

The student should be able

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyze it and apply it to their day to day life.
3. To impart basic principles of thought process, Itihas and Dharma Shastra and connecting society and nature.
4. To understand the concept of Intellectual and intellectual property rights with special reference.
5. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and Indian philosophy

Unit	Description	Instructional Hours
I	**Introduction to traditional knowledge:** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge	6
II	**Protection of traditional knowledge:** The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK	6
III	**Itihas and Dharma-Shastra** **Itihas:** The Mahabharata - The Puranas - The Ramayana **Dharma-Shastra**: Manu Needhi - The Tirukkural – Thir Arutpa	6
IV	**Traditional knowledge and intellectual property:** Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge	6
V	**Indian philosophy** Jain – Buddhist – Charvaka – Samkhya - Yoga - Nyaya - Vaisheshika - Saiva Siddhanta	6
	Total Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able :

Identify the concept of Traditional knowledge and its importance.
Explain the need and importance of protecting traditional knowledge.
Explain the need and importance of Itihas and Dharma Shastra.
Interpret the concepts of Intellectual property to protect the traditional knowledge.
Interpret the concepts of indian philosophy to protect the traditional knowledge.

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
4. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am.

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DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS CBCS PATTERN
UNDERGRADUATE PROGRAMME
B.TECH.INFORMATIO TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023 and onwards

SEMESTER I – 19 Credit

S. No	COURSECODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22MA1101**	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2.	**22HE1151**	English for Engineers	HSC	2	0	2	3	4	50	50	100
3.	**22CY1151**	Chemistry for Circuit Engineers	BSC	2	0	2	3	4	50	50	100
4.	**22CS1151/ 22CS1152**	Problem solving using C programming / **Object Oriented Programming using Python**	ESC/ICC	2	0	2	3	4	50	50	100
5.	**22IT1152**	Introduction to Web Application Development	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	**22HE1071**	Universal Human Values	AEC	2	0	0	2	3	40	60	100
7.	**22HE1072**	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	**22MC1091/ 22MC1092**	தமிழரும் தொழில் நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	0	0	0
TOTAL				**16**	**1**	**8**	**19**	**26**	**480**	**320**	**800**

SEMESTER II – 22 Credits

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22MA2103**	Differential Equations And Linear Algebra	BSC	3	1	0	4	4	40	60	100
2.	**22PH2101**	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	**22HE2151**	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
4.	**22PH2151**	Physics for Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	**22IT2251/ 22IT2252**	Python programming and Practices/ Relational Database Management System	PCC/ICC	2	0	2	3	4	50	50	100

6.	22IT2253	Dynamic Web Design	PCC	2	0	2	2	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude 1	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2091/ 22MC2092	தமிழர் மரபு / Heritage of Tamils	MC	2	0	0	0	1	0	0	0
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**17**	**1**	**14**	**22**	**32**	**640**	**360**	**1000**

SEMESTER III – 25 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3101	Applied Statistics and Queuing Theory	BSC	3	1	0	4	4	40	60	100
2.	22IT3201	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	22IT3202	Operating System	PCC	3	1	0	4	4	40	60	100
4.	22IT3203	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22IT3251/ 22IT3252	Java Programming/ Data Visualization	PCC/ ICC	3	0	2	4	4	50	50	100
PRACTICAL											
6.	22IT3001	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	22IT3002	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	22IT3003	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV - 23 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TC P	CIA	ESE	TOTAL
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22IT4201**	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	**22IT4202**	Computer Networks	PCC	3	0	0	3	3	40	60	100
4.	**22IT4203/ 22IT4204**	Object Oriented Software Engineering / Design Thinking	PCC/ ICC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT4251**	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	**22IT4252**	Database Management System	PCC/ ICC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	**22IT4001/ 22IT4003**	Case Tools Laboratory / Design Thinking Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	**22IT4002**	Network Laboratory	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE4071**	Soft Skills and Aptitude -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**10**	**23**	**29**	**480**	**420**	**900**

*Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V - 22 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT5201**	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	**22IT5202**	Embedded System and IOT	PCC	3	0	0	3	3	40	60	100
3.	**22IT53XX/ 22IT5252**	**Professional Elective-1/Business Intelligence**	PEC	3	0	0	3	3	40	60	100
4.	**22IT53XX**	**Professional Elective-2**	PEC	3	0	0	3	3	40	60	100
5.	**22IT53XX**	**Professional Elective-3**	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	**22IT5251**	Application Development	PCC/I CC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22IT5001**	Artificial Intelligence and Machine Learning laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills -4/ Foreign Languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**1**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI - 24 Credits

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT6201/ 22IT6313**	Foundation of Data Science /Data Science	PCC	3	0	0	3	3	40	60	100
2.	**22HE6101**	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3.	**22IT63XX/ 22IT6314**	Professional Elective - 4/ Predictive Modelling	PEC/ ICC	3	0	0	3	3	40	60	100
4.	**22IT63XX**	**Professional Elective-5**	PEC/ ICC	3	0	0	3	3	40	60	100
5.	**22XX64XX**	**Open Elective – 1***	OEC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	**Open Elective – 2***	OEC	3	0	0	3	3	40	60	100
7.	**22CY6101**	Environmental Science	ESC	2	0	0	2	3	40	60	100
PRACTICAL											
8.	**22IT6001**	Internet of Things Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII- 20 Credits

S. No	COURS ECODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT7201/ 22IT7205**	Cryptography and Network Security / Big Data with Security	PCC	3	0	0	3	3	40	60	100
2.	**22IT7202**	Quantum Computing	PCC	3	1	0	4	4	40	60	100
3.	**22IT73XX**	**Professional Elective-6**	PEC	3	0	0	3	3	40	60	100
4.	**22XX74XX**	**Open Elective – 3***	OEC	3	0	0	3	3	40	60	100
5.	**22XX74XX**	**Open Elective – 4***	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22IT7001/ 22IT7002**	Cryptography and Network Security Laboratory / Big Data with Security Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	**22IT7701**	Internship - II*	SEC	0	0	0	2	2	100	0	100
		TOTAL		**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII – 10 Credits

S. No	COURS CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC COURSES (SE/AE)											
1.	**22IT8901**	Project Work	SEC	0	0	20	10	20	100	100	200
		TOTAL		**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

1. **Note:** *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible toundergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22AI6451**	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	**22CS6451**	Block Chain Technology	OEC	2	0	2	4	3
3	**22EC6451**	Cyber security	OEC	2	0	2	4	3
4	**22EC6452**	IoT Concepts and Applications	OEC	2	0	2	4	3
5	**22IT6451**	Data Science and Analytics	OEC	2	0	2	4	3
6	**22BM6451**	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22AE6401**	Space Science	OEC	3	0	0	3	3
2	**22MT6401**	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	**22MT6402**	Industrial Safety and Environment	OEC	3	0	0	3	3
4	**22CE6401**	Climate Change and its Impact	OEC	3	0	0	3	3
5	**22CE6402**	Environment and Social Impact Assessment	OEC	3	0	0	3	3

6	**22ME6401**	Renewable Energy System	OEC	3	0	0	3	3
7	**22ME6402**	Additive Manufacturing systems	OEC	3	0	0	3	3
8	**22EI6401**	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	**22EI6402**	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	**22AU6401**	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	**22AU6402**	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	**22EE6401**	Digital Marketing	OEC	3	0	0	3	3
13	**22EE6402**	Research Methodology	OEC	3	0	0	3	3
14	**22FT6401**	Traditional Foods	OEC	3	0	0	3	3
15	**22AG6401**	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	**22CH6401**	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme. (Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22IT7401**	Disaster Management	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22LS7401**	General studies for competitive examinations	OEC	3	0	0	3	3
2	**22LS7402**	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3

3	**22LS7403**	Indian ethos and Human values	OEC	3	0	0	3	3
4	**22LS7404**	Financial independence and management	OEC	3	0	0	3	3
5	**22LS7405**	Yoga for Human Excellence	OEC	3	0	0	3	3
6	**22LS7406**	Democracy and Good Governance	OEC	3	0	0	3	3
7	**22LS7407**	NCC Level – II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I DataScience	**Vertical II Full Stack Development for IT**	**Vertical III CloudComputing and Data Centre Technologies**	**Vertical IV Internet of Things**	**Vertical V CreativeMedia**	**Vertical VI Emerging Technologies**
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing and Automation	**22IT5307** Data Warehousing and Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22 IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cyber security
22IT5303 Computer Vision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry 4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** Stream Processing	**22IT6307** Fog Computing & Energy Management In Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big Data Analytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT cloud and data analytics	**22IT6310** Video Creation and Editing	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and video analytics	**22IT7302** Security and Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304** IOT Security	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Image and video analytics	PEC	3	0	0	3	3

Details of Vertical II: Full Stack Development for IT

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Securityand Privacy in Cloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software Defined Networks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5310	Design of Smart Cities	PEC	3	0	0	3	3
2.	22IT5311	IoT Architectures andProtocols	PEC	3	0	0	3	3
3.	22IT5312	Industry 4.0	PEC	3	0	0	3	3
4.	22IT6307	Fog Computing & Energy Management In Iot Devices	PEC	3	0	0	3	3
5.	22IT6308	IoT cloud and data analytics	PEC	3	0	0	3	3
6.	22IT7304	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5313	Multimedia Data Compression and Storage	PEC	3	0	0	3	3
2.	22IT5314	Multimedia and Animation	PEC	3	0	0	3	3
3.	22IT5315	Digital marketing	PEC	3	0	0	3	3
4.	22IT6309	UI and UX Design	PEC	3	0	0	3	3
5.	22IT6310	Video Creation and Editing	PEC	3	0	0	3	3
6.	22IT7305	Visual Effects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5316	Augmented Reality	PEC	3	0	0	3	3
2.	22IT5317	Cyber security	PEC	3	0	0	3	3
3.	22IT5318	Tamil Computing	PEC	3	0	0	3	3
4.	22IT6311	Robotic Process Automation	PEC	3	0	0	3	3
5.	22IT6312	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	22IT7306	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5601	Sem 5: Database System	MDC	3	0	0	3	3
2.	22IT6601	Sem 6: Fundamentals of Data Science	MDC	3	0	0	3	3
3.	22IT6602	Sem 6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3
4.	22IT7601	Sem 7: Data Exploration and Visualization	MDC	3	0	0	3	3
5.	22IT7602	Sem 7: Business Intelligence	MDC	3	0	0	3	3
6.	22IT8601	Sem 8: Cyber Security	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

B Tech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	**22IT5203**	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	**22IT6203**	Applied Natural Language Processing	PC	3	0	0	3	4	40	60	100
3.	**22IT6204**	AI-Knowledge Representation and Reasoning	PC	3	0	0	3	4	40	60	100
4.	**22IT7203**	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	**22IT7204**	Ethics of artificial intelligence	PC	3	0	0	3	4	40	60	100
6.	**22IT8201**	Generative AI	PC	3	0	0	3	4	40	60	100

B Tech (Hons) Information Technology with Specialization in Cyber Security

S NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	**22IT5204**	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	**22IT6205**	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	**22IT6206**	Social Network Security	PC	3	0	0	3	3	40	60	100
4.	**22IT7206**	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	**22IT7207**	Cryptocurrency and Blockchain Technologies	PC	3	0	0	3	3	40	60	100
6.	**22IT8202**	Network Security	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Information Technology with Specialization in Block Chain Technology

S No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	**22IT5205**	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	**22IT6207**	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	**22IT6208**	Building Private Blockchain	PC	3	0	0	3	3	40	60	100
4.	**22IT7208**	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	**22IT7209**	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	**22IT8203**	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEM. NO	COURSE	COURSE TITLE	L	T	P	C	TCP	CIA	ESE	TOTAL
SKILLED / INTEGRATED COURSES OFFERED THROUGH CHOICE BASED CREDIT SYSTEM										
1	**22CS1152**	Object Oriented Programming using Python	2	0	2	3	4	50	50	100
2	**22IT2252**	Relational Database Management System	2	0	2	3	4	50	50	100
3	**22IT3252**	Data Visualization	3	0	2	4	4	50	50	100
4	**22IT4204**	Design Thinking	3	0	0	3	3	40	60	100
5	**22IT4003**	Design Thinking Laboratory	0	0	3	1.5	3	60	40	100
6	**22IT5252**	Business Intelligence	3	0	0	3	3	40	60	100
7	**22IT6313**	Predictive Modeling	2	0	2	3	4	40	60	100
8	**22IT6314**	Big Data and Security	3	0	0	3	3	40	60	100
9	**22IT7205**	Data Science	3	0	0	3	4	40	60	100
10	**22IT7002**	Data Science Laboratory	0	0	4	2	4	60	40	100

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	23
3	ESC	6	2	5	-	-	2	-	-	15
4	PCC	-	5	13	20	12	5	9	-	61
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	6	6	-	12
7	EEC	3	3	3	1	1	2	2	10	25
8	MCC	✓	✓	-	-	-	-	-	-	-
Total		**19**	**22**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

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Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	**165**

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(An Autonomous Institution Affiliated to Anna University, Chennai) (Approved by AICTE, New Delhi, Accredited by NAAC with 'A ++'Grade) Coimbatore - 641032.

B.TECH. INFORMATION TECHNOLOGY

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Revised Curriculum and Syllabus for the ODD semester

Academic year 2024-2025

BATCH 2022-2026

CURRICULUM
R2022

SYLLABUS

Programme	Course Code	Name of the course	L	T	P	C
B.Tech	22IT5201	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	3	1	0	4

Course Objective

The student should be made

1 To understand the basic concepts of search in Artificial Intelligence.
2 To learn the methods of solving problems using Artificial Intelligence.
3 To learn supervised machine learning techniques.
4 To learn ensemble techniques and unsupervised machine learning.
5 To be aware of Expert Systems development

Unit	Description	Instructional Hours
I	**INTRODUCTION AND PROBLEM SOLVING** Definitions of AI - Intelligent Agents - Problem solving by searching: Problem-solving agents - Example problems – Search for solutions- Uninformed Search Strategies – Informed search strategies – Heuristic functions. Local Search Algorithms and Optimization Problems.	12
II	**PROBLEM SOLVING METHODS** Adversarial search: Games – Optimal decisions in games – Mini-Max Algorithm - Alpha-beta pruning – Constraint Satisfaction Problems(CSP): Defining CSP Problems – Constraint Propagation: Inference in CSPs-Backtracking search for CSPs	12
III	**SUPERVISED LEARNING** Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.	12
IV	**ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING** Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.	12
V	**EXPERT SYSTEMS** Characteristics of Expert System-Components of an Expert System Expert System Development-Knowledge Engineering-Applications of Expert System- Case Studies :A Simple Medical Expert System-Successful Expert Systems	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, students would be able to:

CO1 Analyze and apply core AI concepts: defining AI, classifying agents, and using search algorithms to solve problems.

CO2 Apply adversarial search techniques like Minimax and Alpha-Beta pruning to make optimal decisions in games.

CO3 Evaluate and compare the performance of different supervised learning approaches based on the problem context.

CO4 Combine and evaluate ensemble learning techniques (bagging, boosting, stacking)to improve the performance of machine learning models.

CO5 Analyze and design expert systems by understanding their characteristics, components, and development process, including knowledge engineering.

TEXT BOOKS

T1	Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
T2	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020
T3	TomM.Mitchell, - Machine Learning, McGraw-Hill Education, 2013

REFERENCES

R1	Vinod Chandra S.S and Anand Hareendran S, Artificial Intelligence and Machine Learning-PHI Learning Private Limited, 2014.
R2	ZsoltNagy, Artificial Intelligence and Machine Learning Fundamentals-Packt Publishing-(1st Edition), 2018.
R3	Giuseppe Bonaccorso, Machine Learning Algorithms, Packt Publishing, 2017.

CO-PO Mapping

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PSO2	PSO 3
CO1	3	3	2	2	2	1	1	1	2	2	2	2	3	2	2
CO2	3	3	3	3	2	1	1	1	2	2	2	2	3	2	2
CO3	3	3	3	3	3	1	1	1	2	2	2	2	3	2	2
CO4	3	3	3	3	3	1	1	1	2	2	2	2	3	2	2
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	2	2
Avg	**3**	**3**	**2.8**	**2.8**	**2.6**	**1.2**	**1.2**	**1.2**	**2**	**2.2**	**2.2**	**2.2**	**3**	**2**	**2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5202	EMBEDDED SYSTEM AND IOT	3	0	0	3

Course Objective

The student should be made

1. To learn the internal architecture and programming of an embedded processor.
2. To introduce interfacing I/O devices to the processor.
3. To introduce the evolution of the Internet of Things (IoT).
4. To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform.
5. To apply the concept of Internet of Things in real world scenario.

Unit	Description	Instructional Hours
I	**8-BIT EMBEDDED PROCESSOR** 8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.	9
II	**EMBEDDED C PROGRAMMING** Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.	9
III	**IOT AND ARDUINO PROGRAMMING** Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.	9
IV	**IOT COMMUNICATION AND OPEN PLATFORMS** IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.	9
V	**APPLICATIONS DEVELOPMENT** Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1 Analyze embedded systems using 8-bit microcontrollers.

CO2 Develop and manage multi-tasking embedded systems in C.
CO3 Apply the principles of IoT devices to utilize Arduino for data acquisition and control.
CO4 Design and implement data exchange mechanisms for IoT applications.
CO5 Design and implement comprehensive embedded systems for IoT applications.

TEXT BOOKS

T1 - Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014.

T2 - Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

REFERENCES:

R1 Michael J. Pont, "Embedded C", Pearson Education, 2007

R2 Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.

R3 Andrew N Sloss, D. Symes, C. Wright, "Arm System Developer's Guide", Morgan Kauffman/ Elsevier, 2006.

R4 Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	2	-	-	1	-	1	-	2	-	-	1
CO2	3	2	3	-	2	-	-	1	-	1	-	2	1	-	2
CO3	3	1	2	-	3	-	-	1	-	1	-	2	-	1	2
CO4	2	2	3	-	2	-	-	1	-	1	-	2	-	1	2
CO5	3	3	3	1	2	1	1	1	1	2	1	3	-	1	3
Avg	**2.6**	**2.2**	**2.4**	**1**	**2.2**	**1**	**1**	**1**	**1**	**1.2**	**1**	**2.2**	**1**	1	**2**

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PROFESSIONAL ELECTIVE

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5301	EXPLORATORY DATA ANALYSIS	3	0	0	3

Course Objective

The student should be made

1. To outline an overview of exploratory data analysis.
2. To implement data visualization using Matplotlib.
3. To perform univariate data exploration and analysis.
4. To apply bivariate data exploration and analysis.
5. To use Data exploration and visualization techniques for multivariate and time series data.

Unit	Description	Instructional Hours
I	**EXPLORATORY DATA ANALYSIS** EDA fundamentals – Understanding data science – Significance of EDA - Making senseof data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.	9
II	**EDA USING PYTHON** Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join - Aggregation and grouping – Pivot Tables – Vectorized String Operations.	9
III	**ARIATE ANALYSIS** Introduction to Single variable: Distribution Variables – Numerical Summaries of Leveland Spread - Scaling and Standardizing – Inequality.	9
IV	**BIVARIATE ANALYSIS** Relationships between Two Variables - Percentage Tables – Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.	9
V	**MULTIVARIATE AND TIME SERIES ANALYSIS** Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tablesand Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time based indexing – Visualizing – Grouping – Resampling.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

- **CO1** Apply exploratory data analysis techniques (descriptive statistics, visualizations, transformations) to clean, analyze, and interpret datasets to gain insights and prepare them forFurther analysis.
- **CO2** Utilize Pandas library functions to manipulate, clean, transform, aggregate, and combineDatasets to analyze and extract insights.
- **CO3** Analyze the characteristics of single variables through distribution types, numericalSummaries, scaling techniques, and measures of inequality.
- **CO4** Analyze relationships between two variables using various techniques, including percentage Tables, contingency tables, scatter plots with resistant lines, and methods for handling multipledata batches.
- **CO5** Analyze interactions between variables, explore causal effects, and apply time seriesTechniques to understand temporal data.

TEXT BOOKS:

T1 Suresh Kumar Mukhiya, Usman Ahmed,"Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1)

T2 Jake Vander Plas,"Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017. (Unit 2)

T3 Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5) Analysis for Social

REFERENCES:

R1 Eric Pimpler, Data Visualization and Exploration with R, Geo Spatial Training service, 2017.

R2 Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.

R3 Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	-	-	-	-	-	3	1	-	3
CO2	3	2	1	2	2	-	-	-	-	-	-	3	2	-	3
CO3	2	3	1	1	1	-	-	-	-	-	-	3	1	-	3
CO4	2	3	1	2	1	-	-	-	-	-	-	3	1	-	3
CO5	2	3	1	3	1	-	-	-	-	-	-	3	2	-	3
Avg	**2.4**	**2.6**	**1**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1.4**	**-**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5302	RECOMMENDER SYSTEMS	3	0	0	3

Course Objective

The student should be made

1. To understand the foundations of the recommender system.
2. To learn the significance of machine learning and data mining algorithms for recommender systems
3. To learn about collaborative filtering
4. To apply algorithms and techniques to develop hybrid Recommender Systems
5. To implement various Evaluation techniques

Unit	Description	Instructional Hours
I	**INTRODUCTION TO RECOMMENDER SYSTEMS** Introduction - Goals of Recommender Systems - Basic Models of Recommender Systems - Domain Specific Challenges in Recommender Systems - Applications of Recommender Systems	9
II	**COLLABORATIVE FILTERING** Neighborhood-Based Collaborative Filtering: User-Based Neighborhood Models-Item-Based Neighborhood Models. Model-Based Collaborative Filtering: Decision and Regression Trees Rule-Based Collaborative Filtering-Naive Bayes Collaborative Filtering-Latent Factor Models	9
III	**CONTENT-BASED RECOMMENDER SYSTEMS** Basic Components of Content-Based Systems-Preprocessing and Feature Extraction- Feature Representation and Cleaning-Supervised Feature Selection and Weighting- Learning User Profiles and Filtering	9
IV	**KNOWLEDGE-BASED & ENSEMBLE-BASED RECOMMENDER SYSTEMS** Constraint-Based Recommender Systems-Case-Based Recommenders-Ensemble Methods from the Classification-Weighted Hybrids-Switching Hybrids-Cascade Hybrids	9
V	**EVALUATING RECOMMENDER SYSTEMS** Evaluation Paradigms - Goals of Evaluation Design-Issues in Offline Recommender Evaluation-Accuracy Metrics in Offline Evaluation-Limitations of Evaluation Measures	9
Total Instructional Hours		45

Course Outcome

At the end of the course, Students would be able to:

CO1	Analyze the goals and challenges of recommender systems, evaluate different basicmodels, and identify applications across various domains.
CO2	Apply collaborative filtering techniques (user & item-based) and evaluate model-based approaches (decision trees, rule-based, Naive Bayes, latent factor models) for recommender system design.
C03	Analyze the components of content-based recommender systems, apply pre-processing, feature extraction, and selection techniques, and evaluate user profile learning and contentfiltering methods.
CO4	Critically analyze advanced recommender system techniques (constraint-based, case-based, hybrids) and design solutions for specific applications
CO5	Evaluate the goals and challenges of recommender system design, analyze differentoffline evaluation metrics, and critique the limitations of evaluation measures.

Text Book:

T1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016 (All 5 Units)

REFERENCES:

R1 DietmarJannach,Markus Zanker, AlexanderFelfernigandGerhard Friedrich, Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.

R2 FrancescoRicci, LiorRokach,Bracha Shapira,Recommender Systems Handbook,1sted, Springer (2011)

R3 Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	1	-	-	-	1	-	3	2	2	3
CO2	3	3	2	2	1	1	-	1	-	1	-	3	3	2	3
CO3	3	3	1	2	1	1	-	1	-	1	-	3	2	1	3
CO4	3	3	2	3	1	1	-	1	-	1	-	3	2	1	3
CO5	2	2	3	3	1	1	-	1	-	1	-	3	2	1	3
Avg	2.6	2.8	1.8	2.2	1	1	-	1	-	1	-	3	2.2	1.4	3

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5303	COMPUTER VISION	3	0	0	3

Course Objective

The student should be made

1. To master the core principles underlying images
2. To analyze images in the spatial and frequency domain
3. To interpret image segmentation and representation techniques
4. To describe different methods in object detection and recognition.
5. To enunciate the applications of computer vision.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF IMAGE PROCESSING** Introduction - Fundamentals steps in Digital Image Processing – Components of an Image Processing System- Elements of Visual Perception – Image sensing and Acquisition – Sampling and Quantization-Pixel Relationships.	9
II	**IMAGE TRANSFORMATION** Spatial Domain Gray Level Transformations – Histogram Processing – Spatial Filtering - Smoothing and Sharpening. Frequency Domain: Discrete Fourier Transform - Properties of DFT - Smoothening and Sharpening Filters	9
III	**SEGMENTATION AND FEATURE EXTRACTION** Introduction – Point, Line and Edge Detection – Thresholding – Region Based Segmentation - Feature extraction: Boundary Preprocessing - Boundary Feature Descriptors – Boundary Feature Descriptors - Region Feature Descriptors	9
IV	**OBJECT DETECTION AND RECOGNITION** The Sliding Window Method: Face Detection, Detecting Humans, Detecting Boundaries - Detecting Deformable Objects - Object Recognition: Introduction - Current Strategies for Object Recognition – Categorization – Selection	9
V	**APPLICATIONS** Image-Based Modeling and Rendering: Initial Feature Matching – Expansion – Filtering – Image Search and Retrieval: Applications - User Needs – Types of Image Query - Basic Technologies from Information Retrieval – Word Counts- Approximate Nearest Neighbors and Hashing Ranking image search result-Predicting correlated words with classifiers.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

CO1	Comprehend core digital image processing concepts through explanation, identification, and analysis.
CO2	Utilize spatial domain techniques (transformations, histograms, filtering) and analyze frequency domain with DFT for image enhancement.
CO3	Apply image processing techniques for point/line/edge detection, segmentation, and feature extraction using thresholding, preprocessing, and various descriptors.
CO4	Implement the sliding window method for detection tasks and analyze deformable object detection & object recognition strategies.
CO5	Apply image processing techniques for feature matching, retrieval based on user needs and query types, and leverage ranking and prediction methods for effective image search.

Text Book(s):

T1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", 4th Edition, Addition - Wesley, New Delhi, 2018, (Unit I,II,III).

T2 D. A. Forsyth, J. Ponce ,"Computer Vision: A Modern Approach", 2nd Edition, Pearson Education, 2015, (Unit IV,V).

REFERENCES:

R1 Richard Szeliski, "Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2020

R2 Rafael C Gonzalez, Richard E.woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill,New Delhi, 2010

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	-	1	1	-	-	-	-	1	-	3	2	-	3
CO2	3	3	-	2	2	-	-	-	1	1	-	2	2	-	2
CO3	3	2	1	2	2	-	-	-	1	1	-	2	2	-	2
CO4	2	3	3	3	2	-	-	-	1	1	-	2	2	-	2
CO5	3	2	1	2	2	-	-	-	1	1	-	3	3	-	3
Avg	2.8	2.2	1.7	2	1.8	-	-	-	1	1	-	2.4	2.2	-	2.4

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5304	SOFTWARE TESTING AND AUTOMATION	3	0	0	3

The student should be made

Course Objective

1. To understand the basics of software testing.
2. To learn how to do the testing and planning effectively.
3. To build test cases and execute them.
4. To focus on wide aspects of testing and understanding multiple face to testing.
5. To get an insight about test automation and the tools used for test automation.

Unit	Description	Instructional Hours
I	**FOUNDATIONS OF SOFTWARE TESTING** Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V- model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.	9
II	**TEST PLANNING** The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Tes Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.	9
III	**TEST DESIGN AND EXECUTION** Test Objective Identification, Test Design Factors, Requirement identification Testable Requirements, Modeling a Test Design Process, Modeling Test Results Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.	9
IV	**ADVANCED TESTING CONCEPTS** Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.	9
V	**TEST AUTOMATION AND TOOLS** Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions or Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.	9
	Total Instructional Hours	**45**

At the end of the course, Students would be able to:

Course Outcome

CO1	Understand and applykey principles and methodologies in software testing,
CO2	Develop comprehensive software testing plans through defining objectives, strategies, resources, and execution phases.
CO3	Design effective test cases that can uncover critical defects in the application.
CO4	Design, execute, and evaluate various performance testing techniques for web and mobile application.
CO5	Automate the software testing using Selenium and TestNG tools.

TEXT BOOKS

T1 Yogesh Singh,"Software Testing",Cambridge University Press,2012

T2 Unmesh Gundecha, Satya Avasarala," Selenium Web Driver 3Practical Guide"– Second Edition 2018..

REFERENCES:

R1 Glenford J.Myers, Corey Sandler, Tom Badgett, The Art of Software Te31 sting, 3rdEdition, 2012,John Wiley& Sons, Inc

R2 Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing

R3 Satya Avasarala, Selenium WebDriver Practical Guide,2014,Packt Publishing

R4 Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing

R5 PaulC. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	-	1	1	1	1	2	2	1	2
CO2	2	3	3	2	2	2	1	2	2	2	2	2	3	2	2
CO3	2	3	3	2	2	2	1	2	2	2	2	2	3	2	3
CO4	2	2	3	3	2	1	1	1	2	2	2	2	3	3	3
CO5	2	2	3	2	3	2	2	2	2	2	2	3	3	3	3
Avg	2	2.4	2.8	2	2	1.6	1.3	1.6	1.8	1.8	1.8	2.2	2.8	2.2	2.6

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5305	UI and UX Design	3	0	0	3

Course Objective

The student should be made

1. To provide a sound knowledge in UI & UX
2. To understand the need for UI and UX
3. To understand the various Research Methods used in Design
4. To explore the various Tools used in UI & UX
5. To Create a wireframe and prototype

Unit	Description	Instructional Hours
I	**FOUNDATIONS OF DESIGN** UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.	9
II	**FOUNDATIONS OF UI DESIGN** Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.	9
III	**FOUNDATIONS OF UX DESIGN** Introduction to User Experience - Why You Should Care about User Experience –understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research – User Needs and its Goals - Knowabout Business Goals.	9
IV	**WIREFRAMING, PROTOTYPING AND TESTING3** Sketching Principles - Sketching Red Routes - Responsive Design – Wire-framing – Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests -Other Evaluative User Research Methods - Synthesizing Test Findings – Prototype Iteration.	9
V	**RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** Identifying and Writing Problem Statements - Identifying Appropriate Research Methods – Creating Personas - Solution Ideation - Creating User Stories – Creating Scenarios - Flow Diagrams – Flow Mapping - Information Architecture	9
	Total Instructional Hours	45

At the end of the course, Students would be able to:

Course Outcome

C01	Differentiate between UI and UX design, apply core stages of design thinking, and utilize Divergent and convergent thinking.
C02	Implement visual and UI principles, design effective UI elements and patterns, integrate interaction behaviours and principles
C03	Articulate the importance of user experience, understand and define the UX design process and its methodology
C04	Utilize design tools efficiently, apply interaction patterns, conduct usability tests, and iterate prototypes based on synthesized test findings.
C05	Select appropriate research methods, create roles, ideate solutions, develop user stories and scenarios, construct flow diagrams and flow maps, and design effective information architecture.

TEXTBOOKS

T1 Joel Marsh, "UX for Beginners", O'Reilly, 2022

T2 Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021

REFERENCES:

R1 Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020

R2 Steve Schoger, Adam Wathan "Refactoring UI", 2018

R3 Steve Krug, "Don't Make Me Think, Revisited: A Common sense Approach to Web & Mobile", Third Edition, 2015.

R4 https://www.nngroup.com/articles/

R5 https://www.interaction-design.org/literature.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	2	2	-	-	2	3	1	2	2	1	2
CO2	3	2	3	1	2	-	1	1	2	2	2	3	3	3	2
CO3	3	3	3	3	2	3	1	1	2	3	2	3	3	2	3
CO4	2	2	3	3	3	2	-	-	3	2	3	3	3	3	3
CO5	3	3	3	3	2	2	-	-	3	3	2	3	3	2	3
Avg	2.6	2.6	3	2.4	2.2	2.3	1	1	2.4	2.6	2	2.8	2.8	2.2	2.6

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5306	CLOUD SERVICES MANAGEMENT	3	0	0	3

Course Objective

The student should be made to

1. Introduce Cloud Service Management terminology, definition & concepts
2. Compare and contrast cloud service management with traditional IT service management
3. Identify strategies to reduce risk and eliminate issues associated with adoption of cloud Services
4. Select appropriate structures for designing, deploying and running cloud-based services in a business environment
5. Illustrate the benefits and drive the adoption of cloud-based services to solve real world Problems

Unit	Description	Instructional Hours
I	**CLOUD SERVICE MANAGEMENT FUNDAMENTALS** Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models	9
II	**CLOUD SERVICES STRATEGY** Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture	9
III IV	**CLOUD SERVICE MANAGEMENT** Cloud Service Reference Model, Cloud Service Life Cycle, Basics of Cloud ServiceDesign, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management	12
V	**CLOUD SERVICE ECONOMICS** Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models	9
	CLOUD SERVICE GOVERNANCE & VALUE IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership	6
		45
	Total Instructional Hours	

Course Outcome

At the end of the course, Students would be able to:

- CO1 Exhibit cloud-design skills to build and automate business solutions using cloudtechnologies.
- CO2 Understand and implement effective cloud service strategies.
- CO3 Solve the real world problems using Cloud services and technologies.
- CO4 Analyze the procurement process for cloud-based services, distinguishing between Capex and Opex shifts and understanding the implications of each on organizational finances.

CO5	Construct a cloud governance framework and structure tailored to the unique needs and objectives of an organization, integrating risk management strategies and compliance requirements.

TEXT BOOKS:

T1	Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications 2020
T2	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013
T3	Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour 2017

REFERENCES:

R1	Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing 2020
R2	Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi 2013

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	2	1	3	2	2	1	3
CO2	3	1	2	3	2	-	-	-	1	2	3	1	2	2	2
CO3	1	1	3	1	3	-	-	-	3	3	1	1	3	2	1
CO4	1	3	1	3	3	-	-	-	2	3	3	1	1	1	1
CO5	1	3	3	2	2	-	-	-	1	3	1	2	1	3	2
Avg	1.8	2.2	2	2	2.2	-	-	-	1.8	2.4	2.2	1.4	1.8	1.8	1.8

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Dean Academics

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5307	DATA WAREHOUSING AND DATA MINING	3	0	0	3

Course Objective

The student should be made

1 To learn the concept of Data Ware housing and OLAP
2 To understand Data and Preprocessing Techniques
3 To acquaint with the techniques used for Knowledge Discoveryin Databases.
4 To study Association rule mining and Classification for handling large data
5 To expose the concept of Clustering in data mining

Unit	Description	Instructional Hours
I	**DATA WAREHOUSING AND OLAP** Basic Concepts: Operational database systems Vs Data warehouses- A Multi- tiered Architecture – Data Warehouse Models- Transformation and Loading- Metadata Repository **Data Cube and OLAP:** A Multidimensional Data Model- Stars, Snowflakes and Fact Constellations, Dimensions and Measures, Typical OLAP Operations and ServerArchitecture	9
II	**KNOWING DATA AND DATA PREPROCESSING** **Knowing Data**: Data objects and attributes - Statistical description of data - Data visualization. **Data preprocessing:** Data cleaning - Data integration and transformation - Data reduction	9
III	**DATA MINING** Introduction to Knowledge Discovery from Databases (KDD) process, Kinds of data, Datamining Functionalities, Technologies used - Issues – Applications: Mining Sequence data, Statistical data mining, Visual and Audio Data mining, Mining other kinds of data	9
IV	**ASSOCIATION RULE MINING AND CLASSIFICATION** Introduction - Association rule mining – Frequent Item Set Mining Methods: Apriori and FP Growth Algorithm, Pattern Evaluation Methods. Classification: Basic Concepts – Decision Tree Induction - Bayesian lassification – Rule Based Classification	9
V	**CLUSTERING** Cluster Analysis – Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, BIRCH, Chameleon and Other clustering Methods	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

CO1	Design the data warehouses and utilize OLAP techniques to extract insightful information for data analysis.
CO2	Analyze and prepare data for further exploration and analysis by applying data cleaning, transformation, and reduction techniques.
CO3	Apply KDD process concepts to various data types along with understanding data mining functionalities, technologies, related issues, and applications.
CO4	Extract patterns using association rule mining techniques and construct classification models using decision trees, Bayesian approaches, and rule-based methods to uncover relationships and predict outcomes from data.

CO5	Select and apply appropriate cluster analysis techniques, including partitioning methods and hierarchical methods to uncover hidden structures and group data points based on their similarities.

TEXTBOOKS:

T1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Third Edition, Elsevier,2012.(All 5 units)

T2 Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining and OLAP, Tata McGraw – HillEdition,21st Reprint 2011.

REFERENCES:

R1 Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, PersonEducation, 2007.

R2 K.P. Soman, ShyamDiwakar and V. Aja, Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.

R3 G. K. Gupta, Introduction to Data Mining with Case Studies, Eastern Economy Edition, Prentice Hall of India, 2014.

R4 Ian Witten, EibeFrank, Data mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, Third edition,2011.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	3	-	-	1	1	1	-	2	2	-	1
CO2	2	3	2	2	3	-	-	1	1	1	-	2	-	-	1
CO3	3	2	1	2	2	-	-	1	1	1	-	2	-	-	1
CO4	1	2	2	3	3	-	-	1	1	1	-	2	1	1	1
CO5	3	2	2	3	3	-	-	1	1	1	-	2	1	-	1
Avg	**2.2**	**2**	**2.2**	**2.6**	**2.8**	-	-	**1**	**1**	**1**	-	**2**	**1.3**	**1**	**1**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5308	VIRTUALIZATION	3	0	0	3

Course Objective

The student should be made

1. To Learn the basics and types of Virtualization
2. To understand the Hypervisors and its types
3. To Explore the Virtualization Solutions
4. To Experiment the virtualization platforms
5. To Learn the basics and types of Virtualization

Unit	Description	Instructional Hours
I	**INTRODUCTION TO VIRTUALIZATION** Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization – partial virtualization - Paravirtualization-Types of Hypervisors	9
II	**SERVER AND DESKTOP VIRTUALIZATION** Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization	9
III	**NETWORK VIRTUALIZATION** Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization	9
IV	**STORAGE VIRTUALIZATION** Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID	9
V	**VIRTUALIZATION TOOLS** VMWare-Amazon AWS-Microsoft Hyper V- Oracle VM Virtual Box - IBM Power VM- Google Virtualization- Case study.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

CO1	Evaluate the benefits and limitations of hardware virtualization and hypervisors to determine their suitability for cloud computing environments.
CO2	Differentiate between server and desktop virtualization types and implement an appropriate server virtualization platform to optimize resource utilization
CO3	Analyze tools (VLANs) and design principles (WAN), to implement efficient and secure virtual network solutions.
CO4	Distinguish between memory and storage virtualization, and select appropriate SAN, NAS, or RAID technologies to design virtual storage solutions.

CO5 Critically evaluate and compare leading virtualization tools to select the optimal tool for specific virtual machine management needs

TEXTBOOKS

T1 Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

T2 Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

T3 David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

REFERENCES:

R1 Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress, 2005.

R2 James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	3	2	-	-	2	-	1	1	1	1	-	2
CO2	1	1	3	3	2	-	-	2	1	1	2	1	-	-	1
CO3	1	3	2	2	3	-	-	1	1	1	1	1	-	-	1
CO4	3	3	2	2	3	-	-	1	-	1	1	1	-	-	1
CO5	1	2	1	3	3	-	-	2	-	1	1	2	-	-	1
Avg	**1.6**	**2**	**2**	**2.6**	**2.6**	**-**	**-**	**1.6**	**1**	**1**	**1.2**	**1.2**	**1**	**-**	**1.2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5309	CLOUD COMPUTING	3	0	0	3

Course Objective

The student should be made

1. To understand the principles of cloud architecture, models and infrastructure.
2. To understand the concepts of virtualization and virtual machines.
3. To gain knowledge about virtualization Infrastructure.
4. To explore and experiment with various Cloud deployment environments.
5. To learn about the security issues in the cloud environment.

Unit	Description	Instructional Hours
I	**CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE** Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing. Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges	9
II	**VIRTUALIZATION BASICS** Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts –Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.	9
III	**VIRTUALIZATION INFRASTRUCTURE AND DOCKER** Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.	12
IV	**CLOUD DEPLOYMENT ENVIRONMENT** Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.	6
V	**CLOUD SECURITY** Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyper jacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

CO1	Compare and Contrast different cloud computing models (deployment & service) and reference architectures to design and evaluate cloud infrastructure solutions.
CO2	Analyze, differentiate, and evaluate various types and implementation levels of virtualization technologies, including full virtualization, para-virtualization, and

	hardware virtualization, in order to design and implement efficient virtual machine Environments for CPU, memory, and I/O device virtualization.
CO3	Analyze and implement desktop, network, storage, and system-level virtualization technologies; evaluate virtual clusters, resource management strategies, and differentiate between containers and virtual machines; and demonstrate proficiency in using Docker components, including Docker containers, images, and repositories
CO4	Apply cloud computing principles and practices using Google App Engine, AmazonAWS, and Microsoft Azure, as well as understand the functionality of Cloud Software Environments like Eucalyptus and OpenStack for deploying scalable and resilient applications.
CO5	Analyze and Assess virtualization system-specific attacks such as guest hopping, VM migration attacks, and hyper jacking, while evaluating the effectiveness of identity and access management (IAM) strategies, addressing IAM challenges, and applying IAM architecture and practices in practical scenarios.

TEXT BOOKS

T1 Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

T2 James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.

T3 Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.

REFERENCES:

R1 James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

R2 Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Securityand Privacy: an enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO2	3	3	3	3	3	2	1	1	2	2	3	3	3	2	3
CO3	3	3	3	3	3	2	1	1	2	2	3	3	3	3	3
CO4	3	3	3	3	3	2	1	1	2	2	3	3	3	2	3
CO5	3	3	3	3	3	3	1	1	2	2	3	3	3	2	3
Avg	**3**	**3**	**3**	**2.8**	**3**	**2.2**	1	1	**2**	**2**	**3**	**3**	**3**	**2.2**	**3**

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Dean Academics

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5310	Design of Smart Cities	3	0	0	3

Course Objective

The student should be made

1. To understand the basic concepts involved in the design of smart cities and urban planning.
2. To understand energy sustainability and security related to urban planning.
3. To understand the planning, development and governance of smart cities.
4. To perform process control and stabilization related with smart cities.
5. To perform project management in the development of smart cities.

Unit	Description	Instructional Hours
I	**SMART CITY AND URBAN PLANNING** Smart City - Complexities of Smart Cities - Urban Network - Sensor Network - Role of Urban Networks - Trends in Urban Development - Community Resource Sensing. Urban Planning - Databases - Principles of Urban Planning - Data Organization - Role of Planning in Smart Cities - Case Studies.	9
II	**ENERGY SUSTAINABILITY AND SECURITY** Energy - Decision Making - Energy as a catalyst for Sustainable Transformation - Cohesion and efficiency of smart cities Security challenges in smart cities - Security threats in smart cities - IoT related safety measures for a safer smart city	9
III	**SMART CITIES PLANNING AND DEVELOPMENT** City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global standards and performance benchmark of smart cities - Financing smart cities development - Governance of smart cities.	9
IV	**PROCESS CONTROL AND STABILIZATION** Structural concept - Specific applications - Structural health monitoring - Process control and stabilization - Internet of Vehicle (IoV) Importance - Applications - Security issues - Perspectives on Intelligent Transport Systems (ITS) - ITS Highway safety perspective - Environmental aspects of ITS.	9
V	**PROJECT MANAGEMENT IN SMART CITIES** Case studies on project management of smart cities: web application and mobile based implementation.	9
	Total Instructional Hours	**45**

At the end of the course, Students would be able to:

Course Outcome

- CO1 Apply their understanding of Smart City complexities to real-world scenarios.
- CO2 Analyze security threats associated with smart city infrastructure.
- CO3 Identify and apply global standards and performance benchmarks to assess the smartness of acity.
- CO4 Describe the structural concepts behind intelligent transportation systems (ITS) and their Specific applications.
- CO5 Apply project management methodologies to analyze web and mobile application implementations in smart city projects.

TEXTBOOKS

T1 Carol L. Stimmel, Building Smart Cities Analytics, ICT, Design Thinking, 2016, 1st edition, CRC Press, Taylor and Francis, UK

REFERENCES:

R1 Andrea Vesco and Francesco Ferrero, Handbook of research on social, economic, and environmental sustainability in the development of smart cities, 2015, 1st edition, Information Science Reference, IGI Global, USA

R2 La Scala, Massimo, et al., eds. From smart grids to smart cities: new challenges in optimizing energy grids. 2021, Vol. 2. John Wiley & Sons, USA

R3 Angelakis, Vangelis, et al., eds. Designing, developing, and facilitating smart cities: urban design to IoT solutions. 2016, Springer, USA

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	2	3	3	2	2	2	2	3	2	2	3
CO2	2	3	3	3	2	3	2	2	2	2	2	3	2	2	3
CO3	3	3	3	3	2	3	3	2	2	2	2	3	3	2	3
CO4	2	2	2	3	3	2	2	1	2	2	2	3	2	3	3
CO5	2	3	3	2	3	2	2	2	3	3	3	3	3	3	3
Avg	**2.2**	**2.8**	**2.6**	**2.6**	**2.4**	**2.6**	**2.4**	**1.8**	**2.2**	**2.2**	**2.2**	**3**	**2.4**	**2.4**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5311	IOT ARCHITECTURES AND PROTOCOLS	3	0	0	3

Course Objective

The student should be made

1. To be aware of the architectures and various IoT protocols.
2. To be proficient in various pillars of IoT paradigm
3. To be proficient with various resource management techniques in IoT
4. To know about setting up cloud based IoT applications
5. To analyze, design and develop IoT based solutions for societal problems

Unit	Description	Instructional Hours
I	**IOT ARCHITECTURES AND PROTOCOLS** Physical Design of IoT - Logical Design of IoT - IoT Functional Blocks - Control Units – Basic Communication modules – Bluetooth – Zigbee – WiFi - GPS - IoT Protocols - IPv6 6LoWPAN - RPL - CoAP – MQTT - Wired Communication - Power Sources	9
II	**TECHNOLOGIES BEHIND IOT** Four pillars of IoT paradigm: RFID, Wireless Sensor Networks, Supervisory Control and Data Acquisition (SCADA) - M2M - IoT Enabling Technologies: BigData Analytics, Cloud Computing, Embedded Systems	9
III	**RESOURCE MANAGEMENT IN IOT** Scalability: Network Configuration Protocol, Open vSwitch Database Management Protocol - Routing and Protocols: Collection Tree, LOADng.	9
IV	**IOT TO WEB OF THINGS** Scope of Web of Things (WoT) – IoT Data Management: Set up cloud environment, Cloud access from sensors, Data Analytics Platforms for IOT- Resource Identification: Richardson Maturity Model - REST API	9
V	**IOT PROGRAMMING** Working principles of sensors – IoT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices - Communication through Bluetooth - WiFi and USB - Contiki OS - Cooja Simulator.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Design and analyze Internet of Things (IoT) systems by applying their knowledge of architectures, protocols, and components.
CO2	Apply enabling technologies to IoT applications.
CO3	Evaluate and configure resource management protocols to optimize network performance and scalability in IoT deployments.
CO4	Integrate and manage IoT data within the Web of Things (WoT) by utilizing cloud platforms, data analytics tools, and standardized resource identification methods
CO5	Implement sensor-based IoT applications on platforms and using simulators.

TEXT BOOKS

T1 Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri. Internet of Things: Architectures, Protocols and Standards, 2019, 1st Edition, Wiley Publications, USA.

REFERENCES:

R1 Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A Hands-on Approach, 2014,1st Edition, Universities press, India.

R2 Vlasios Tsiatsis, Jan Holler, Catherine Mulligan, Stamatis Karnourskos and David Boyle. Internet of Things: Technologies and Applications for a New Age of Intelligence, 2018, 2nd Edition, Academic Press, USA.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3
CO2	3	2	2	3	2	2	2	2	2	3	2	3	3	3	3
CO3	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	3	2	3	3	3	3	3
Avg	**3**	**2.8**	**2.8**	**3**	**2.8**	**2.2**	**2**	**2**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5312	INDUSTRY 4.0	3	0	0	3

Course Objective

The student should be made to:

1. Exhibit Industry 4.0 and scope for Indian Industry
2. Inspect conceptual framework of Industry 4.0
3. Examine Technology Roadmap and Product development phase of Industry 4.0
4. Demonstrate Robotic technology and Augmented reality for Industry 4.0
5. Examine obstacle and framework conditions for Industry 4.0

Unit	Description	Instructional Hours
I	**Introduction** Introduction, core idea of Industry 4.0,origin concept of industry 4.0,Industry 4.0 production system, current state of industry 4.0, Technologies, How is India preparing for Industry 4.0.	9
II	**A Conceptual Framework** Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0.	7
III	**Technology Roadmap** Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, New Product and Process Development Phase.	7
IV	**Advances in Robotics and Role of Augmented Reality** Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly- AR Hardware and Software Technology, Industrial Applications of AR	11
V	**Obstacles and Framework Conditions** Lack of a Digital Strategy alongside Resource Scarcity, Lack of standards and poor data security, Financing conditions, availability of skilled workers, comprehensive broadband infra- structure, state support, legal framework, protection of corporate data, liability, handling personal data.	11
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze the current state and technologies of Industry 4.0
CO2	Analyze the core concepts and supporting technologies of Industry 4.0
CO3	Apply their understanding of the Industry 4.0 framework to develop a technology roadmap for new product and process development.
CO4	Compare and contrast recent advancements in robotics

CO5 Evaluate the obstacles and framework conditions necessary for successful Industry 4.0

TEXTBOOKS

T1 Alp Ustundag, Emre Cevikcan, "Industry 4.0: Managing The Digital Transformation", Springer, 2018.

REFERENCES:

R1 Bartodziej, Christoph Jan, "The Concept Industry 4.0", Springer, 2017

R2 Klaus Schwab, "The Fourth Industrial Revolution", 2016

Web References: 1. https://www.i-scoop.eu/industry-4-0

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	2	2	2	2	3	2	3	3	2	3
CO2	3	3	1	3	3	2	2	2	2	2	2	3	3	3	3
CO3	3	3	1	3	3	2	2	2	2	3	3	3	3	3	3
CO4	3	2	1	2	2	2	2	2	2	3	2	3	3	2	3
CO5	3	3	1	3	3	3	3	2	2	3	3	3	3	3	3
Avg	**3**	**2.6**	**1**	**2.6**	**2.6**	**2.2**	**2.2**	**2**	**2**	**2.8**	**2.4**	**3**	**3**	**2.6**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5313	MULTIMEDIA DATA COMPRESSION AND STORAGE	3	0	0	3

Course Objective

The student should be made

1. To understand the basics of compression techniques
2. To understand the categories of compression for text, image and video
3. To explore the modalities of text, image and video compression algorithms
4. To know about basics of consistency of data availability in storage devices
5. To understand the concepts of data streaming services

Unit	Description	Instructional Hours
I	**BASICS OF DATA COMPRESSION** Introduction —Lossless and Lossy Compression– Basics of Huffmann coding- Arithmetic coding- Dictionary techniques- Context based compression – Applications.	9
II	**IMAGE COMPRESSION** Lossless Image compression – JPEG-CALIC-JPEG LS-Prediction using conditional averages – Progressive Image Transmission–Lossless Image compression formats– Applications-Facsimile encoding.	9
III	**VIDEO COMPRESSION** Introduction – Motion Compensation – Video Signal Representation – H.261 – MPEG-1- MPEG-2- H.263.	9
IV	**DATA PLACEMENT ON DISKS** Statistical placement on Disks – Striping on Disks – Replication Placement on Disks – Constraint allocation on Disks – Tertiary storage Devices – Continuous Placement on Hierarchical storage system – Statistical placement on Hierarchical storage systems – Constraint allocation on Hierarchical storage system.	12
V	**DISK SCHEDULING METHODS** Scheduling methods for disk requests –Feasibility conditions of concurrent streams– Scheduling methods for request streams.	6
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

- CO1 **Apply** knowledge of lossless and lossy compression techniques to **analyze** and **implement** compression algorithms
- CO2 **Distinguish** between various lossless image compression techniques
- CO3 Analyze the effectiveness of video compression techniques
- CO4 **Identify** and **apply** various data placement techniques
- CO5 **Compare and contrast** different disk request scheduling methods.

TEXTBOOKS :

T1 Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Series in Multimedia Information and Systems, 2018, 5th Edition.

T2 Philip K.C.Tse, Multimedia Information Storage and Retrieval: Techniques and Technologies, 2008.

REFERENCES:

R1 David Salomon, A concise introduction to data compression,2008.

R2 Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teaching series, 2017.

R3 Yun-QingShi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor & Francis,2019.

R4 Irina Bocharova, Compression for Multimedia, Cambridge University Press;1st edition. 2009.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	2	-	-	-	1	-	-	1	1	-	2
CO2	2	3	1	2	1	-	-	-	1	-	-	1	-	-	2
CO3	2	3	1	2	1	-	-	-	1	-	-	1	-	-	2
CO4	3	1	2	2	1	-	-	-	1	-	-	1	1	-	2
CO5	2	3	1	1	1	-	-	-	1	-	-	1	1	-	2
Avg	2.4	2.2	1.4	1.6	1.2	-	-	-	1	-	-	1	1	-	2

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5314	MULTIMEDIA AND ANIMATION	3	0	0	3

Course Objective

The student should be made

1. To grasp the fundamental knowledge of Multimedia elements and systems
2. To get familiar with Multimedia file formats and standards
3. To learn the process of Authoring multimedia presentations
4. To learn the techniques of animation in 2D and 3D and for the mobile UI
5. To explore different popular applications of multimedia

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MULTIMEDIA** Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.	9
II	**MULTIMEDIA FILE FORMATS AND STANDARDS** File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.	9
III	**MULTIMEDIA AUTHORING** Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning,simulations.	9
IV	**ANIMATION** Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D,2 ½ D, and 3D animation, Animation techniques: Key frame, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.	9
V	**MULTIMEDIA APPLICATIONS** Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

- CO1 Apply knowledge of multimedia and evaluate interactive multimedia experiences.
- CO2 Analyze and select appropriate multimedia file formats based on content type, desired quality, and web delivery considerations.
- CO3 To design, develop, and deliver interactive multimedia experiences for presentations, virtual learning, and simulations.
- CO4 Analyze and apply principles and techniques of animation, considering virtual and augmented reality applications.
- CO5 Analyze and leverage multimedia big data, social networks, and cloud computing to design secure solutions.

TEXTBOOKS:

T1 Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021.

T2 Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly

REFERENCES:

R1 1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.

R2 Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018.

R3 Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design", Pearson Education, 1st Edition, 2015.

R4 Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature, 1st Edition, 2021.

R5 Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.

R6 Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.

R7 Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.

R8 Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	-	-	2	1	1	-	1	2	2	2
CO2	1	3	2	1	2	-	-	2	-	1	-	1	1	3	1
CO3	2	2	3	1	3	1	1	2	2	2	1	1	-	3	3
CO4	3	3	2	1	2	-	-	2	1	1	-	1	1	2	1
CO5	3	3	1	2	3	1	1	2	1	1	-	2	2	3	1
Avg	**2.4**	**2.4**	**1.8**	**1.4**	**2.4**	**1**	**1**	**2**	**1.3**	**1.2**	**1**	**1.2**	**1.5**	**2.6**	**1.6**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5315	DIGITAL MARKETING	3	0	0	3

Course Objective

The student should be made :

1. To Identify the components of a digital marketing strategy.
2. To Learn about the basics of search engine optimization (SEO)
3. To Understand the different types of e-mail marketing.
4. To Understand the concept of social media marketing.
5. To gain an overview of digital transformation.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ONLINE** Online Market space- Digital Marketing Strategy- Components - Opportunities forbuilding Brand Website - Planning and Creation - Content Marketing.	6
II	**SEARCH ENGINE OPTIMISATION** Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.	9
III	**E- MAIL MARKETING** E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns- Profiling and targeting.	12
IV	**SOCIAL MEDIA MARKETING** Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.	9
V	**DIGITAL TRANSFORMATION** Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

- CO1 Analyze and develop a digital marketing strategy for an online marketplace, including website creation and content marketing techniques.
- CO2 Analyze and implement SEO SEM strategies, including keyword research, on-page and off-page optimization techniques, and paid advertising methods.
- CO3 Design, develop, and evaluate multi-channel digital marketing campaigns utilizing email automation, social media integration, and various mobile marketing techniques.
- CO4 Utilize and manage social media platforms for brand promotion, building customer relationships.
- CO5 Analyze and optimize data from various digital marketing channels.

TEXTBOOKS:

T1 Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education: First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373

T2 Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 019945544

T3 Marketing 4.0: Moving from Traditional to Digital by Philip Kotler; Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.

REFERENCES:

R1 Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.

R2 Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning

R3 Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	-	1	3	3	3	3	3	2	3
CO2	3	2	3	3	3	2	1	1	3	3	3	2	3	3	3
CO3	3	3	3	2	3	2	1	1	3	3	3	3	3	2	3
CO4	3	3	3	2	3	2	1	1	3	3	3	2	3	2	3
CO5	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
Avg	**3**	**2.8**	**3**	**2.4**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**2.6**	**3**	**2.4**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5316	AUGMENTED REALITY	3	0	0	3

Course Objective

The student should be made

1. To explain the concept and type of Virtual and Augmented Reality.
2. To identify and compare current & future options in VR and AR
3. To explore the knowledge in writing, compiling, running and building application in C#.
4. To display a data with UI elements using unity 3D tool.
5. To design a 2D scene with sound and animation effects.

Unit	Description	Instructional Hours
I	**Introduction to Virtual and Augmented Reality** Introduction - Types of Virtual and Augmented Reality – History of VR/AR - Evaluating the Technology Hype Cycle - Current State of VR: Features – Controllers - Current Issues with VR - Current State of AR: AR Available Form Factors - Controllers - Current Issues with AR.	9
II	**Content in Virtual and Augmented Reality** Consumer Grade Virtual Reality - Identifying Near Future Hardware in VR - Comparing Current and Future Options in VR - Exploring Consumer Grade Augmented Reality - Identifying Near Future Hardware in AR - Comparing Current and Future Options in AR.	9
III	**C# Basics** C# and .NET Architecture – CLR – Assemblies – Classes – Namespaces – C# Basics – Variables – Data Types – Statements – Preprocessor Directives – Objects and Types – Inheritance – Arrays – Operators and Casts.	9
IV	**Displaying Data with Core UI Elements and Inventory UIs** Displaying a "Hello World" UI text message - Displaying a digital clock - digital countdown timer - Perspective 3D Text Mesh - Displaying an image-Creating UIs with the Fungus open source dialog system - Creating a Fungus character dialog with images – Inventory UIs – Displaying single object pickups with carrying and not-carrying text.	9
V	**Manipulating Sound and Animation** Playing different one-off sound effects with a single Audio Source component - Creating the basic scene using camera - Creating a picture-in-picture effect - Lights and Effects – Environment lighting - Emissive materials – Projector – 2D Animation - Flipping a sprite horizontally using Animator State Chart and Transitions - Animating body parts for character movement events.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, Students would be able to:

- CO1 Distinguish between virtual and augmented reality, and critically evaluate the hype surrounding these technologies.
- CO2 **Distinguish** between current and future consumer VR/AR hardware options.
- CO3 **Distinguish** between core building blocks of C# programming and .NET architecture.
- CO4 **Create** interactive user interfaces (UI) elements for games or applications.
- CO5 **Integrate** audio-visual elements into a game or application, encompassing sound effects, scene creation, camera manipulation, lighting, 2D animation, and character state-based animation.

TEXTBOOKS

T1 Paul Mealy, "Virtual & Augmented Reality", John Wiley & sons, 2018(Unit I,II).

T2 Nagel Christion, "Professional C# 2012 And .Net 4.5", John Wiley & sons,2018(Unit III)

T3 Matt Smith, "Unity 2018 Cookbook", Packt Publication, 2018(Unit IV & V).

REFERENCES:

R1 Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", John Wiley & Sons,Inc., Second Edition, 2008.

R2 Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications

R3 Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1	-	2	1	-	-	2	-	-	1	-	1
CO2	1	3	1	2	1	-	-	-	-	1	-	-	1	1	1
CO3	1	3	2	1	1	-	-	-	-	-	-	-	3	2	3
CO4	1	1	3	3	2	-	-	-	1	2	-	-	-	3	3
CO5	1	1	3	1	3	-	-	-	1	2	-	-	-	3	3
Avg	**1**	**2.2**	**5**	**1.6**	**1.7**	**2**	**1**	**-**	**1**	**1.7**	**-**	**-**	**1.6**	**2.2**	**2.2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT5317	CYBER SECURITY	3	0	0	3

Course Objective

The student should be made

1. To know the importance of Information System Security.
2. To explore various Crypto graphic Techniques.
3. To learn the basics of Cybercrime and Cyber Offences.
4. To familiarize various Cyber Threats, Attacks, Vulnerabilities, Defensive Mechanisms.
5. To understand the Organizational Implications on Cyber Security.

Unit	Description	Instructional Hours
I	**INFORMATION SYSTEMS AND SECURITY** Information System Components, Information System Categories, Individuals in Information System, Information Security, Threats to Information systems, Cyber Security and Risk analysis, Database Security, Internet Security, Security technology, Intrusion Detection.	9
II	**OVERVIEW OF SECURITY TECHNIQUES** Computer security concepts, OSI security architecture, Security attacks, Security services, Security mechanisms, Model for Network security, Symmetric cipher model, cryptography, Cryptanalysis and Brute-Force Attack, Caesar Cipher, Rail fence technique, Public-Key Cryptography: Principles, Applications, Public-Key Cryptanalysis, RSA algorithm.	9
III	**CYBERCRIME AND CYBER OFFENCES** Introduction to Cybercrime, Classifications of Cybercrimes planning of attacks, social engineering: Human based, Computer based: Cyberstalking, Cybercafe and Cybercrimes.	9
IV	**CYBER THREATS, ATTACKS AND PREVENTION** Phishing, Password cracking, Key loggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID): Types of identity theft, Techniques of ID theft	9
V	**CYBER SECURITY IMPLICATIONS** Lessons for Organizations, Web Threats for Organizations, Security and Privacy Implications, Risks in social media marketing, People's Privacy in the organization, Organizational Guidelines, Incident Handling, Best Practices for organizations, Media and asset protection, End point security	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Identify components and categories of information systems, and explain their roles in organizational contexts.
CO2	Analyze threats to information systems and propose appropriate cyber security measures for prevention and mitigation.
CO3	Evaluate cryptographic techniques including symmetric and asymmetric cryptography, and apply them to ensure database and internet security.

CO4	Demonstrate knowledge of cybercrime classifications and develop strategies forpreventing cyber threats such as phishing, DoS attacks, and identity theft.
CO5	Assess the implications of cyber security on organizational policies and formulate effective guidelines and best practices for incident handling and endpoint security.

TEXTBOOKS

T1 William Stallings, "Cryptography and Network Security: Principles and Practice", Seventh Edition, Pearson Education, 2017.

T2 Nina Godbole, Sunit Belapure, "Cyber security: Understanding Cybercrime, Computer Forensics and Legal perspectives", Wiley India Pvt. Ltd, 2013.

REFERENCES:

R1: Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Securityand Cyber Laws", Cengage Learning India Pvt Ltd (1st Edition), 2018.

R2: Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security: Principles, Theory and Practices", BPB Publications (1st Edition), 2017.

R3: William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Pearson Education (3rd Edition), 2014.

R4: McDonough, Bart R., "Cyber Smart: Five Habits to Protect Your Family, Money, and Identity from Cyber Criminals", John Wiley & Sons, Incorporated, 2019. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=5612908.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	-	1	2	2	1	2	3	2	2
CO2	3	3	2	2	2	1	-	1	3	2	1	2	3	3	3
CO3	3	3	2	2	2	2	-	2	2	2	1	2	2	2	2
CO4	2	2	3	3	3	2	-	2	3	2	1	3	3	3	3
CO5	3	3	3	3	2	3	-	3	3	3	3	3	3	3	3
Avg	3	3	2	2	2	2	-	2	3	2	1	2	3	3	3

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT5318	TAMIL COMPUTING	3	0	0	3

Course Objective

The student should be made to:

1. Introduce fundamental Tamil language concepts and computing principles.
2. Enhance comprehension of Tamil script and language structure in digital contexts.
3. Foster mastery of Tamil computing tools and technologies.
4. Cultivate students' ability to create software supporting Tamil language Applications.
5. Provide insight into open Tamil initiatives and large language modelling.

Unit	Description	Instructional Hours
I	**Introduction** Tamil Basics and Grammar - Introduction - Tamil Characters and Classification, Tamil Grammar, Tamil Words Classification - Basics of Tamil Computing - Encoding Standards, SBCS (Single Byte Character Set) / MBCS (Multi-byte Character Set) , TAB/TAM Encoding Schemes, TACE16, Standard Codes for Tamil Computing, Unicode, TSCII, ISCII, Tamil Fonts, Tamil Keyboard Standards. Tamil Computing Issues and Challenges, Software Design Issues, Rendering Text, Fonts standards, Data Entry Methods, Writing systems, Translation, text to speech.	6
II	**Basics of Tamil Language Script and Tamil Computing** Introduction to Tamil Phonology - Speech Sounds - Tolkappiyar's Phonological Pattern - Modern Tamil Phonological Structure - Tamil Morphology - Classes and Categories - Lexicography - Syntax - Semantics and Pragmatics.	6
III	**Tamil Computing Tools and Technologies** Tamil Computing Tools and Resources - Sentence splitter - Tokenizer, Stemmer, PoS Tagger, Tamil Morphology - Analyzer - Generation - Name Entity Recognition- Sentence Parser- Spell Checker - Anaphora Resolution and Word Sense Disambiguation -Tamil Indic Libraries - Open Tamil Basics and Tools.	6
IV	**Tamil Computing Applications and Packages** Tamil Information System Applications - Information extraction - Retrieval - Summarization - Machine Translation - Question Answering System Tamil Dictionary - MS Office and Google in Tamil - Database Management System in Tamil - Tamil Speech Processing and Handwritten Character Recognition.	6
V	**Tamil Customization and Large Language Model For Tamil** Inputting and Outputting of Tamil, Automata Theory, NFA and DFA for Tamil - Customization of Windows Operating - Introduction to Language Modeling, Transformer Architecture, Attention Mechanism in Transformers - Generative Models and Their Role in Language Generation, Fine Turning, Choosing Hyperparameters and Model Selection Evaluation Metrics and Best Practices, English to Tamil Neural Machine Translation.	6
	Total Instructional Hours	**30**

S.No	List of Experiments
1	How can a Python program be written to accept Tamil input and produce corresponding output?
2	What steps are involved in installing and customizing the Windows Tamil system?
3	How can a Python program be implemented for stemming and tokenization?
4	What is the procedure for implementing POS tagging in Python?
5	How can a Python program be developed for Tamil Named Entity Recognition?
6	What is the process for integrating MySQL with Python to perform database operations in Tamil?
7	How can MS Office be customized for Tamil language usage, including creating documents, presentations, and spreadsheets?
8	How can a Tamil spell checker be developed using Python?
9	What steps are involved in creating a Tamil dictionary program?
10	How can various Tamil language operations be performed using Python Indic libraries?
11	How can a translation program be developed in Python using Transformers and LLM for Tamil language?
12	What are the functionalities offered by Open Tamil Tools, and how can they be utilized?
13	What steps are involved in developing a Tamil question-answer system in Python?
14	How can a Python program be created for text summarization in Tamil?

Course Outcome

At the end of the course, students would be able to:

CO1	Encode Tamil text using various standards and employsuitable fonts/keyboards.
CO2	Analyze Tamil speech sounds, classify words, utilize lexicography, and construct grammatically sound sentences considering semantics and pragmatics.
CO3	Apply Tamil computing tools for tasks like sentence splitting, tokenization, morphological analysis, named entity recognition, and spell checking.
CO4	Utilize information processing tools in Tamil for tasks like extraction, retrieval, translation, and leverage Tamil features in MS Office, Google, and databases.
CO5	Applytechniques for Tamil input/output, automata theory, language modeling (transformers), and evaluate English-Tamil machine translation

TEXT BOOK:

T1 1. Dr. R. Ponnusamy, Tamil Computing, Allied Publishers, 2024.

REFERENCES:

R1 Tholkaappiyam: Phonology & Morphology, Albert, International Institue of Tamil Studies, First Edition, 1985

R2 The Oxford Handbook of Computational Linguistics, Edited by Ruslan Mitkov, Oxford University Press, 2003

R3 Translation - Theoryand Application, Valarmathi, International Institute of Tamil Studies, First Edition, 2001.

R4 Tholkaappiyam - Thodariyal, Shanmugam, International Institute of Tamil Studies, First Edition, 2004.R5 Conference Papers, Tamil Internet, Government of Tamilnadu, 2003.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	1	2	-	1	-	-	-	1	-	-	3	1	3
CO2	2	3	3	3	1	-	1	-	1	-	1	2	2	-	2
CO3	3	1	2	3	1	1	1	-	-	1	-	1	2	-	2
CO4	3	1	2	3	1	1	1	-	-	1	-	1	2	-	2
CO5	3	1	2	3	1	1	1	1	-	1	-	1	1	-	1
AVG	2.8	1.5	2	2.8	1	1	1	1	1	1	1	1.3	2	1	2

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THEORY WITH LAB COMPONENT

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT5251	APPLICATION DEVELOPMENT	2	0	2	3

The student should be able

Course Objectives

1. To compare and contrast native, hybrid, cross-platform, progressive web apps, and responsive web design to choose the right approach for a project.
2. To compare native apps with web apps and choose the right development approach for a given scenario.
3. To understand the pros, cons, use cases and tools for building hybrid mobile apps.
4. To understand the trade-offs between native and cross-platform app development and choose the right approach for a project.
5. To analyze app development frameworks across factors like build speed, app performance, debugging, and maintainability to choose the best fit for their project.

Unit	Description	Instructional Hours
I	**Fundamentals of Mobile & Web Application Development** Basics of Web and Mobile application development - Native App - Hybrid App - Cross-platform App - What is Progressive Web App - Responsive Web design	06
II	**Native App Development using Java** Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS	06
III	**Hybrid App Development** Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova	06
IV	**Cross-Platform App Development using React-Native** What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props	06
V	**Non-Functional Characteristics of App Frameworks** Comparison of different Ap p frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability	06
	Total Instructional Hours(Theory)	30
	Total Instructional Hours(Practical)	30
	Total Instructional Hours	60

Laboratory Practical Exercises — **30 Hours**

1. Develop a simple android hello world application.
2. Design an application that uses Layout Managers and event listeners.
3. Using react native, build a cross platform application for a BMI calculator.
4. Build a cross platform application for a simple expense manager which allows entering expenses and income on each dayand displays category wise weekly income and expense.
5. Design and develop an android application using Apache Cordova to find and display the current location of the user.

6. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.

Course Outcomes

At the end of the course, students would be able to:

CO1	Distinguish native, hybrid, and cross-platform mobile app development approaches, and analyze the role of PWAs and responsive web design in the mobile landscape.
CO2	Develop impactful native mobile applications by evaluating use cases, exploring frameworks (Java/Kotlin, Swift/Objective-C), and understanding the pros and cons of native app development.
CO3	Evaluate hybrid app development, identify creation tools (Ionic, Cordova) and frameworks, and distinguish between native and hybrid app suitability.
CO4	Develop cross-platform apps, evaluating benefits and drawbacks, while exploring tools like React Native, Flutter, and Xamarin to leverage native UI components, JSX syntax, and state/prop management.
CO5	**Evaluate** app frameworks across factors like build performance, debugging, time-to-market, maintainability, ease of development, UI/UX, and reusability to make informed decisions for your mobile app development projects.

TEXT BOOKs:

T1	Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition
T2	Apache Cordova in Action, Raymond K. Camden, Manning. 2015
T3	Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

REFERENES:

R1	Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition
R2	Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
R3	Apache Cordova 4 Programming, John M Wargo, 2015

CO-PO Mapping

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO1	PO2	PO3
CO1	3	3	1	1	2	1	-	1	1	2	-	2	1	3	2
CO2	3	2	3	1	2	1	-	2	1	2	1	2	1	3	2
CO3	3	3	3	2	3	1	-	1	1	2	-	2	2	3	3
CO4	3	2	3	2	3	1	-	1	1	2	-	2	2	3	3
CO5	3	3	2	2	2	1	-	2	1	3	1	3	0	3	3
Avg	3	2	2.2	1	2.4	1	-	1.4	1	2.2	1	2.2	1.5	3	2.6

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LABORATORY

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT5001	ARTIFICIAL INTELLIGIENCE AND MACHINE LEARNING LABORATORY	0	0	4	2

The student should be made

Course Objective

1. To be proficient in using machine learning software packages
2. To Implement AI based search techniques for solving problems
3. To design techniques for solving gaming problems
4. To develop simple machine learning systems
5. To build neural network models

Exp. No	Description of the Experiments
1	Demonstration of machine learning packages and the use of built in functions
2	Implementation of Uninformed search algorithms
3	Implementation of Informed search algorithms
4	Implementation of alpha-beta pruning
5	Implementation of CSP problems
6	Build Regression models
7	Build decision trees and random forests
8	Build SVM models
9	Implement ensemble techniques
10	Implement clustering algorithms
11	Development of a simple expert system
12	Build simple neural network models

Total Instructional Hours **60**

At the end of the course, students would be able to:

Course Outcome

CO1	Demonstrate proficiency in using machine learning packages and built-in functions to solve real-world problems.
CO2	Implement various search algorithms including uninformed and informed search algorithms, and apply alpha-beta pruning for optimizing search in game trees.
CO3	Solve Constraint Satisfaction Problems (CSP) and demonstrate an understanding of their applications.
CO4	Build and evaluate a variety of machine learning models including regression models, decision trees, random forests, SVM models, ensemble techniques, and clustering algorithms.
CO5	Develop practical applications such as a simple expert system and basic neural network models, integrating these components into larger systems.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

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EEC COURSES
(SE/AE)

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE5071	Soft Skills - IV	0	0	0	1

Course Objectives:

1. To employ soft skills to enhance employability and ensure workplace and career success.
2. To interpret things objectively, to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**Introduction to Soft Skills:** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills -Self management-Critical thinking-Reflective thinking and writing- p2p Interaction	10
II	**Art of Communication:** Verbal Communication - Effective Communication - Active listening –Paraphrasing - Feedback - Non Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve non verbal Communication - Importance of feelings in communication - dealing with feelings in communication.	10
III	**World of Teams:** Self Enhancement - importance of developing assertive skills- developing self confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making.	10
	Total Instruction Hours	30

Course Outcome:

CO1: Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.

CO2: Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others

CO3: Students will understand how teamwork can support leadership skills

REFERENCE BOOKS:

R1: Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz

R2: Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent – by Bruce Tulgan

R3: Soft Skills Training: A Workbook to Develop Skills for Employment – by Frederick H. Wentz

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SKILLED/INTEGRATED COURSES

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5252	BUSINESS INTELLIGENCE	3	0	0	3

Course Objective

The student should be made:

1. To understand ethical working with IBM Cognos BI
2. To understand the ethical considerations in different Reports
3. To make reports interactive for users.
4. To create calculations based on data sources and use expressions for complex data manipulation.
5. To employ conditional formatting techniques to highlight exceptional data and customize reports for multi-lingual use.

Unit	Description	Instructional Hours
I	**Overview of IBM Cognos BI** Introduction to the reporting application, examine report studio and its interface, explore format, group and sort list reports, describe options for aggregating data, create a report with repeated data	9
II	**Focus Reports using Filters and Create Crosstab Reports** Create filters to narrow the focus of reports, examine detail and summary filters, determine when to apply filters on aggregate data, format and sort Cross tab reports, convert a list to a crosstab, create crosstabs using unrelated data items and create complex crosstabs using drag and drop functionality.	9
III	**Present Data Graphically and Focus Reports using Prompts** Create charts containing peer and nested items, present data using different chart type options, add context to charts, Create and reuse custom chart palettes, present key data in a single dashboard report, identify various prompt types, use parameters and prompts to focus data, search for prompt items and navigate between pages	9
IV	**Extend Reports using Calculations** Create calculations based on data in the data source, add run-time information to the reports, create expressions using functions, highlight exceptional data, show and hide data, conditionally render objects in reports, conditionally format one crosstab measure.	9
V	**Customize Reports with Conditional Formatting** Create multi-lingual reports, highlight exceptional data, create a conditionally rendered column, conditionally format one crosstab measure based on another	9
		45

Upon completion of this course, the students will be able to:

CO1	Explore the IBM Cognos BI interface to create, format, and manipulate reports using functions like grouping, sorting, and data aggregation.
CO2	Analyze reports through strategic filtering and advanced crosstab manipulation
CO3	Design and customize charts to visually represent data, create dashboards for key insights, and utilize prompts to enable interactive and focused reporting.
CO4	Create and leverage calculations, expressions, and conditional logic to extend Focus reportfunctionality for enhanced analysis and data visualization.
CO5	Personalize Focus reports with conditional formatting to enhance data visualization and user experience.

TEXT BOOK:

T1 IBM CE - Foundation in Business Analytics by IBM CE 2018, Fifth edition (2017).

T2 IBM Cognos Analytics: Author Reports Fundamentals (v11.0) by IBM CE, (2016).

REFERENCES:

R1 Sangeeta Gautam - IBM Cognos Business Intelligence v10: The Complete Guide (IBM Press) 1st Edition (2012).

R2 Dustin Adkison - IBM Cognos Business Intelligence (2013).

R3 Dan Volitich and Gerard Ruppert - IBM Cognos Business Intelligence 10: The Official Guide (India) Private Ltd, 2012

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	2	-	-	1	-	2	-	1	1	-	1
CO2	1	2	1	1	2	1	-	1	-	2	-	1	1	-	2
CO3	1	1	2	-	2	-	-	1	-	3	-	1	1	-	2
CO4	1	1	1	-	3	-	-	1	-	2	-	1	1	-	2
CO5	1	1	1	-	2	-	-	1	-	2	-	1	1	-	2
Avg	**1**	**1.2**	**1.2**	**1**	**2.2**	**1**	**-**	**1**	**-**	**2.2**	**-**	**1**	**1**	**-**	**1.8**

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NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2022

ACADEMIC YEAR 2024-25 ODD SEMESTER

S. No	Regulation	Course Code with Name	Credit
1	2022	22IT5202 - Embedded System and IoT	3
2	2022	22IT5301 - Exploratory Data Analysis	3
3	2022	22IT5302 - RecommenderSystems	3
4	2022	22IT5303 - ComputerVision	3
5	2022	22IT5304 - Software Testing and Automation	3
6	2022	22 IT5305 - UI and UXDesign	3
7	2022	22IT5306 - Cloud Services Management	3
8	2022	22IT5308 - Virtualization	3
9	2022	22IT5309 - Cloud Computing	3
10	2022	22IT5310 – Design of Smart Cities	3
11	2022	22IT5311- IoT Architectures and Protocols	3
12	2022	22IT5312 - Industry 4.0	3
13	2022	22IT5313 - Multimedia DataCompression and Storage	3
14	2022	22IT5314 -Multimedia andAnimation	3
15	2022	22IT5315 - Digital marketing	3
16	2022	22IT5316 - Augmented Reality	3
17	2022	22IT5317 - Cyber security	3
18	2022	22IT5318 - Tamil Computing	3
19	2022	22IT5252 – Business Intelligence (IBM track)	3

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COIMBATORE - 641 032.

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi& Accredited by NAAC with 'A ++' Grade)
Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu

B.TECH. INFORMATION TECHNOLOGY

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the ODD semester

Academic year 2024-2025

BATCH 2021-2025

CURRICULUM
R2019

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMME

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2019

For the students admitted during the academic year 2021-2022 and onwards

The course code 21 indicates that the students joined in the academic year 2021

SEMESTER I – 20 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2.	21MA1101	Calculus	BS	3	1	0	4	40	60	100
THEORY & LAB COMPONENT										
3.	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4.	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5.	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6.	21EC1154	Basics of Electron Devices and Electric Circuits	ES	2	0	2	3	50	50	100
PRACTICAL										
7.	21HE1071	Language Competency Enhancement Course-I	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
8.	21HE1072	**Career Guidance Level** – I Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9.	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total:	**16**	**2**	**10**	**20**	**580**	**320**	**900**

SEMESTER II - 22 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2.	21MA2104	Differential Equations and Linear Algebra	BS	3	1	0	4	40	60	100
THEORY & LAB COMPONENT										
3.	21IT2151*	Programming in C	ES	2	0	2	3	50	50	100

4.	21ME2154	Engineering Graphics	ES	1	0	4	3	50	50	100
5.	21PH2151	Material Science	BS	2	0	2	3	50	50	100
6.	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICALS										
7.	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8.	21HE2071	Language Competency Enhancement Course-II	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
9.	21HE2072	Career Guidance Level – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total:	**14**	**2**	**16**	**22**	**530**	**370**	**900**

SEMESTER III – 20 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA3151	Statistics and Queuing Theory	BS	3	0	2	4	50	50	100
2.	21IT3201	Data Structures and Algorithm Design	PC	3	0	0	3	40	60	100
3.	21IT3202	Object Oriented Programming Using C++	PC	3	0	0	3	40	60	100
4.	21IT3203	Computer Organization and Architecture	PC	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
5.	21IT3251*	Digital Principles and System Design	PC	3	0	2	4	50	50	100
PRACTICALS										
6.	21IT3001	Data Structures and Algorithm Laboratory	PC	0	0	3	1.5	50	50	100
7.	21IT3002	Object Oriented Programming using C++ Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8.	21MC3191	Indian Constitution	AC	2	0	0	0	100	0	100
9.	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10.	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total:	**20**	**0**	**10**	**20**	**575**	**425**	**1000**

SEMESTER IV - 21 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA4102	Discrete Mathematics	BS	3	1	0	4	40	60	100
2.	21IT4201	Java Programming	PC	3	0	0	3	40	60	100

3.	21IT4202	Advanced Database Management Systems	PC	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
4.	21IT4251*	Object Oriented Software Engineering	PC	3	0	2	4	50	50	100
5.	21IT4253	Principles of Operating Systems	PC	3	0	2	4	50	50	100
PRACTICALS										
6.	21IT4001	Java Programming Laboratory	PC	0	0	3	1.5	50	50	100
7.	21IT4002	Database Management Systems Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8.	21MC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100	0	100
9.	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10.	21HE4073	Ideation Skills	EEC	1	0	0	0	100	0	100
			Total:	**20**	**2**	**8**	**21**	**620**	**380**	**1000**

SEMESTER V – 23 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
1.	21IT5201	Mobile Computing	PC	3	0	0	3	40	60	100
2.	21IT5202	Computer Networks	PC	3	0	0	3	40	60	100
3.	21IT5209	Embedded Systems Design	PC	3	0	0	3	40	60	100
4.	21IT5204	Artificial Intelligence and Machine Learning	PC	3	0	0	3	40	60	100
5.	21IT5205	Data Warehousing and Data Mining	PC	3	0	0	3	40	60	100
Theory with Lab Component										
6.	21IT53XX* /21IT5357	**Professional Elective-I/ Business Intelligence Analyst**	PE/ ICC	2	0	2	3	50	50	100
PRACTICALS										
7.	21IT5001	Machine Learning Laboratory	PC	0	0	3	1.5	50	50	100
8.	21IT5002	Mobile Application Development Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10.	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	**19**	**0**	**8**	**23**	**550**	**450**	**1000**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21IT5351	Internet and Web Technology	PE	2	0	2	3	50	50	100
2	21IT5352	Advanced Java Programming	PE	2	0	2	3	50	50	100
3	21IT5353	C# and .Net Programming	PE	2	0	2	3	50	50	100
4	21IT5354	Advanced Data Structure	PE	2	0	2	3	50	50	100
5	21IT5355	Advanced Database Technology	PE	2	0	2	3	50	50	100
6	21IT5356	Ethics and AI	PE	2	0	2	3	50	50	100

SEMESTER VI – 25 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	21IT6181	Software Project Management	HS	3	0	0	3	40	60	100
2.	21IT6201	Internet of Things	PC	3	0	0	3	40	60	100
3.	21IT6202	Principles of Compiler Design	PC	3	0	0	3	40	60	100
4.	21IT63XX / 21IT6309	**Professional Elective II** / Predictive Modeling	PE	3	0	0	3	40	60	100
5.	21XX64XX	**Open Elective I**	OE	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
6.	21IT6251 /21IT6252	Cryptography and Network Security **/ Data Sciences**	PC	3	0	2	4	50	50	100
PRACTICALS										
7.	21IT6001	Internet of Things Laboratory	PC	0	0	3	1.5	50	50	100
8.	21IT6003	Project Based Learning	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	21IT6701	Internship/Industrial Training	EEC	0	0	0	1	100	0	100
10.	21HE6071	Soft Skill-II	EEC	1	0	0	1	100	0	100
11.	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			TOTAL	**20**	**0**	**8**	**25**	**575**	**525**	**1100**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE II										
1	**21IT6301**	Business Intelligence And Analysis	PE	3	0	0	3	40	60	100
2	**21IT6302**	Information Security	PE	3	0	0	3	40	60	100
3	**21IT6303**	Software Design	PE	3	0	0	3	40	60	100
4	**21IT6304**	Natural Language Processing	PE	3	0	0	3	40	60	100
5	**21IT6305**	Soft Computing	PE	3	0	0	3	40	60	100
6	**21IT6307**	Virtual Reality andAugmented Reality	PE	3	0	0	3	40	60	100
7	**21IT6308**	Web Development - I	PE	0	0	3	3	50	50	100

OPEN ELECTIVE

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	**21IT6402**	Machine Learning for Engineers	OE	3	0	0	3	40	60	100

SEMESTER VII – 20 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	**21IT7201**	Introduction to Distributed and Cloud Computing	PC	3	0	0	3	40	60	100
2.	**21IT7202/ 21IT7204**	Data Science and Analytics/Big Data with security	PC	3	0	0	3	40	60	100
3.	**21IT7203**	Software Testing and Quality Assurance	PC	3	0	0	3	40	60	100
4.	**21IT73XX**	**Professional Elective III**	PE	3	0	0	3	40	60	100
5.	**21XX74XX**	**Open Elective – II**	OE	3	0	0	3	25	75	100
PRACTICALS										
6.	**21IT7001**	Distributed and Cloud Computing Laboratory	PC	0	0	3	1.5	50	50	100
7.	**21IT7002/ 21IT7003**	Data Analytics Laboratory / Big Data with Security Laboratory	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8.	**21IT7901**	Project Work - Phase I	EEC	0	0	4	2	50	50	100
			TOTAL	**15**	**0**	**10**	**20**	**335**	**465**	**800**

PROFESSIONAL ELECTIVE III										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT7301	Social Network analysis	PE	3	0	0	3	40	60	100
2.	21IT7302	Cyber Forensics	PE	3	0	0	3	40	60	100
3.	21IT7303	Software Documentation	PE	3	0	0	3	40	60	100
4.	21IT7304	Principles of Management	PE	3	0	0	3	40	60	100
5.	21IT7305	Software Architecture	PE	3	0	0	3	40	60	100
6.	21IT7306	Green Computing	PE	3	0	0	3	40	60	100
7.	21IT7307	Web Development - II	PE	0	0	3	3	50	50	100

OPEN ELECTIVE - II										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT7401	Cyber Security	OE	3	0	0	3	40	60	100

SEMESTER VIII – 14 Credit

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21IT83XX	**Professional Elective –IV**	PE	3	0	0	3	25	75	100
2.	21IT83XX	**Professional Elective- V**	PE	3	0	0	3	25	75	100
PRACTICAL										
3.	21IT8901	Project Work – Phase II	EEC	0	0	24	8	50	50	100
			TOTAL	**6**	**0**	**24**	**14**	**100**	**200**	**300**

PROFESSIONAL ELECTIVE IV										
1.	21IT8301	Graphics and Multimedia	PE	3	0	0	3	40	60	100
2.	21IT8302	Software Process	PE	3	0	0	3	40	60	100
3.	21IT8303	Service Oriented Architecture	PE	3	0	0	3	40	60	100
4.	21IT8304	Human Computer Interaction	PE	3	0	0	3	40	60	100
5.	21IT8305	Mobile Edge Systems	PE	3	0	0	3	40	60	100
6.	21IT8311	Robotics and its Applications	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE V										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT8306	Information Retrieval Technologies	PE	3	0	0	3	40	60	100

2.	21IT8307	Block Chain Technology	PE	3	0	0	3	40	60	100
3.	21IT8308	Professional Ethics	PE	3	0	0	3	40	60	100
4.	21IT8309	Deep Learning Techniques	PE	3	0	0	3	40	60	100
5.	21IT8310	Management Information System	PE	3	0	0	3	40	60	100
6.	21IT8312	Quantum Computing	PE	3	0	0	3	40	60	100
7.	21IT8314	Web Development - III	PE	0	0	3	3	50	50	100

	LIFE SKILL COURSES									
1.	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
2.	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
3.	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
4.	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
5.	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / MinorDegree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21IT5601	Sem 5:Database System	MDC	3	0	0	3	3
2.	21IT6601	Sem 6: Foundation of Data Science	MDC	3	0	0	3	3
3.	21IT6602	Sem 6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3

4.	21IT7601	Sem 7: Foundations of Digital Marketing	MDC	3	0	0	3	3
5.	21IT7602	Sem 7: Business Analytics	MDC	3	0	0	3	3
6.	21IT8601	Sem 8: Cyber Security	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I - Fintech and Block Chain								
S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21CS5602	Financial Management	MDC	3	0	0	3	3
2.	21CS6603	Fundamentals of Investment	MDC	3	0	0	3	3
3.	21CS6604	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4.	21XXXXXX	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5.	21XXXXXX	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6.	21XXXXXX	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II - Entrepreneurship								
S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21BA5601	Foundation of Entrepreneurship	MDC	3	0	0	3	3
2.	21BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3.	21BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4.	21BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5.	21BA7602	Principles of Marketing Management for Business	MDC	3	0	0	3	3
6.	21BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7.	21BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III - Environment and Sustainability								
S. No	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	22CEXXXX	Sustainable infrastructure Development	MDC	3	0	0	3	3

2.	22CE6603	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3.	22CE6604	Sustainable Bio Materials	MDC	3	0	0	3	3
4.	22CEXXXX	Materials for Energy Sustainability	MDC	3	0	0	3	3
5.	22CEXXXX	Green Technology	MDC	3	0	0	3	3
6.	22CEXXXX	Environmental Quality Monitoringand Analysis	MDC	3	0	0	3	3

VERTICALS FOR HONOURS DEGREE

B.Tech. (Hons) Information Technology (Artificial Intelligence and Machine Learning)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5206	Fundamentals of Machine Learning	PC	3	0	0	3	4	40	60	100
2.	21IT6203	Knowledge Engineering	PC	2	0	2	3	4	40	60	100
3.	21IT6204	Deep Learning	PC	3	0	0	3	4	40	60	100
4.	21IT7205	Applied Natural Language Processing	PC	3	0	0	3	4	40	60	100
5.	21IT7206	Ethics and Artificial Intelligence	PC	3	0	0	3	4	40	60	100
6.	21IT8201	Generative Artificial Intelligence	PC	3	0	0	3	4	40	60	100

B.Tech. (Hons) Information Technology (Cyber Security and Data Privacy)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5207	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	21IT6205	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	21IT6207	Social Network Security	PC	3	0	0	3	3	40	60	100
4.	21IT7207	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	21IT7208	Cryptocurrency and Blockchain Technologies	PC	3	0	0	3	3	40	60	100
6.	21IT8202	Network Security	PC	3	0	0	3	3	40	60	100

B.Tech. (Hons) Information Technology (Block Chain Technology)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5208	Fundamentals of Blockchain Technology	PC	3	0	0	3	3	40	60	100

2.	**21IT6208**	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	**21IT6209**	Building Private Blockchain	PC	3	0	0	3	3	40	60	100
4.	**21IT7209**	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	**21IT7210**	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	**21IT8203**	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honors degree

Sem. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
SKILLED / INTEGRATED COURSES OFFERED THROUGH CHOICE BASED CREDIT SYSTEM									
1	**21CS1152**	Object Oriented Programming Using Python	2	0	2	3	50	50	100
2	**21IT2153**	Relational Database Management System	2	0	2	3	50	50	100
3	**21IT3252**	Data Visualization	3	0	2	4	50	50	100
4	**21IT4252**	Design Thinking	3	0	0	4	50	50	100
5	**21IT5357**	Business Intelligence Analyst	2	0	2	3	50	50	100
6	**21IT6309**	Predictive Modeling	3	0	0	3	40	60	100
7	**21IT6252**	Data Science	3	0	2	4	50	50	100
8	**21IT7204**	Big Data with Security	3	0	0	3	40	60	100
9	**21IT7003**	Big Data with Security Laboratory	0	0	3	1.5	50	50	100

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	04	04	-	-	-	03	-	-	11
2	BS	10	10	04	04	-	-	-	-	28
3	ES	06	08	-	-	-	-	-	-	11
4	PC	-	-	16	17	18	13	12		79
5	PE	-	-	-	-	03	03	03	06	15
6	OE	-	-	-	-	-	03	03	-	06
7	EEC	-	-	-	-	02	03	02	08	15
Total		**20**	**22**	**20**	**21**	**23**	**25**	**20**	**14**	**165**

CREDIT DISTRIBUTION R2019

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	23	25	20	14	**165**

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COIMBATORE - 641 032.

Syllabus

Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7201	INTRODUCTION TO DISTRIBUTED AND CLOUD COMPUTING	3	0	0	3

Course Objective

The student should be made

1. To learn Distributed Communication
2. To understand Distributed Resource Management
3. To study the basics of Cloud Computing and Virtualization
4. To study both Cloud Platform and Thread Programming
5. To gain insight on Cloud Resource Management and Applications

Unit	Description	Instructional Hours
I	**DISTRIBUTED COMMUNICATION** Introduction to Distributed Systems-Characterization of Distributed Systems–Distributed Architectural Models–Remote Invocation–Request-Reply Protocols –Remote Procedure Call-Remote Method Invocation–Group Communication	9
II	**DISTRIBUTED RESOURCE MANAGEMENT** Time Ordering–Physical Clock Synchronization–Logical Time and Logical Clocks-Global States– Distributed Mutual Exclusion–Election Algorithms– Distributed Deadlock–Distributed File System Architecture	9
III	**CLOUD ARCHITECTURE** NIST Cloud Computing Reference Architecture -IaaS – Examples of IaaS Providers – PaaS – Examples of PaaS Providers – SaaS – Examples of SaaS Providers – Public, Private and HybridClouds – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms	9
IV	**CLOUD PLATFORM AND THREAD PROGRAMMING** Anatomy of the Aneka-Container – Building Aneka Clouds – Cloud Programming and Management –Programming Applications with Threads – Multithreading and Programming-Applications with Aneka Threads	9
V	**RESOURCE MANAGEMENT AND CLOUD APPLICATIONS** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources - Applications: Amazon Web Applications – Google App Engine – Microsoft Azure.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1 Analyze the core concepts of distributed communication in designing and understanding distributed systems.

CO2 Evaluate and troubleshoot distributed resource management techniques for coordinating resources and ensuring consistency in distributed systems.

CO3 Distinguish the cloud computing services and resources using various cloud architecture models and virtualization techniques.

CO4 Explore the cloud applications leveraging Aneka platform functionalities and thread programming techniques

CO5 Analyze resource management strategies for cloud applications across different cloud platforms.

TEXT BOOKS

T1 George Coulouris, Jean Dollimore, Tim Kindberg, —Distributed Systems Concepts and Design, Pearson Education, Fifth Edition, 2017. (UNIT 1 and 2)

T2 Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, FromParallel Processing to the Internet of Things", Morgan Kaufmann Publication, First Edition, 2013

REFERENCES:

R1 Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, —Mastering Cloud Computing, TataMcGraw Hill Publication, 2017.(UNIT 4)

R2 Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation,Management and Security, CRC Press, 2017. (UNIT 5)

R3 Toby Velte, Anthony Velte, Robert Elsenpeter. "Cloud Computing - A Practical Approach, TataMcGraw Hill Publication, 2009.

R4 George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Media Publication, 2009.

Co-Po Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	-	-	-	1	1	-	2	1	-	2
CO2	2	2	2	3	1	-	-	-	1	1	1	2	1	-	2
CO3	2	2	1	1	3	-	-	-	1	1	1	3	1	-	2
CO4	2	2	2	3	2	-	-	-	1	1	-	2	1	1	2
CO5	2	3	2	1	2	-	-	-	1	1	1	2	1	-	2
Avg	**2**	**2.4**	**1.6**	**1.8**	**1.8**	**-**	**-**	**-**	**1**	**1**	**1**	**2.2**	**1**	**1**	**2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7202	DATA SCIENCE AND ANALYTICS	3	0	0	3

Course Objective

The student should be made

1. To know the Fundamental Concepts of Data Science and Analytics.
2. To know about Data Merging and Spectral Analysis.
3. To gain knowledge about Finite state machines and Recurrent models.
4. To learn Data analysis, Classification and Clustering.
5. To learn various NoSql Databases and map reduce.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA SCIENCE AND BIG DATA** Data Science and Analytics - Big Data - Relations: Data Scales - Set and Matrix Representations-Relations - Similarity Measures - Dissimilarity Measures - Sequence Relations.	9
II	**PREPROCESSING AND VISUALIZATION** Sampling and Quantization - Error Types - Error Handling - Data Transformation – Data Merging - Diagrams - Principal Component Analysis – Multidimensional Scaling-Sammon Mapping - Histograms - Spectral Analysis.	9
III	**CORRELATION, REGRESSION AND FORECASTING** Linear Correlation - Correlation and Causality - Chi-Square Test for Independence – Linear Regression- Neural Networks -Radial Basis Function Networks - Cross Validation - Finite State Machines - Recurrent Models Autoregressive Models.	9
IV	**CLASSIFICATION AND CLUSTERING** Classification Criteria - Naive Bayes Classifier - Linear Discriminant Analysis – Support Vector Machine- k-Nearest Neighbour Classifier- Decision Trees - **Clustering:** Cluster Partitions - Sequential – Prototype-Based Clustering - Cluster Tendency Assessment-Cluster Validity - Self Organizing Maps.	9
V	**SYSTEM ARCHITECTURE AND APPLICATIONS** Lambda Architecture - **Nosql Stores:** Key-Value - Columnar - Document - Graph. **Case Studies:** Riak - Hbase - Mongodb - Neo4j. MapReduce – Event Processing–Hadoop-Storm. Recommendation Systems - Time Series Analysis.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

- CO1 Analyze the concept of data scale and understand its impact on data analysis methods.
- CO2 Apply data preprocessing techniques and analyze data for further exploration and modeling.
- CO3 Evaluate the relationships between variables using correlation analysis.
- CO4 Apply appropriate classification and clustering techniques to categorize and group data based on its characteristics.
- CO5 Evaluate and design big data processing architectures

TEXTBOOKS

T1 Marz N and Warren J,‖Big Data‖, Manning Publications, 2015.

T2 Runkler TA,‖Data Analytics: Models and algorithms for intelligent data analysis‖, Springer, 2012.

REFERENCES:

R1 Dean J.‖Big Data, Data Mining and Machine learning‖, Wiley publications, 2014.

R2 Provost F and Fawcett T,‖Data Science for Business‖, O_Reilly Media Inc, 2013.

R3 Janert PK, Data Analysis with Open Source Tools‖, O_Reilly Media Inc, 2011.

Co-Po Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	1	-	1	-	3	2	1	2
CO2	-	3	2	2	3	-	-	1	1	2	-	2	3	3	3
CO3	2	3	1	2	2	-	-	1	-	2	-	2	2	1	1
CO4	2	2	3	2	3	-	-	1	1	2	-	2	2	2	2
CO5	3	3	3	2	3	-	-	1	1	2	1	3	2	-	1
Avg	**2**	**2.6**	**2**	**1.8**	**2.6**	**-**	**-**	**1**	**1**	**1.8**	**1**	**2.4**	**2.2**	**1.8**	**1.8**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7203	SOFTWARE TESTING AND QUALITY ASSURANCE	3	0	0	3

Course Objective

The student should be made

1. To understand the Basics of Testing and categories of Defects in Software Testing
2. To familiar with the types and levels of Software Testing.
3. To understand How to Control and Monitor Software Testing process
4. To familiar with Quality factors and Customer Satisfaction Benchmark
5. To Learn the process of Certification and Standard Assessment to improve quality.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Testing as an Engineering activity-Evolution-Testing as process-Overview of the Testing Maturity Model - Testing Fundamentals: Basic Definitions-Testing Principles-The tester's role in Software Development Organization-Origins of Defects-Defect Classes-Tester support for Developing a Defect Repository	9
II	**SOFTWARE TESTING METHODS AND TESTING LEVELS** Testing Design Strategies-Black Box methods: Random Testing-Equivalence Class Partitioning - Boundary Value Analysis-White box Testing: Data Flow- Loop Testing-Mutation Testing-Need for levels oftesting-UnitTesting-IntegrationTesting-SystemTesting–Regression Testing-Alpha and Beta Testing – Acceptance Testing.	9
III	**CONTROLLING MONITORING AND REVIEW** Measurements and Milestones for Controlling and Monitoring, Status Meetings, Reports and Control Issues, Criteria for test completion, Software Configuration Management, Types of Reviews, developing a Review Program, the need for Review Policies, Components of Review Plans, Reporting Review Results.	9
IV	**INTRODUCTION TO SOFTWARE QUALITY** Defining Software Quality, Software Quality factors, Components of Software Quality Assurance system, Development and Quality Plans, Integrating Quality activities in Project Life Cycle.	9
V	**STANDARDS, CERTIFICATION AND ASSESSMENT** Need for standards, SQA Standards –ISO:9001Certification, Bootstrap methodology, V SPICE Project and Process Assessment, Management and its Role in Quality Assurance–SQA Unit & other actors in SQA systems	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Identify (define), Understand (explain), and Implement (support) core testing principles and processes.
CO2	Identify, Apply, and Differentiate between black-box (random, equivalence class partitioning, boundary value analysis) and white-box (data flow, loop, mutation) testing methods, understand the need for multiple testing levels (unit, integration, system, regression), and explain the purpose of alpha, beta, and acceptance testing.
CO3	Identify, Implement, and Evaluate processes for controlling, monitoring, reviewing, and reporting on software development projects.

CO4	Analyze, Design, and Implement a software quality assurance system that integrates with the development life cycle, considering all factors impacting software quality.
CO5	Analyze, Apply, and Evaluate the need for SQA standards, including ISO 9001 certification, Bootstrap methodology, V SPICE project and process assessment, and the roles of management and actors within SQA systems.

TEXT BOOKS

T1	DanielGalin,—SoftwareQualityAssurance:FromTheorytoImplementation,PearsonAddison-Wesley,Second Edition, 2012
T2	IleneBurnstein,—PracticalSoftwareTesting,SpringerInternationalEdition2003.

REFERENCES:

R1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012. ISBN:9781118063330
R2	Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach —, Tata McGraw Hill Edition, 2010
R3	Andrew S.Tanenbaum, Modern Operating Systems,4/E,Pearson Publications,
R4	Harvey M.Deitel-Operating systems, Third Edition, Pearson/Prentice Hall,2004. ISBN 0-13-124696
R5	William Stallings, Operating Systems –Internals and Design Principles, 8/E, Pearson Publications

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	-	1	1	1	2	2	3	2	2
CO2	3	3	3	3	3	1	-	1	1	2	2	2	3	3	2
CO3	2	3	3	3	3	1	-	2	2	2	3	2	3	2	2
CO4	2	3	3	3	3	2	1	2	2	2	3	2	3	2	3
CO5	2	3	3	3	3	1	-	3	2	2	3	3	2	2	3
AVG	2.4	2.8	3	2.8	2.8	1.2	1	1.8	1.6	1.8	2.6	2.2	2.8	2.2	2.4

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PROFESSIONAL ELECTIVE III

Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7301	SOCIAL NETWORK ANALYSIS	3	0	0	3

The student should be made to

Course Objective

1. Understand the concept of semantic web and related applications.
2. Understand about web data and knowledge representation using ontology.
3. Learn how to perform Modeling and aggregating social network data
4. Understand human behavior in social web and related communities
5. Learn visualization and Real time applications of Social Networks.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web –Social Network analysis: Development of Social Network Analysis–Key concepts and measures in network analysis.	9
II	**WEB DATA AND KNOWLEDGE REPRESENTATION** Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation –Ontology languages for the Semantic Web: Resource Description on Framework– Web Ontology Language-Comparison with UML, E/R model, XML and XML Schema.	9
III	**MODELLING AND AGGREGATING** Modeling and aggregating social network data: State –of –the –art in network data representation– Ontological representation of social individuals–Ontological representation of social relationships– Aggregating and reasoning with social network data -Developing social-semantic applications: Building Semantic Web applications with social network features.	9
IV	**MINING COMMUNITIES IN WEB SOCIAL NETWORKS** Detecting communities in social networks– Definition of community – Evaluating communities– Methods for community detection and mining – Applications of community mining algorithms– Tools for detecting communities social network infrastructures and communities – Decentralized online. Social networks–Multi–Relational characterization of dynamic Social Network Communities	9
V	**VISUALIZATION AND APPLICATIONS** Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations–Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks –Community welfare–Collaboration networks – Co- Citation networks.	9
	Total Instructional Hours	**45**

At the end of the course, students would be able to:

Course Outcome

CO1 Apply semantic web technologies to model and represent knowledge, develop ontologies for specific domains, and **assess** the role of social network analysis in various applications.

CO2 Identify and utilize electronic sources for network analysis, explain the role of ontologies in the semantic web.

CO3 Evaluate current methods for network data representation, design ontologies for social entities and relationships, and integrate social network data with Semantic Web applications.

CO4 Define and evaluate human behavior social network communities, and apply community mining techniques to analyze real-world social network structures.

CO5 Analyze online social networks using graph theory concepts like centrality and clustering, and understand real time applications.

TEXTBOOKS:

T1 Borko Furht,—Hand book of Social Network Technologies and Applications,1st Edition, Springer, 2010.

T2 Peter Mika,— Social Networks and the Semantic Webǁ, First Edition, Springer 2007.

REFERENCES:

R1 Guandong Xu , Yanchun Zhang and Lin Li, Web Mining and Social Networking –Techniques and applications, First Edition Springer, 2011.

R2 Max Chevalier, Christine Julien and Chantal Soulé - Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modellingǁ, IGI Global Snippet, 2009.

R3 John G. Breslin, Alexander Passant and Stefan Decker, -The Social Semantic Web, Springer, 2009.

R4 Dion Goh and Schubert Foo,—Social information Retrieval Systems: Emerging Technologies And Applications for Searching the Web Effectively, IGI Global Snippet, 2008.

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	3	-	-	-	-	1	-	2	-	-	2
CO2	-	1	-	1	1	-	-	-	-	1	-	1	-	-	1
CO3	1	3	2	2	2	-	-	-	-	1	-	3	-	-	3
CO4	-	2	-	1	-	-	-	-	-	1	-	1	-	-	1
CO5	1	2	-	2	3	-	-	-	-	1	-	1	-	-	2
Avg	**1**	**2**	**2**	**1.4**	**2.25**	-	-	-	-	**1**	-	**1.6**	-	-	**1.8**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7302	CYBER FORENSICS	3	0	0	3

Course Objective

The student should be made to

1. Learn the Forensics and Investigation.
2. Be Exposed to Forensics Technology and Systems.
3. Learn About Evidence Collection and Forensic Tools.
4. Learn to Analyse and Validate Forensics Data.
5. Learn Ethical Hacking and System Hacking

Unit	Description	Instructional Hours
I	**INTRODUCTIONTOCYBERFORENSICS** The Goal of the Forensic Investigation: Why Investigate, Internet Exceeds Norm, How to Begin a Non–Liturgical Forensic Examination: Isolation of Equipment, Cookies, Cache, How to Correlate the Evidence, The Liturgical Forensic Examination: Tracing Activity on a Windows–Based Desktop.	9
II	**COMPUTER FORENSICS TECNOLOGY AND SYSTEMS** Specialized Forensics Techniques- Spyware and Adware- Security and Wireless Technologies - Avoiding Pitfalls with Firewalls – Biometric Security Systems Internet Security Systems- Intrusion Detection Systems- Firewall Security Systems.	9
III	**EVIDENCE COLLECTION AND FORENSICS TOOLS** Crime and Incident Scenes – Working with DOS and Windows Systems - Current Computer Forensics Tools : Software / Hardware Tools.	6
IV	**ANALYSIS AND VALIDATION** Validating Forensics Data – Data Hiding Techniques –Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.	9
V	**ETHICAL HACKING** Introduction to Ethical Hacking – Foot printing and Reconnaissance– Scanning Networks – Enumeration –System Hacking–Malware Threats – Sniffing – Social Engineering.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Distinguish between **non-liturgical and liturgical forensic examinations,** explain **the goals of forensic investigation, and** apply **procedures for evidence isolation.**
CO2	Identify various security threats like spyware and adware, evaluate the effectiveness of wireless and biometric security systems, and implement intrusion detection and firewall protocols to safeguard computer networks
CO3	Apply appropriate procedures for securing and processing crime and incident scenes involving DOS and Windows systems, and utilize current software and hardware tools for computer forensics investigations.
CO4	Analyze digital evidence, ensuring its validity and extracting information from emails, mobile devices, and other sources.

CO5 Identify and utilize ethical hacking techniques like foot printing, scanning, and social engineering to understand network vulnerabilities, while also recognizing and mitigating threats like malware and Sniffing.

TEXTBOOKS:

T1 Albert J. Marcella, Robert S. Greenfield Cyber Forensics A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, AUERBACH Publications, (Second Edition), 2007.

T2 Bill Nelson, Amelia Phillips, Christopher Steuart, Guideto Computer Forensics and Investigations, Cengage Learning, Published: Fourth Edition, 2010

REFERENCES:

R1 John R.Vacca, Computer forensics: Computer Crime Scene Investigation, 2nd Edition, Charles

R2 CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	2	1	-	2	-	1	-	3	-	-	2
CO2	2	2	1	2	1	1	-	-	-	1	-	2	-	-	2
CO3	3	1	-	2	3	-	-	-	-	1	-	3	-	-	3
CO4	2	2	-	2	2	-	-	-	-	1	-	3	-	-	3
CO5	3	2	-	2	3	-	-	3	-	1	-	2	-	-	2
Avg	**2.4**	**1.8**	**1**	**2.2**	**2.2**	**1**	**-**	**2.5**	**-**	**1**	**-**	**2.6**	**-**	**-**	**2.4**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7303	SOFTWARE DOCUMENTATION	3	0	0	3

Course Objective

The student should be made

1. To learn about the various Processes Involved in Software Documentation.
2. To be familiar about the Documentation Styles and to Standardize the Business Practices.
3. To gain Knowledge of Commonly used Documented Artifacts Concerning Software Testing.
4. To design a Software Document with Effective UIDs and Layouts.
5. To create Documents that clarifies the Goals of the various Software Development teams.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Need for Software Documentation - Understanding Task Orientation -Analyzing Users – Writing user scenarios - User Informational Needs -Document Goals - User Work Motivations – User Analysis Checklist –Constructing a Task List-Categorization- Writing steps as Actions-Task Analysis	9
II	**DOCUMENTATION** Planning and Writing Documents - Task List and Schedule – Guidelines -Documentation Process - Documentation Plan - Document Review Form -Review Plan- Schedule - Checklist.	9
III	**DOCUMENTATIONTESTING** Usability Tests - Advantages of Field Testing - Editing and Fine Tuning -Problems - Designing for Task Orientation - Page Showing Elements of Document Design- Screen Showing Elements for Online Help Design- Solutions to the Design Problem for Printed and Online Documentation.	9
IV	**DOCUMENTATIONLAYOUTS** Laying Out Pages and Screens - Elements of Page and Screen Design -Designing Type – Effective Writing Style - Using Graphical that Support Decision Making-Functions of Graphics-Type and Elements of Graphics.	9
V	**DOCUMENTATIONGUIDELINES** Writing to Guide- Procedures- Guidelines-Writing to Support- Reference - Structural– Reference Entry - Checklist- Designing Index-User Oriented Index-Case Studies.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze user needs and motivations to develop user scenarios and task analyses, categorize tasks, and document software functionalities in a clear and user-oriented manner.
CO2	Develop technical documentation plans and schedules and Review Plan.
CO3	Refine technical documentation based on usability testing, ensuring a user-friendly experience for both print and online formats.
CO4	Apply principles of page layout, screen design, typography, and effective writing to create user-friendly layouts that integrate data visualization for clear decision-making. Design a Software Documents and Layouts.
CO5	Develop user guides and reference materials by applying writing techniques for procedures and guidelines, structuring reference entries, and designing user-oriented indexes.

TEXTBOOKS:

T1 Thomas T. Barker, "Writing Software Documentation- a Task Oriented approach", Allyn & Bacon Series of Technical Communication, 2002.

T2 Andreas Ruping , Agile Documentation: A Pattern Guide to Producing Light weight Documents For Software Projects, John Wiley &Sons, 2005.

REFERENCES:

R1 Cyrille Martraire, Living Documentation: Continuous Knowledge Sharing by Design, First Editionl, Addison-Wesley Professional, 2019

R2 Gerardus Blokdyk, Software documentation, 5STARCooks,2018.

R3 Edmond H.Weiss, How To Write Usable User Documentation, SecondEdition,Oryx Press,1991.

R4 Patricia A.Williams, PamelaS.Beason, Writing Effective Software Documentation, LONGMAN,1990.

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	1	-	-	-	-	3	1	2	-	-	2
CO2	1	1	2	-	1	-	-	-	1	2	2	2	-	-	2
CO3	1	2	-	1	1	-	-	-	-	2	-	2	-	-	2
CO4	2	2	3	-	1	-	-	-	-	2	-	2	-	-	2
CO5	1	1	2	-	1	-	-	-	-	3	-	2	-	-	2
Avg	**1.4**	**1.8**	**2.5**	**1**	**1**	**-**	**-**	**-**	**1**	**2.2**	**1.5**	**2**	**-**	**-**	**2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7304	PRINCIPLES OF MANAGEMENT	3	0	0	3

Course Objective

The student should be made

1. To Understand the Evolution of Management.
2. To Study the Functions and Principles of Management.
3. To Learn the Application of the Principles in an Organization.
4. Be Exposed to Communication Process.
5. Be Familiar with various Budgetary Concepts.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS** Definition of Management – Science or Art – Manager Vs Entrepreneur – Types of Managers – Managerial Roles and Skills – Evolution of Management–Scientific , Human Relations, System and Contingency Approaches –Types of Business Organization– Sole Proprietorship, Partnership, Company –Public and Private Sector Enterprises – Organization Culture and Environment –Current Trends and Issues in Management.	9
II	**PLANNING** Nature and Purpose of Planning – Planning Process – Types of Planning –Objectives – Setting Objectives– Policies – Planning Premises–Strategic Management – Planning Tools and Techniques–Decision Making Steps and Process.	9
III	**ORGANISING** Nature and Purpose – Formal and Informal Organization – Organization Chart – Organization Structure – Types – Line and Staff Authority –Departmentalization–Delegation of Authority– Centralization and Decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, Selection, Training and Development, Performance Management, Career Planning and Management.	9
IV	**DIRECTING** Foundations of Individual and Group Behavior–Motivation–Motivation Theories – Motivational Techniques – Job Satisfaction – Job Enrichment–Leadership–Types and Theories of Leadership – Communication–Process of Communication–Barrier in Communication– Effective Communication – Communication and IT.	9
V	**CONTROLLING** System and Process of Controlling– Budgetary and Non- Budgetary Control Techniques – Use of Computers and IT in Management Control –Productivity Problems and Management – Control and Performance –Direct and Preventive Control– Reporting.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	**Classify and compare** business structures, and **evaluate** the influence of organizational context andtrends on management practices.
CO2	**Apply** the planning process to **develop** strategic and operational plans for effective organizational decision-making.
CO3	**Analyze** formal and informal organizational structures while **incorporating** human resourcemanagement functions
CO4	**Apply** motivation theories, leadership styles, and communication techniques **to influence** individual and group behavior for organizational effectiveness.
CO5	**Implement** control techniques to **monitor, evaluate, and ensure** organizational performance aligns with strategic objectives.

TEXTBOOKS:

T1 Stephen P. Robbins &Mary Coulter, —Management‖, Prentice Hall (India) Pvt. Ltd., (14th Edition), 2017.

T2 JAF Stoner, Freeman R.E and Daniel R Gilbert—Management‖, Pearson Education,(6th Edition), 2011.

REFERENCES:

R1 Tripathy PC & Reddy P N—Principles of Management ,Tata Mc Graw Hill, (6thEdition), 2017.

R2 Harold Koontz & Heinz Weihrich—Essentials of management ,Tata Mc GrawHill,(10th Edition), 2015.

R3 Robert Kreitner & Mamata Mohapatra,— Management, Biztantra, (12th Edition),2011

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2	1	2	2	-	1	-	3	1	1	-	-	-
CO2	3	3	2	3	2	1	-	2	-	2	2	1	-	-	1
CO3	1	3	1	2	1	2	-	1	2	2	1	1	-	-	1
CO4	3	2	1	1	1	1	-	3	3	3	-	1	-	-	1
CO5	1	3	3	3	2	-	-	2	-	1	-	1	-	-	1
Avg	**1.8**	**2.8**	**1.8**	**2**	**1.6**	**1.5**	**-**	**1.8**	**2.5**	**2.2**	**1.3**	**1**	-	-	**1**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7305	SOFTWARE ARCHITECTURE	3	0	0	3

Course Objective

The student should be made to

1. Understand the Software Architectural Requirements and Drivers.
2. Learn the Quality attributes for Software Architecture
3. Gain knowledge about various Architectural Views.
4. Be exposed to Architectural Styles.
5. Be familiar with Architectures for Emerging Technologies.

Unit	Description	Instructional Hours
I	**INTRODUCTION AND ARCHITECTURAL DRIVERS** Introduction –What is Software Architecture?–Standard Definitions –Architectural Structures – Influence of Software Architecture on Organization-both Business and Technical–Architecture Business Cycle- Introduction–Functional Requirements–Technical Constraints.	9
II	**QUALITY ATTRIBUTE WORKSHOP** Quality Attributes– Documenting Quality Attributes – Functionality and Quality Attributes- System Quality Attributes–Quality Attribute Scenarios -Six Part Scenarios– Case studies..	9
III	**ARCHITECTURAL VIEWS** Introduction – Standard Definitions for Views – Structures and Views -Representing Views- Available Notations – Standard Views – 4+1 View of Rup , Siemens4 Views, SEI's Perspectives and Views– Case Studies.	9
IV	**ARCHITECTURAL STYLES** Introduction–Data Flow Styles–Call- Return Styles–Shared Information Styles – Event Styles – Case Studies for Each Style.	9
V	**DOCUMENTING THE ARCHITECTURE** Good practices–Documenting the Views using UML– Merits and Demerits of using Visual Languages – Need for Formal Languages –Architectural Description Languages–ACME–9 Case Studies.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Distinguish between functional requirements and technical constraints within the context of software architecture.
CO2	Evaluate how quality attributes affect software design by analyzing their connection to functionality and examining real-world examples.
CO3	Identify various architectural view definitions, structures, and notations, and apply them to analyze real-world scenarios
CO4	Recognize different software architecture styles (data flow, call-return, shared information, event) based on communication patterns and recommend suitable styles for given scenarios, applying this knowledge through case study analysis.
CO5	Compare and contrast the use of visual languages (like UML) with formal languages (ADLs) for documenting architectures, justify the need for ADLs, and practice applying an ADL (like ACME) to document architectural views

TEXTBOOKS:

T1 Len Bass, Paul Clements and Rick Kazman ,—Software Architectures in Practices. Addison-Wesley. Third Edition. 2014

T2 Anthony J Lattanze — Architecting Software Intensive System. A Practitioner's Guide, Auer bach Publications, 2010

REFERENCES:

R1 Paul Clements , Felix Bachmann, Len Bass, David Garlan , Jame sIvers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, —Documenting Software Architectures. Views and Beyond, Addison - Wesley, 2nd Edition, 2010.

R2 Paul Clements, Rick Kazman and Mark Klein — Evaluating software architectures: Methods and Case Studies. Addison-Wesley, 2004.

R3 Oliver Vogel, Ingo Arnold, Arif Chughtai, Timo Kehrer, —Software Architectures: A Comprehensive Framework and Guide for Practitioner, Springer2011.

R4 Flavio Oquendo, Jair Leite, Thai Batista, —Software Architecture in Action, Springer 2016.

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	-	-	-	2	-	2	1	-	2
CO2	3	2	1	1	-	-	-	-	-	2	-	2	-	-	2
CO3	3	2	2	-	1	-	-	-	-	2	-	2	-	-	2
CO4	3	3	2	-	-	-	-	-	-	2	-	2	-	-	2
CO5	3	3	2	-	2	-	-	-	-	3	-	3	-	-	3
Avg	**3**	**2.6**	**1.8**	**1**	**1.5**	**-**	**-**	**-**	**-**	**2.2**	**-**	**2.2**	**1**	**-**	**2.2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7306	GREEN COMPUTING	3	0	0	3

Course Objective

The student should be made

1. To learn the fundamentals of Green Computing.
2. To understand various green as sets and Models.
3. To analyze the Green computing Grid Framework.
4. To understand the issues related with Green compliance.
5. To study and develop various case studies.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS** **Green IT Fundamentals:** Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals.	9
II	**GREEN ASSETS AND MODELING** Green Assets: Buildings, Data Centers, Networks and Devices–Green Business Process Management: Modeling, Optimization and Collaboration – Green Enterprise Architecture–Environmental Intelligence– Green Supply Chains.	9
III	**GRID FRAMEWORK** Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.	9
IV	**GREEN COMPLIANCE** Socio- cultural aspects of Green IT–Green Enterprise Transformation Road map–Green Compliance: Protocols, Standards and Audits–Emergent Carbon Issues: Technologies and Future.	9
V	**CASE STUDIES** The Environmentally Responsible Business Strategies (ERBS)–Case Study Scenarios for Trial Runs–Case Studies–Applying Green IT Strategies and Applications .	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Design a plan for implementing green IT practices using business drivers and measurable goals.
CO2	Evaluate green assets across the IT lifecycle.
CO3	Evaluate technology tools that can reduce paper waste and carbon foot print by the stake holders.
CO4	Analyze the social and cultural implications of Green IT and carbon management.
CO5	Evaluate environmentally responsible business strategies and green IT applications through real-world scenarios.

TEXT BOOKS:

T1 Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2014.

T2 BudE.Smith, "Green Computing Tools and Techniques for Saving Energy, Money and Resources", CRC Press, 2018,ISBN9781138374669

REFERENCES:

R1 Woody Leonhard, Katherine Murray,—Green Home computing for dummies‖ , August 2012.

R2 Bhuvan Unhelkar, Green IT Strategies and Applications-Using Environmental Intelligence, CRC Press, June 2011

R3 Alin Gales, Michael Schaefer, Mike Ebbers, —Green Data Center: steps for the Journey‖, Shroff / IBM rebook, 2011.

R4 Carl Speshocky, —Empowering Green Initiatives with IT‖, John Wiley & Sons, 2010.

CO-POs Mapping:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	3	2	1	1	1	1	-	-	1
CO2	1	2	1	2	1	-	3	-	-	1	-	1	-	-	1
CO3	-	1	1	1	2	-	3	2	-	1	-	1	-	-	1
CO4	-	3	-	2	-	3	3	2	-	1	-	1	-	-	1
CO5	1	2	2	1	2	-	3	2	-	1	1	1	-	-	2
Avg	**1.3**	**2**	**1.8**	**1.4**	**1.5**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	-	-	**1.2**

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7307	WEB DEVELOPMENT - II	3	0	0	3

Course Objective

The student should be made

1. To set up a development environment to build dynamic user interfaces with React using TypeScript and Hooks.
2. To spot state management problems, use browser storage, and understand client-side routing
3. To apply advanced Type Script concepts and analyze React's state management using the use Reducer hook.
4. To apply APIs, data models, sessions, and pageable APIs to build client-server communication.
5. To build upon front-end development best practices to optimize, build, deploy, and configure React applications for production.

Unit	Description	Instructional Hours
I	**REACT FUNDAMENTALS** This module introduces students to development using Type Script by setting up a development environment, introducing them to the Type Script programming language and the React framework, and demonstrates some of the basic concepts that underpin the use of React for building dynamic reactive user interfaces.	5
II	**STATE MANAGEMENT** This module introduces students to the Hooks feature of React, on the usage of callback functions and how to use them to build dynamic components that maintain an internal state. This module also demonstrates state management by building a form and accepting user input.	5
III	**A DEEPER DIVE INTO REACT HOOKS** This module discusses the common pitfalls of state management, introduces in-browser persistent storage, and demonstrates additional standard hooks and the creation and use of custom hooks.	5
IV	**CLIENT-SIDE ROUTING** This module covers the concept of client-side routing as a separate behavior from server-side route management. It demonstrates the various aspects of client-side routing such as the use of path parameters, query parameters, programmatic navigation and the operation of links and URLs that are handled client-side.	5
V	**TYPES IN DEPTH AND VARIANTS** This module takes a deeper dive into Type Script's type system, demonstrating concepts such as function types, custom-defined types, generics, and union types. It also instructs the student why the "any" type should be avoided in practice, and finishes up with a demonstration of Type Script's type inference behaviour.	5
VI	**MODELLING AND MANAGING COMPLEX STATES** This module teaches students how to manage complex states using the state reducer pattern, and then demonstrates the pattern by implementing it using React's use Reducer hook.	5
VII	**APIS AND STATE MODELING** Through this module, students are introduced to using APIs to interface their client-side code with the server-side, how to model types to allow this interaction to take place, how to maintain a session with the backend, and how to work with page able APIs.	5

	BEST PRACTICES AND NPM PACKAGES	
VIII	This module covers the best practices of front-end development, including the importance of accessibility and WAI-ARIA standards, and use of third-party packages from the NodeJS ecosystem.	5
	PRODUCTION REACT APPS	
IX	This final module focuses on production-specific optimizations of a React application, best practices for its build & deployment process, and the configuration of a progressive web app.	5
	Total Instructional Hours	**45**

Course Outcomes

At the end of the course, students would be able to:

CO1	Develop dynamic and reactive user interfaces using React Hooks and state management techniques.
CO2	Analyze common pitfalls of state management, leverage in-browser persistence, and apply advanced techniques for routing and hook usage.
CO3	Apply advanced Type Script concepts and the state reducer pattern with React's useReducer hook to manage complex application state.
CO4	Apply their understanding of APIs to design and implement client-side applications that interact with server-side data.
CO5	Apply best practices for building, deploying, and optimizing production-ready React applications with accessibility in mind.

TEXT BOOKS:

This course does not require students to use physical textbooks. Instead, original course material (videos, text and images) has been prepared for students to go through and is open-sourced under Creative Commons Attribution-Share A like 4.0 International License © Fresh works Inc. & Pupil first Pvt. Ltd. This course material may include some third-party content with a compatible license, and external links for additional reading on the Internet. Students are also taught how to search for information on their own.

REFERENCES:

R1 Learning React: Functional Web Development with React and Redux 1st Edition by Alex Banks, Eve Porcello .O'REILLY publication.

R2 The Road to React: Your journey to master plain yet pragmatic React.js by Robin Wieruch.

CO - PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	3	-	-	-	2	1	-	1	2	3	1
CO2	3	3	3	2	3	-	-	1	2	1	-	1	2	3	1
CO3	3	2	3	1	3	-	-	1	1	1	-	2	2	3	1
CO4	3	2	3	1	3	-	-	1	2	1	-	1	2	3	1
CO5	3	1	3	-	3	1	-	2	1	2	1	2	2	3	1
Avg	**2.2**	**2**	**2.8**	**1.3**	**3**	**1**	**-**	**1.3**	**1.6**	**1.2**	**1**	**1.4**	**2**	**3**	**1**

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OPEN ELECTIVE –II

Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7401	CYBER SECURITY	3	0	0	3

Course Objective

The student should be made

1. To know the importance of Information System Security.
2. To explore various Crypto graphic Techniques.
3. To learn the basics of Cybercrime and Cyber Offences.
4. To familiarize various Cyber Threats, Attacks, Vulnerabilities, Defensive Mechanisms.
5. To understand the Organizational Implications on Cyber Security.

Unit	Description	Instructional Hours
I	**INFORMATION SYSTEMS AND SECURITY** Information System Components, Information System Categories, Individuals in Information System, Information Security, Threats to Information systems, Cyber Security and Risk analysis, Database Security, Internet Security, Security technology, Intrusion Detection.	9
II	**OVERVIEW OF SECURITY TECHNIQUES** Computer security concepts, OSI security architecture, Security attacks, Security services, Security mechanisms, Model for Network security, Symmetric cipher model, cryptography, Cryptanalysis and Brute-Force Attack, Caesar Cipher, Rail fence technique, Public-Key Cryptography: Principles, Applications, Public-Key Cryptanalysis, RSA algorithm.	9
III	**CYBERCRIME AND CYBER OFFENCES** Introduction to Cybercrime, Classifications of Cybercrimes planning of attacks, social engineering: Human based, Computer based: Cyberstalking, Cybercafe and Cybercrimes.	9
IV	**CYBER THREATS, ATTACKS AND PREVENTION** Phishing, Password cracking, Keyloggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID): Types of identity theft, Techniques of ID theft	9
V	**CYBER SECURITY IMPLICATIONS** Lessons for Organizations, Web Threats for Organizations, Security and Privacy Implications, Risks in social media marketing, People's Privacy in the organization, Organizational Guidelines, Incident Handling, Best Practices for organizations, Media and asset protection, End point security	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Identify components and categories of information systems, and explain their roles in organizational contexts.
CO2	Analyze threats to information systems and **propose** appropriate cyber security measures for prevention and mitigation.
CO3	Evaluate cryptographic techniques including symmetric and asymmetric cryptography, and apply them to ensure database and internet security.
CO4	Demonstrate knowledge of cybercrime classifications and **develop** strategies for preventing cyber threats such as phishing, DoS attacks, and identity theft.
CO5	**Assess** the implications of cyber security on organizational policies and formulate effective guidelines and best practices for incident handling and endpoint security.

TEXTBOOKS

T1 William Stallings, "Cryptography and Network Security: Principles and Practice", Seventh Edition, Pearson Education,2017.

T2 Nina Godbole, Sunit Belapure, "Cyber security: Understanding Cybercrime, Computer Forensics and Legal perspectives", Wiley India Pvt. Ltd, 2013.

REFERENCES:

R1 Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Cengage Learning India Pvt Ltd (1st Edition), 2018.

R2 Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security: Principles, Theory and Practices", BPB Publications(1st Edition), 2017.

R3 William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Pearson Education (3rd Edition), 2014.

R4 McDonough, Bart R., "Cyber Smart: Five Habits to Protect Your Family, Money, and Identity from Cyber Criminals", John Wiley & Sons, Incorporated, 2019. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=5612908.

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	-	1	2	2	1	2	3	2	2
CO2	3	3	2	2	2	1	-	1	3	2	1	2	3	3	3
CO3	3	3	2	2	2	2	-	2	2	2	1	2	2	2	2
CO4	2	2	3	3	3	2	-	2	3	2	1	3	3	3	3
CO5	3	3	3	3	2	3	-	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**2**	**2**	**2**	**2**	**-**	**2**	**3**	**2**	**1**	**2**	**3**	**3**	**3**

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LABORATORY

Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7001	DISTRIBUTED AND CLOUD COMPUTING LABORATORY	0	0	3	1.5

Course Objective

The student should be made

1. To understand Basics, Techniques and Tools for Cloud Computing
2. To know about usage of Virtualization Concept
3. To use GAE as PaaS
4. To understand the working of version control systems commands
5. To gain knowledge about CloudSim Environment

Exp. No	Description of the Experiments
1	Install Virtual Box with different flavours of Linux or Windows OS on top of Windows OS.
2	Install a C Compiler in the Virtual Machine created using Virtual Box and execute Simple Programs.
3	Create a VM image which has a C Compiler along with an Operating System and do the followingexperiments a.Fibonacci Series b.File Operations
4	Moving files between virtual machines
5	Install Google App Engine. Create hello World app and other simple web applications using Python/Java.
6	Use GAE launcher to launch the Web Applications.
7	Control systems command to CLONE, COMMIT, PUSH, FETCH, PULL, CHECKOUT. RESET and DELETE
8	Simulate a cloud scenario using Cloud Sim and run a Scheduling Algorithm not present in Cloud Sim

Total Instructional Hours 45

Course Outcome

At the end of the course, students would be able to:

CO1	Create and manage virtual machines with different guest operating systems.
CO2	Implement core programming concepts like variables, data types, control flow, and functions.
CO3	Create and deploy simple web applications using GAE's framework and tools.
CO4	Use basic Git commands like clone, commit, push, pull, checkout, and reset to effectively manage their codebase.
CO5	Explore the Cloud Sim toolkit to simulate cloud computing scenarios.

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	3	-	1	-	-	2	-	-	1	1	1	-	2
CO2	2	2	3	-	2	-	-	2	-	-	-	1	3	2	2
CO3	1	1	3	-	2	-	-	2	-	1	1	1	2	3	2
CO4	3	-	-	-	2	-	-	2	1	1	1	1	2	2	2
CO5	2	1	1	3	2	-	-	2	-	-	-	2	1	1	3
Avg	1.8	1.3	2.5	3	1.8	-	-	2	1	1	1	1.2	1.8	2	2.2

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Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7002	DATA ANALYTICS LABORATORY	0	0	3	1.5

Course Objective

The student should be made

1. To Get familiar with Hadoop distributions, configuring Hadoop and performing File management tasks.
2. To Implement Map Reduce Programs in variety applications.
3. To Realize Storage Of Big Data Using H Base, Mongo Db.
4. To analyse Big Data Using Linear Models.
5. To analyse Big Data Using Machine Learning Techniques Such As SVM / Decision Tree Classification And Clustering.

Exp. No	Description of the Experiments
1	Install, Configure and Run Hadoop and HDFS.
2	Implement the following File Management tasks in Hadoop: • Adding Files and Directories • Retrieving Files • Deleting Files
3	Implementing Matrix Multiplication with Hadoop Map Reduce.
4	Implement an Map Reduce program that processes a Weather Dataset.
5	To perform NoSQL database using mongodb to create, update and insert.
6	Create, load data to tables and manipulate the data in Hbase.
7	Implement Linear Regression.
8	Implement Logistic Regression.
9	Perform test on Normalization using R.
10	Visualize data Using any Plotting Framework.

Total Instructional Hours **45**

Course Outcome

At the end of the course, students would be able to:

CO1	Process Big Data using Hadoop Framework.
CO2	Equip skill in Installation of Hadoop and Hbase Setup.
CO3	Apply MapReduce programs to real time issues like weather dataset.
CO4	Build and apply Linear And Logistic Regression Models and Perform Data Analysis With Machine Learning Methods.
CO5	Perform Graphical Data Analysis.

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	-	-	1	1	1	-	2	2	-	3
CO2	1	1	2	1	1	-	-	1	1	1	-	1	1	-	2
CO3	2	3	2	2	3	-	-	1	1	1	-	2	2	1	3
CO4	3	3	3	3	3	-	-	1	1	2	-	3	3	2	3
CO5	1	2	1	2	2	-	-	1	1	2	-	2	2	2	2
Avg	**1.8**	**2.2**	**2.2**	**2**	**2.4**	**-**	**-**	**1**	**1**	**1.4**	**-**	**2**	**2**	**1.6**	**2.6**

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SKILLED/INTEGRATED COURSES

Programme	Course code	Name of the course	L	T	P	C
B.Tech	21IT7204	BIG DATA WITH SECURITY	3	0	0	3

Course Objective

The student should be made:

1. To equip learners with the foundational knowledge of big data.
2. To understand Apache Ambari for HDP management and big data strategy
3. To learn MapReduce programming for Hadoop v1 & v2, exploring limitations overcome by YARN's resource management.
4. To understand Apache Spark's role in Hadoop.
5. To analyze data formats, NoSQL stores, Hadoop security, functionalities of HBase, Pig, Hive, and Hortonworks DPS.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BIG DATA** Types of Digital Data, Introduction to Bigdata, Bigdata use cases, Evolution of data Processing, Introduction to Apache Hadoop, Hadoop Infrastructure, Introduction to Hortonworks Data Platform (HDP), IBM added value components	9
II	**INTRODUCTION TO AMBARI** Purpose of Apache Ambari in the HDP stack, Architecture of Ambari, functions and Main components of Apache Ambari, the need for a bigdata strategy, importance of parallel reading of large data files, internode network speed in a cluster, nature of the Hadoop Distributed File System (HDFS), Name Node (NN) and Data Node in a Hadoop cluster	9
III	**MAP REDUCE MODEL** MapReduce programming model, Java code required to handle the Mapper class, the Reducer class, and the program driver needed to access MapReduce, Hadoop v1 and MapReduce v1 and list their limitations, Apache Hadoop v2 and YARN, Compare Hadoop v2 and YARN with Hadoop v1.	9
IV	**APACHE SPARK AND HADOOP** Apache Spark in the Hadoop infrastructure, Resilient Distributed Dataset (RDD), principles of Apache Spark programming, Apache Spark libraries, Apache Spark Scala and Python shells, Apache Spark Streaming, Apache Spark SQL, MLib, and GraphX.	9
V	**ADVANCE MODELS** Characteristics of representative data file formats, including flat text files, CSV, XML, JSON, and YAML, characteristics of the four types of NoSQL data stores, HBase, Apache Pig, Apache Hive, security with Hadoop, function of the Hortonworks Data Plane Service (DPS).	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to:

CO1 Analyze and describe the characteristics and key tools used in big data management.

CO2 Identify the purpose of Apache Ambari in the HDP stack, evaluate the role of internode network speed in a cluster, and distinguish the functions of Name Node and Data Node.

CO3	Implement and analyze MapReduce programs while explaining the evolution of Hadoop resource management from v1 to v2 with YARN.
CO4	Utilize Apache Spark Scala and Python shells, implement Apache Spark Streaming, employ Apache Spark SQL, and apply MLib and GraphX for data analysis and machine learning.
CO5	Analyze and compare data file formats, evaluate NoSQL data stores for suitability, and describe functionalities of Apache Pig, Hive, and Hortonworks DPS for big data managementand security.

TEXT BOOK:

T1 IBM Course ware

REFERENCES:

R1 Learning Spark: Lightning-Fast Big Data Analysis" by Holden Karau

R2 "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services

R3 Learning Spark: Lightning-Fast Big Data Analysis" by Holden Karau

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1	2	1	-	1	-	1	-	2	1	i	3
CO2	3	1	1	1	2	1	-	1	-	1	-	1	1	-	1
CO3	2	3	1	1	3	1	-	1	1	1	-	1	2	1	3
CO4	3	2	-	1	3	1	-	1	-	1	-	2	1	3	3
CO5	1	3	2	1	2	1	-	1	1	1	-	2	1	2	3
Avg	**2**	**2.4**	**1.25**	**1**	**2.4**	**1**	**-**	**1**	**1**	**1**	**-**	**1.6**	**1.2**	**1.75**	**2.6**

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT7003	BIGDATA WITH SECURITY LABORATORY	0	0	3	1.5

The student should be made

Course Objective

1. To study the basic technologies that form the foundations of data.
2. Understand the Big Data platform and its Use Case.
3. Exposure to Data Analytics
4. Implement Basic Hadoop Operations and Commands
5. Analyze and Evaluate Big Data Platforms

Exp. No	Description of the Experiments
1	Develop a Scala program that accepts a year as input and determines if it is a leap year.
2	Write a simple Scala application that prompts the user to input a number, then checks if the number is even or odd, and displays the result.
3	Create a Scala program demonstrating both user-defined and built in exceptions.
4	Implement Scala's efficient Spark operations to perform advanced data analysis.
5	Develop a Scala application that uses case classes to manage and store employee details.
6	Write a Scala program that identifies the character that appears most frequently in a given string, usingan array to count occurrences.
7	Create a Scala program to find the character that occurs most frequently in a given string, using an arrayto track character counts and iterating through the string to determine the maximum occurring character.
8	Perform data analysis using Apache Spark, utilizing its capabilities for efficient processing of largescale datasets.
9	Develop a Scala program that explores the Hadoop environment, showcasing its features and functionalities.

Total Instructional Hours **45**

At the end of the course, students would be able to:

Course Outcome

CO1	Utilize basic Scala syntax for user input, conditional statements, and printing output.
CO2	Implement exception handling using both built-in and user-defined exceptions in Scala programs.
CO3	Design case classes in Scala to represent data structures with defined fields and functionalities.
CO4	Employ Scala arrays or collections to manipulate data and identify patterns, such as finding the most frequent character in a string.
CO5	Explain the concept of Apache Spark for large-scale data analysis and its potential for advanced tasks.

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	1	-	1	-	1	1	-	1
CO2	2	1	-	-	2	-	-	1	-	1	-	1	1	-	1
CO3	1	2	3	-	2	-	-	1	-	1	-	1	2	-	1
CO4	1	1	1	1	3	-	-	1	-	1	-	1	1	-	2
CO5	1	1	1	1	3	-	1	1	-	1	-	2	1	-	2
Avg	1.2	1	1.6	1	2.4	-	1	1	-	1	1	1.2	1.2	-	1.4

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NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2019 WITH AMENDMENT

ACADEMIC YEAR 2024-25 ODD SEMESTER

S. No	Regulation	Course Code with Name	Credits
1	2019	21IT7205 – Applied Natural Language Processing (Hons)	3
2	2019	21IT7206 – Ethics and Artificial Intelligence (Hons)	3
3	2019	21IT7204 – Big Data with Security (IBM track)	3
4	2019	21IT7003 - Big Data with Security Laboratory (IBM track)	3

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SYLLABUS REVISION DETAILS FOR THE REGULATION2019 WITH AMENDMENT– ACADEMIC YEAR 2024-25 ODD SEMESTER

S. No	Year	Semester	Course Code and Course Name	Existing content (in academic Year 2023-24)	Revised Content (for 2024-25)	Percentage of Revision
1	IV	VII	21IT7202- Data Science and Analytics	**19IT7202R- Data Science and Analytics** **UNIT II PREPROCESSING AND VISUALIZATION** Sampling and Quantization - Error Types - Error Handling - Filtering – Data Transformation – Data Merging - Diagrams - Principal Component Analysis – Multidimensional Scaling - Sammon Mapping – Auto associator - Histograms - Spectral Analysis. **UNIT III CORRELATION, REGRESSION AND FORECASTING** Linear Correlation - Correlation and Causality - Chi-Square Test for Independence – Linear Regression -Non-Linear Substitution – Robust Regression - Neural Networks -Radial Basis Function Networks - Cross Validation - Feature Selection - Finite State Machines - Recurrent Models - Autoregressive Models. **UNIT IV CLASSIFICATION AND CLUSTERING** Classification Criteria - Naive Bayes_ Classifier - Linear Discriminant Analysis – Support Vector Machine –k-Nearest Neighbour Classifier – Learning Vector Quantization - Decision Trees - Clustering: Cluster Partitions - Sequential - Prototype-Based - Fuzzy - Relational - Cluster Tendency Assessment-Cluster	**21IT7202- Data Science and Analytics** **UNIT II PREPROCESSINGAND VISUALIZATION** Sampling and Quantization - Error Types - Error Handling – Data Transformation – Data Merging - Diagrams - Principal Component Analysis – Multidimensional Scaling - Sammon Mapping – Histograms - Spectral Analysis. **UNIT III CORRELATION, REGRESSION AND FORECASTING** Linear Correlation - Correlation and Causality - Chi-Square Test for Independence – Linear Regression - Neural Networks -Radial Basis Function Networks – Cross Validation - Finite State Machines - Recurrent Models - Autoregressive Models. **UNIT IV CLASSIFICATION AND CLUSTERING** Classification Criteria - Naive Bayes_ Classifier - Linear Discriminant Analysis – Support Vector Machine –k-Nearest Neighbour Classifier - Decision Trees - Clustering: Cluster Partitions - Sequential - Prototype-Based - Cluster Tendency	20

				Validity - Self Organizing Maps. **UNIT V SYSTEM ARCHITECTURE AND APPLICATIONS** Lambda Architecture - Nosql Stores: Key-Value - Columnar - Document - Graph. Case Studies: Riak - Hbase - Mongodb - Neo4j. MapReduce - Graph Processing - Event Processing – Hadoop- Giraph –Storm. Recommendation Systems – Time Series Analysis – Text Analysis.	Assessment-Cluster Validity - Self Organizing Maps. **UNIT V SYSTEM ARCHITECTURE AND APPLICATIONS** Lambda Architecture - Nosql Stores: Key-Value - Columnar - Document - Graph.Case Studies: Riak - Hbase - Mongodb - Neo4j. MapReduce - Event Processing – Hadoop- Storm. Recommendation Systems – Time Series Analysis.	
2	IV	VII	21IT7002 - Data Analytics Laboratory	**19IT7002 - DATA ANALYTICS LABORATORY** 1. Install, Configure and Run Hadoop and HDFS. 2. Implement the following File Management tasks in Hadoop: Adding Files and Directories Retrieving Files DeletingFiles 3. Implementing Matrix Multiplication with Hadoop MapReduce 4. Implement an MR program that processes a Weather Dataset. 5. To perform NoSQL database using mongodb to create, update and insert. 6. Create, load data to tables and manipulate the data in Hive. 7. Create, load data to tables and manipulate the data in Hbase. 8. Implement Linear and logistic Regression. 9. Perform test on Normalization using R. 10. Visualize data Using any Plotting Framework.	**21IT7002 - DATA ANALYTICS LABORATORY** 1. Install, Configure and Run Hadoop and HDFS. 2. Implement the following File Management tasks in Hadoop: Adding Files and Directories Retrieving Files DeletingFiles 3. Implementing Matrix Multiplication with Hadoop Map Reduce 4. Implement an MR program that processes a Weather Dataset. 5. To perform NoSQL database using mongodb to create, update and insert. 6. Create, load data to tables and manipulate the data in Hbase. 7. Implement Linear and logistic Regression. 8. Perform test on Normalization using R. 9. Visualize data Using any Plotting Framework.	10

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B.Tech IT
MINOR
DEGREE
VII SEMESTER

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT7601	FOUNDATIONS OF DIGITAL MARKETING	3	0	0	3

Course Objective

The student should be made

1. To Identify the components of a digital marketing strategy.
2. To Learn about the basics of search engine optimization (SEO)
3. To Understand the different types of e-mail marketing.
4. To Understand the concept of social media marketing.
5. To gain an overview of digital transformation.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ONLINE** Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation.	6
II	**SEARCH ENGINE OPTIMISATION** Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works.	9
III	**E- MAIL MARKETING** E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Mobile Apps, Mobile Commerce, SMS Campaigns.	12
IV	**SOCIAL MEDIA MARKETING** Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Influencer Marketing.	9
V	**DIGITAL TRANSFORMATION** Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Recent trends in Digital marketing.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Develop a comprehensive digital marketing strategy for an online market space, including the planning and creation of a brand website, by analyzing components and opportunities to enhance brand presence.
CO2	Implement an effective Search Engine Optimization (SEO) and Search Engine Marketing (SEM) strategy by developing and applying keyword strategies, on-page and off-page techniques, and understanding SEO success factors and how search engines work.
CO3	Design a comprehensive email marketing strategy integrating automation, social media, and mobile channels to maximize campaign effectiveness
CO4	Create and execute a successful social media marketing campaign to engage customers, foster brand conversations, and leverage influencer partnerships
CO5	Analyze and implement digital transformation strategies incorporating channel attribution and leveraging analytics across AdWords, email, mobile, social media, and web platforms, in response to recent trends in digital marketing.

TEXT BOOK:

T1 Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education: First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373

T2 Digital Marketing by Vandana Ahuja; Publisher: Oxford University Press (April 2015). ISBN-10: 019945544

T2 Marketing 4.0: Moving from Traditional to Digital by Philip Kotler; Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.

REFERENCES:

R1 Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.

R2 Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning

R3 Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	-	1	3	3	3	3	3	2	3
CO2	3	2	3	3	3	2	1	1	3	3	3	2	3	3	3
CO3	3	3	3	2	3	2	1	1	3	3	3	3	3	2	3
CO4	3	3	3	2	3	2	1	1	3	3	3	2	3	2	3
CO5	3	3	3	3	3	2	1	1	3	3	3	3	3	3	3
Avg	**3**	**2.8**	**3**	**2.4**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**2.6**	**3**	**2.4**	**3**

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT7602	BUSINESS ANALYTICS	3	0	0	3

Course Objective

The student should be made

1. To understand the Analytics Life Cycle.
2. To comprehend the process of acquiring Business Intelligence
3. To understand various types of analytics for Business Forecasting
4. To model the supply chain management for Analytics
5. To apply analytics for different functions of a business

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BUSINESS ANALYTICS** Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration	9
II	**BUSINESS INTELLIGENCE** Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions	9
III	**BUSINESS FORECASTING** Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.	9
IV	**HR & SUPPLY CHAIN ANALYTICS** Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.	9
V	**MARKETING & SALES ANALYTICS** Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Apply the Business Analytics lifecycle to define business problems, collect and prepare data, generate hypotheses, model solutions, validate, interpret, deploy, and iterate on results.
CO2	Utilize data warehouses and marts, knowledge management techniques, and Online Analytical Processing (OLAP) to support various types of business decisions.
CO3	Apply machine learning to develop logic-driven predictive models using data mining techniques for business forecasting.
CO4	Employ HR analytics to forecast annual demand for hourly employees, integrating supply chain analytics for efficient planning and logistics.
CO5	Utilize predictive analytics to enhance marketing and sales strategies, leveraging customer behaviour insights for effective sales planning.

TEXT BOOK:

T1 R. Evans James, Business Analytics, 2nd Edition. Pearson, 2017 2. R N Prasad. Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016.

T2 R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016

T3 Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016.

T4 VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.

REFERENCES:

R1 Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson Education,2018.

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	1	2	2	1	2	3	2	2
CO2	2	2	3	2	3	-	-	1	1	2	1	-	2	3	2
CO3	3	3	3	3	3	-	-	-	1	-	-	2	3	1	2
CO4	3	2	-	2	2	-	-	-	1	-	-	-	1	-	-
CO5	3	2	-	2	2	-	-	-	1	1	-	-	2	2	-
Avg	**2.8**	**2.4**	**2.3**	**2.4**	**2.4**	**-**	**-**	**1.0**	**1.2**	**1.7**	**1.0**	**2.0**	**2.2**	**2.0**	**2.0**

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B.Tech IT
MINOR
DEGREE
V SEMESTER

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5601	DATABASE SYSTEM	3	0	0	3

Course Objective

The student should be made

1. To learn the fundamentals of data models ,relational algebra and SQL
2. To represent a database system using ER diagrams and to learn normalization techniques
3. To understand the fundamental concepts of transaction, concurrency and recovery Processing
4. To understand the internal storage structures using different file and indexing techniques Which will help in physical DB design
5. To have an introductory knowledge about the Distributed databases, NOSQL and database security

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATABASES** Purpose of Database - Database System Architecture - Views of Data– Schema Architecture–Data Independence – Schema and instance-Data Models–Benefits of Data Model–Phases of Data Model.ER Diagram-Extended ER Diagram–Examples.	9
II	**RELATIONAL DATABASE AND DESIGN** Relational Data Model–Keys-Relational Algebra-SQL Fundamentals–Advanced SQL Features - Embedded SQL- Dynamic SQL. Normalization - Functional Dependency-First, Second, Third Normal Form- BCNF, NonLoss Decomposition -4NF-Multivalued Dependency-5NF-JoinDependency.	9
III	**TRANSACTIONS AND CONCURRENCY CONTROL** Transaction processing - ACID Properties - failure and recovery – Schedules – Serializability - Concurrency Control - Lock based protocol - Two Phase Commit - Isolation levels-SQL Facilities for concurrency and recovery- Database integrity and security.	9
IV	**STORAGE & INDEXING** Overview of Storage Techniques – file organization - RAID –Indexing - Types of ordered indices -B & B+tree –Hashing- Static & Dynamic Hashing. Query Processing & Optimization. Algorithms for SELECT and JOIN operations - Query optimization using Heuristics and Cost Estimation.	9
V	**NOSQL** Need for NOSQL–Characteristics of NOSQL-Comparison of relational databases to new NoSQL stores - Key-value database - Apache Cassandra – Columnar Databases – MongoDB – CRUD operations with MongoDB -Document Databases – Graph Databases.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

- CO1 Distinguish between core database concepts and architecture of database systems.
- CO2 Implement a relational database model using SQL, data manipulation, retrieval, and advanced features, normalization techniques to minimize redundancy and ensure dataintegrity.
- CO3 Analyze the impact of concurrency to ensure ACID properties, to maintain database integrity and security.
- CO4 Evaluate storage techniques and indexing methods for efficient data retrieval.
- CO5 Compare relational and NoSQL databases, evaluate the suitability of different NoSQL models for data storage, and perform CRUD operations.

TEXTBOOKS

T1 AbrahamSilberschatz,HenryF.Korth,S.Sudharshan,—IDatabaseSystemConceptsI,SixthEdition, TataMcGrawHill,2013.

T2 RamezElmasri ,ShamkantB. Navathe,- Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2014.

REFERENCES:

R1 C.J.Date,A.Kannan,S.Swamynathan,—An Introduction to Database Systems, EighthEdition, Pearson Education, 2013.

R2 Eben Hewitt,"Cassandra–The Definitive Guide",O'Reilly,2010.

R3 Krisitna Chodorow,"MongoDB–The Definitive Guide",O'Reilly,2013.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	-	1	-	-	3	-	1
CO2	3	1	3	1	3	-	-	-	-	2	-	-	-	3	3
CO3	2	3	2	3	2	1	-	-	-	1	-	-	2	2	1
CO4	2	3	2	3	3	-	-	-	-	1	-	-	2	2	2
CO5	2	3	2	3	2	1	-	-	-	2	-	1	1	2	3
Avg	**2.4**	**2.6**	**2**	**2.2**	**2.2**	**1**	**-**	**-**	**-**	**1.4**	**-**	**0.2**	**2**	**2.6**	**2**

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B.Tech IT
HONOURS
DEGREE
VII SEMESTER

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT7205	APPLIED NATURAL LANGUAGE PROCESSING	3	0	0	3

Course Objective

The student should be made to:

1. Learn the fundamentals of natural language processing.
2. Learn the word level analysis methods.
3. Explore the syntactic analysis concepts.
4. Understand the semantics and pragmatics.
5. Learn to analyze discourses and Lexical Resources.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance	9
II	**WORD LEVEL ANALYSIS** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	9
III	**SYNTACTIC ANALYSIS** Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK,Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.	9
IV	**SEMANTICS AND PRAGMATICS** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	9
V	**DISCOURSE ANALYSIS AND LEXICAL RESOURCES** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze the origins and challenges of Natural Language Processing (NLP), and evaluate different language modeling techniques.
CO2	Implement a rule based system to tackle morphology/syntax of a language
CO3	Design a tag set to be used for statistical processing for real-time applications.
CO4	Compare and contrast the use of different statistical approaches for different types of NLP applications.
CO5	Apply natural language and design innovative NLP applications.

TEXT BOOK:

T1 Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

T2 Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

REFERENCES:

R1 Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.

R2 Richard M Reese, —Natural Language Processing with Javal, O'Reilly Media, 2015.

R3 Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

R4 Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	1	1	-	-	1	-	1	-	2	2	-	2
CO2	1	2	3	1	1	-	-	1	1	1	-	1	2	-	2
CO3	1	2	3	1	2	-	-	1	-	1	-	1	1	-	3
CO4	2	3	1	2	1	-	-	1	-	1	-	2	2	-	2
CO5	1	3	3	2	1	-	-	1	1	1	-	3	2	1	3
Avg	**1.4**	**2.6**	**2.4**	**1.4**	**1.2**	**-**	**-**	**1**	**1**	**1**	**-**	**1.8**	**1.8**	**1**	**2.4**

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT7206	**Ethics and Artificial Intelligence**	3	0	0	3

Course Objective

The student should be made to:

1. Study the morality and ethics in AI
2. Learn ae Ethical initiatives in the field of artificial intelligence
3. Study about AI standards and Regulations
4. Study about social and ethical issues of Robot Ethics
5. Study about AI and Ethics- challenges and opportunities

Unit	Description	Instructional Hours
I	**INTRODUCTION** Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust	9
II	**ETHICAL INITIATIVES IN AI** International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization.	9
III	**AI STANDARDS AND REGULATION** Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems	9
IV	**ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS** Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.	9
V	**AI AND ETHICS- CHALLENGES AND OPPORTUNITIES** Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

- CO1 Understand the fundamental concepts of morality and ethics in AI .
- CO2 Analyze international ethical initiatives and identify AI ethical concerns.
- CO3 Evaluate ethical processes for transparency, data privacy and bias in AI.
- CO4 Discuss ethical implications of robotics and professional responsibilities in robo ethics.
- CO5 Assess AI challenges and opportunities, focusing on ethical issues and strategies.

TEXT BOOK:

T1 Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020

T2 Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES:

R1 Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017

R2 Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020

R3 Web link: https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65

R4 https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/

CO and PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	3	2	3	1	1	1	2	1	1	2
CO2	2	3	1	2	1	2	2	3	1	2	1	2	1	1	2
CO3	1	2	3	3	3	1	1	2	1	1	1	1	2	2	1
CO4	1	1	1	1	1	3	1	3	1	2	1	2	1	1	2
CO5	2	2	2	2	2	2	3	2	1	2	1	3	2	2	3
Avg	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**2**

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HONOURS
DEGREE
V SEMESTER

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT5203	DEEP LEARNING	3	0	0	3

Course Objective

The student should be made

1. The development of deep learning from basic concepts like neurons to powerful architectures like feed forward neural networks.
2. To understand how neural networks learn by adjusting weights based on errors calculated through back propagation and optimization algorithms like gradient descent and its variants.
3. To explore techniques to improve model performance by reducing variance, preventing over fitting,and potentially increasing data or model complexity.
4. To research and understand the key concepts in convolutional neural networks, including input/output size, architectures, visualization techniques, and transfer learning.
5. To understand how Recurrent Neural Networks are trained on sequential data, considering challenges like vanishing gradients and architectures like LSTMs.

Unit	Description	Instructional Hours
I	**Introduction to Neural Networks** History of Deep Learning - Deep Learning success stories – McCulloh Pitts Neuron - Thresholding Logic – Perceptrons - Perceptron Learning Algorithm - Multilayer Perceptrons (MLPs) - Representation power of MLPs - Sigmoid Neurons - Gradient Descent - Feedforward Neural Networks - Reprersentation power of Feedforward Neural Networks.	9
II	**Neural Networks and Back propagation** Feed forward Neural Networks - Learning Parameters - Output Functions and Loss Functions – Back propagation - Computing Gradients - Gradient Descent (GD) - Momentum based GD -Nesterov accelerated GD - Stochastic and minibatch GD – Adarard – RMSProp - Biascorrection in Adam.	9
III	**Regularaization** Bias Variance tradeoffs – L2 Regularaization – Early Stopping – Dataset Augmentation – Parameter sharing and tying – Injecting noise at input – Ensemble methods – Dropout – Greedy Layerwise Pretraining – Better Activation functions – Better Weight initialization methods – Batch normalization.	9
IV	**Convolutional Neural Networks** Convolution operation – Relation between input size, output size and filter size – GoogleNet – RESNet – Visualizing CNN – Guided Backpropagation – Deep dream – Deep art – Fooling CNN – Transfer Learning.	9
V	**Recurrent Neural Networks** Sequence Learning Problems - Recurrent Neural Networks (RNN) – Backpropagation Through Time (BPTT) – Vanishing and Exploding Gradients – Truncated BPTT – GRU – LSTMs	9
	Total Instructional Hours	**45**

Course Outcomes

At the end of the course, students would be able to:

CO1	Trace the evolution from basic concepts like McCulloch-Pitts neurons to powerful architectures like multilayer perceptron's with sigmoid activation and gradient descent optimization, understanding their representational capabilities for tackling complex problems.
CO2	Implement and optimize feedforward neural networks by training them with backpropagation, computing gradients, and utilizing advanced optimization algorithms like Adam.
CO3	Optimize deep learning models by tackling bias-variance trade-offs, employing regularization techniques, and exploring methods like early stopping, data augmentation, and dropout to improve generalization and prevent overfitting.
CO4	Implement convolutional neural networks (CNNs) by understanding core operations, analyzing filter effects on output size, and exploring architectures like GoogleNet, ResNet, visualization techniques, and advanced applications like fooling CNNs and transfer learning.

CO5 Tackle sequence learning problems using RNNs and address gradient issues with techniques like BPTT, truncation, GRUs, and LSTMs.

TEXT BOOKS:

T1 Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

T2 Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

R1 Christopher Bishop, —Pattern Recognition and Machine Learning‖, Springer, 2006.

R2 Kevin P. Murphy, —Machine Learning: A Probabilistic Perspective‖, MIT Press, 2012

R3 Fabio Nelli, —Python Data Analytics with Pandas, Numpy, and Matplotlib‖, Second Edition, Apress.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	-	-	1	1	-	3	3	2	-	1
CO2	3	3	2	2	3	-	-	2	2	-	2	3	3	-	1
CO3	3	3	3	3	3	-	-	1	2	-	3	3	2	-	3
CO4	3	3	2	3	3	-	-	1	2	-	3	3	1	-	2
CO5	3	3	2	3	3	-	-	1	2	-	3	3	1	-	2
Avg	**3**	**2.8**	**2**	**2.6**	**2.8**	**-**	**-**	**1.2**	**1.8**	**-**	**2.8**	**3**	**1.8**	**-**	**1.8**

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Programme	Course code	Name of the course	L	T	P	C
BE/B.Tech	22IT5204	ETHICAL HACKING	3	0	0	3

Course Objective

The student should be made

1. To understand the basics of computer based vulnerabilities.
2. To explore different foot printing, reconnaissance and scanning methods.
3. To expose the enumeration and vulnerability analysis methods.
4. To understand hacking options available in Web and wireless applications.
5. To explore the options for network protection.

Unit	Description	Instructional Hours
I	**UNIT I INTRODUCTION** Ethical Hacking Overview - Role of Security and Penetration Testers and Methodologies- Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing - Network and Computer Attacks-Protecting Against Malware Attacks.	9
II	**UNIT II FOOT PRINTING, RECONNAISSANCE NETWORKS** Foot printing Concepts – Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence – Foot printing through Social Engineering & Tools – Firewall.	9
III	**UNIT III ENUMERATION AND VULNERABILITY ANALYSIS** Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts, Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows.	9
IV	**UNIT IV SYSTEM HACKING** Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network –Wireless Hacking.	9
V	**UNIT V NETWORK PROTECTION SYSTEMS** Access Control Lists - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Network Based and Host-Based IDSs and IPSs - Web Filtering.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Evaluate the role of ethical hackers, penetration testers, and network protocols in securing systems against cyberattacks
CO2	Analyze various footprinting techniques, including search engines, social media, and social engineering, to assess an organization's competitive intelligence and network security posture.

CO3	Analyze the various enumeration techniques, including NetBIOS, SNMP, LDAP, NTP, SMTP, and DNS, to identify potential vulnerabilities and weaknesses in network systems.
CO4	Applytheir knowledge of web application components and vulnerabilities, along with wireless network infrastructure, to identify potential security risks and propose mitigation strategies for both web servers and wireless networks.
CO5	Evaluate and implement network security controls like ACLs, firewalls, IDS/IPS, and web filtering for a comprehensive security strategy.

TEXT BOOKS:

T1 Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 201

T2 The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.

T3 The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.

REFERENCES:

R1 Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz, 2014.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1	-	1	1	1	1	1	3	2	1
CO2	2	3	2	2	1	1	-	1	1	1	1	1	2	3	1
CO3	2	2	3	2	2	1	1	1	1	1	1	1	2	2	1
CO4	2	2	2	3	2	1	1	1	1	1	1	1	2	2	1
CO5	1	2	2	2	3	1	-	1	1	1	1	1	1	2	2
AVG	**2**	**2.4**	**2.2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2.2**	**1.2**

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Programme	Course code	Name of the course	L	T	P	C
BE/B.Tech	22IT5205	FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY	3	0	0	3

Course Objective

The student should be made

1. To Understand Block chain's Fundamental Components. and Examine Decentralization Using Block chain.
2. To Explain how Crypto currency works, from when a Transaction is created to when it is considered part of the Block chain.
3. To Explain the Components of Ethereum and Programming Languages for Ethereum
4. To Study the basics of hyper ledger and Web3.
5. To know about alternative Block chains and Block chain Projects in Different Domains.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BLOCKCHAIN** History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization.	9
II	**ETHEREUM** The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols.	9
III	**HYPERLEDGER FABRIC** Architecture of Hyperledger fabric v1.1- chain code-, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.	9
IV	**BLOCK CHAIN APPLICATIONS** Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking.	9
V	**ALTERNATIVE BLOCK CHAINS AND NEXT EMERGING TRENDS** Kadena – Ripple – Rootstock – Quorum – Tendermint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous Tools.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

- CO1 Analyze the evolution and applications of blockchain technology, including its impact on decentralization and ecosystem design.
- CO2 Evaluate Ethereum's components, languages, fees, and supporting protocols for understanding its role in the block chain ecosystem
- CO3 Compare and contrast Hyper ledger Fabric's architecture (chain code, EVM) with Ethereum concepts (gas, Ether) to understand their transaction fees and execution environments.
- CO4 Analyze and apply smart contracts (Truffle), Daps, NFTs, and block chain applications in supply chain, logistics, smart cities, finance, and banking.
- CO5 Evaluate various block chain platforms in terms of their scalability, privacy features, and ability to address other challenges.

TEXT BOOKS:

T1	Imran Bashir, Mastering Block chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained,(Second Edition), Packt Publishing, 2018.
T2	S.Shukla, M.Dhawan, S.Sharma,S.Venkatesan, Blockchain Technology: Cryptocurrency

REFERENCES:

R1	Arshdeep sBahga, Vijay Madisetti, Blockchain Applications: A Hands-on Approach, VPT, 2017
R2	Alex Leverington, Ethereum Programming‖ Packt Publishing, 2017.
R3	Roger Wattenhofer, The Science of the Blockchain‖ CreateSpace Independent Publishing,2016
R4	A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	-	-	1	1	1	1	3	2	2	3
CO2	3	3	2	1	1	-	-	1	1	1	1	3	3	2	3
CO3	2	3	2.	1	1	-	-	1	1	1	1	2	3	2	2
CO4	2	3	3	1	1	-	1	1	1	1	1	2	2	3	2
CO5	1	3	3	1	1	-	1	1	1	1	1	1	2	3	1
AVG	**2.2**	**3**	**2.4**	**1**	**1**	**-**	**1**	**1**	**1**	**1**	**1**	**2.2**	**2.4**	**2.4**	**2.2**

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VALUE ADDED COURSES

Course Code 23VACH01	Course Name Data visualization using the python libraries	Credits 2

Course Objective

- To provide students with the skills and knowledge to effectively visualize data using Python's powerful libraries. This course aims to equip students with the ability to create meaningful and aesthetically pleasing visualizations that can communicate insights clearly and effectively. Through a combination of theoretical concepts and hands-on exercises, students will learn to use libraries such as Matplotlib, Seaborn, and Plotly to visualize various types of data.

Module No	Heading	Subheading	Hours
Module 1	**Introduction to Data Visualization and Matplotlib**	• Introduction to Data Visualization ➢ Importance and role of data visualization ➢ Overview of Python libraries for data visualization • Getting Started with Matplotlib ➢ Basic plots: line plots, scatter plots, bar plots ➢ Plot customization: titles, labels, legends • Advanced Matplotlib Features ➢ Subplots and grid layouts ➢ Annotations and styling	6
Module 2	**Enhancing Visualizations with Seaborn**	• Introduction to Seaborn ➢ Seaborn vs. Matplotlib ➢ Basic plots: scatter plots, line plots, bar plots • Statistical Plots with Seaborn ➢ Box plots, violin plots, pair plots ➢ Heatmaps and correlation plots • Customizing Seaborn Plots ➢ Themes and color palettes ➢ Advanced customization techniques	6
Module 3	**Interactive Visualizations with Plotly**	• Introduction to Plotly ➢ Basic interactive plots: line charts, bar charts, scatter plots ➢ Plotly syntax and structure • Advanced Plotly Features ➢ Interactive plots: hover, zoom, pan ➢ 3D plots and animations • Customizing and Styling Plotly Visualizations ➢ Layouts, themes, and annotations ➢ Exporting and sharing Plotly plots	6

Module 4	**Data Manipulation and Visualization with Pandas**	• Introduction to Pandas for Data Manipulation ➢ DataFrames, series, and basic operations ➢ Cleaning and preparing data for visualization • Basic Visualizations with Pandas ➢ Plotting directly from Data Frames ➢ Time series and categorical data plots • Combining Pandas with Matplotlib and Seaborn ➢ Integrating data manipulation with advanced visualizations	6
Module 5	**Dashboards and Storytelling with Data**	• Introduction to Plotly Dash ➢ Creating basic dashboards ➢ Combining multiple plots into a dashboard • Advanced Dash Features ➢ Interactivity in dashboards ➢ Layouts and navigation • Telling a Story with Data ➢ Creating a coherent set of visualizations ➢ Best practices for data storytelling	6
Module 6	**Best Practices and Final Project**	• Best Practices in Data Visualization ➢ Principles of good design ➢ Avoiding misleading visualizations • Final Project and Review ➢ Hands-on project: Creating a comprehensive data visualization project ➢ Review of key concepts and Q&A session	6
		Total Content Hours	**36**

Course Outcome

At the end of the course the students will be able to

- Understand the role and importance of data visualization in data analysis and communication.
- Create basic plots using Matplotlib, including line plots, scatter plots, bar plots, and histograms.
- Customize and style Plotly visualizations for enhanced interactivity and presentation
- Understand and apply principles of good design and effective data communication

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Course Code 22VACH03	Course Name DevOps for Beginners	Credits 2

Course Objective

- To provide students with a comprehensive understanding of DevOps principles and practices. This course aims to equip students with the knowledge and skills necessary to implement DevOps methodologies in software development projects, focusing on continuous integration, continuous delivery, infrastructure as code, containerization, and monitoring.

Module No	Heading	Subheading	Hours
Module 1	**Introduction to DevOps**	• Introduction to DevOps ➢ Definition and principles ➢ Benefits and key concepts • DevOps Culture and Practices ➢ Collaboration, communication, and cultural shifts ➢ Overview of DevOps practices: CI/CD, automated testing, monitoring • Introduction to Version Control with Git ➢ Basics of Git: repositories, commits, branches • Hands-on practice with Git commands	6
Module 2	**Continuous Integration (CI)**	• Introduction to Continuous Integration ➢ CI concepts and benefits ➢ Popular CI tools: Jenkins, GitLab CI, Travis CI • Setting Up a Basic CI Pipeline ➢ Installing and configuring Jenkins ➢ Creating a simple CI pipeline • Integrating Automated Testing in CI ➢ Writing and running unit tests ➢ Incorporating tests into the CI pipeline	6
Module 3	**Continuous Delivery (CD) and Deployment**	• Introduction to Continuous Delivery ➢ CD concepts and benefits ➢ Difference between CI and CD • Setting Up Continuous Delivery Pipelines ➢ Configuring Jenkins for CD ➢ Deploying applications automatically • Basic Deployment Strategies ➢ Rolling updates, blue-green deployments ➢ Hands-on deployment exercise	6

Module 4	**Infrastructure as Code (IaC)**	• Introduction to Infrastructure as Code ➢ IaC concepts and tools (Terraform, CloudFormation) • Getting Started with Terraform ➢ Basic Terraform setup and configuration ➢ Writing and applying Terraform scripts • Managing Infrastructure with Terraform ➢ Creating and managing resources with Terraform ➢ Hands-on practice with a simple infrastructure project	6
Module 5	**Containerization with Docker**	• Introduction to Containers ➢ Container concepts and benefits ➢ Introduction to Docker • Working with Docker ➢ Building Docker images ➢ Running and managing Docker containers • Docker Compose ➢ Multi-container applications with Docker Compose • Hands-on practice with Docker Compose	6
Module 6	**Monitoring, Logging, and Final Project**	• Introduction to Monitoring and Logging ➢ Importance of monitoring and logging in DevOps ➢ Tools overview: Prometheus, Grafana, ELK Stack • Final Project and Course Review ➢ Building a simple CI/CD pipeline with monitoring ➢ Review of key concepts and Q&A session	6
		Total Content Hours	**36**

Course Outcome

At the end of the course the students will be able to

- Define DevOps and explain its principles, benefits, and cultural significance in modern software development
- Utilize Git for version control, including creating repositories, committing changes, and managing branches
- Understand container concepts and use Docker to build, run, and manage containers.
- Understand the importance of monitoring and logging in DevOps

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Dean-Academics

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF INFORMATION TECHNOLOGY

Curriculum and EVEN Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 14.12.2024)

(Academic Council Meeting held on 19.12.2024)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi& Accredited by NAAC with 'A ++' Grade)
Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu

B.TECH. INFORMATION TECHNOLOGY

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for EVEN Semester

Academic Year 2024-2025

Institution Vision and Mission

Vision

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

Mission

M1: To provide academic excellence in technical education through novel teaching methods.
M2: To empower students with creative skills and leadership qualities.
M3: To produce dedicated professionals with social responsibility.

Department Vision and Mission

Vision

To produce Information Technology professionals with robust technical knowledge, creative thinking, and high ethical standards to address global challenges.

Mission

DM1: To prepare the students to excel in the dynamic realm of Information Technology througha conducive learning environment.

DM2: To equip the students with essential innovative skills to solve technical issues andeffectively promote interdisciplinary collaboration.

DM3: To instill ethical integrity in students for successful professional careers andentrepreneurial ventures.

Program Educational Objectives (PEO)

PEO1: Graduates of the program will be proficient in the identification, formulation, and solution of complex problems by applying their knowledge of mathematics, science, and Information Technology principles.

PEO2: Graduates of the program will be capable of analyzing, designing, implementing and managing software projects through continuous learning and using modern tools to meet real-world constraints.

PEO3: Graduates of the program will exhibit professionalism with ethical attitudes, communication, teamwork, and will contribute to societal needs.

Program Outcome (PO)	
PO-01	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO-02	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO-03	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
PO-04	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
PO-05	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
PO-06	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
PO-07	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
PO-08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO-09	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO-10	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
PO-11	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
PO-12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
Program Specific Outcomes (PSOs) of B.Tech. Information Technology	
PSO-01	Able to design and develop software solutions by employing appropriate problem-solving strategies, including logically thinking, creating a user interface and writing code to connect a front-end user interface with a backend database using a contemporary object-oriented language.
PSO-02	Ability to design and develop mobile applications and web-based applications, coupled with testing skills fostering employability and entrepreneurship skills
PSO-03	Apply the appropriate techniques and modern engineering hardware and software tools to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

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B.TECH. INFORMATION TECHNOLOGY

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for EVEN Semester

Academic Year 2024-2025

BATCH 2024-2028

CURRICULUM
R2022

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
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HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
(Approved by AICTE, New Delhi, Accredited by NAAC with 'A++'Grade)
Coimbatore - 641032.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2024-2025 and onwards

SEMESTER I – 18 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA1101	Matrices-and Calculus	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2.	22CY1152	Basics of Chemistry for Computational Sciences	BSC	2	0	2	3	4	50	50	100
3.	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
4.	22CS1151	Problem solving using C programming	ESC	2	0	2	3	4	50	50	100
5.	22IT1152R	Introduction to web Application Development	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	1	0	0	0	1	100	0	100
MANDATORY COURSE											
8.	22MC1093/ 22MC1094	தமிழரம்பரபு/ Heritage of Tamil	MC	1	0	0	1	2	40	60	100
9.	22MC1095	Universal Human Values	MC	1	0	0	0	2	100	0	100
			TOTAL	**15**	**1**	**8**	**18**	**20**	**480**	**320**	**800**

SEMESTER II -23 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2103	Differential Equations and Linear Algebra	BSC	3	1	0	4	4	40	60	100
2.	22IT2101	Basics of Electronics	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH2153	Physics for computational science	BSC	2	0	2	3	4	50	50	100
4.	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
5.	22IT2251R	Python programming and Practices	PCC	2	0	2	3	4	50	50	100
6.	22IT2253	Dynamic Web Design	PCC	2	0	2	2	3	50	50	100

PRACTICAL											
7.	**22ME2001**	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE2071**	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	**22HE2072**	Soft Skills and Aptitude	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2094/ 22MC2095**	தமிழரும் தொழில்நுட்பமும்/ Tamil and Technology	MC	2	0	0	1	2	40	60	100
11.	**22MC2093**	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**18**	**1**	**12**	**23**	**29**	**580**	**420**	**1000**

SEMESTER III– 25 Credit

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA3101**	Applied Statistics and Queuing Theory	BSC	3	1	0	4	4	40	60	100
2.	**22IT3201**	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	**22IT3202**	Operating System	PCC	3	1	0	4	4	40	60	100
4.	**22IT3203**	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT3251**	Java Programming	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
6.	**22IT3001**	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	**22IT3002**	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE3071**	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	**22IT3003**	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10.	**22MC3191**	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV – 23 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22IT4201**	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	**22IT4203**	Object Oriented Software Engineering	PCC	3	0	0	3	3	40	60	100
4.	**22IT4204**	Database Management System	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT4251**	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	**22IT4253**	Computer Networks	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	**22IT4001**	Case Tools Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	**22IT4003**	Data Base Management System Laboratory	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE4071**	Soft Skills and Aptitude –III	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC4091**	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**16**	**0**	**12**	**23**	**29**	**480**	**420**	**900**

Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.

If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V – 22 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT5201**	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	**22IT5202**	Embedded System and IOT	PCC	3	0	0	3	3	40	60	100
3.	**22IT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22IT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22IT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	**22IT5251**	Application Development	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22IT5001**	Artificial Intelligence and Machine Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills-4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**1**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI – 24 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT6201**	Foundations of Data Science	PCC	3	0	0	3	3	40	60	100
2.	**22IT6202**	Principles of Compiler Design	HSC	3	0	0	3	3	40	60	100
3.	**22HE6101**	Professional Ethics	PEC	3	0	0	3	3	40	60	100
4.	**22IT63XX**	**Professional Elective-4**	PEC	3	0	0	3	3	40	60	100
5.	**22XX63XX**	**Professional Elective-5**	OEC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	**Open Elective–1***	OEC	3	0	0	3	3	40	60	100

7.	22CY6101	**Environmental Science**	ESC	2	0	0	2	3	40	60	100
PRACTICAL											
8.	22IT6001	Project Based Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII – 20 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT7201	Distributed and Cloud Computing	PCC	3	0	0	3	3	40	60	100
2.	22IT7202	Quantum Computing	PCC	3	1	0	4	4	40	60	100
3.	22IT7203	Edge Computing	PCC	3	0	0	3	3	40	60	100
4.	22XX73XX	**Professional Elective-6**	PEC	3	0	0	3	3	40	60	100
5.	22XX74XX	**Open Elective–2***	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22IT7001	Cloud Computing Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22IT7701	Internship - II*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII – 10 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC COURSES (SE/AE)											
1.	22IT8901	Project Work	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. * As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I

(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3
5	22BM6401	3D printing	OEC	3	0	0	3	3
6	22AE6401	Space Science	OEC	3	0	0	3	3
7	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
8	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
9	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
10	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
11	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
12	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3

13	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
14	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3
15	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3
16	22FT6401	Traditional Foods	OEC	3	0	0	3	3
17	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
18	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3
19		NCC Level - I	OEC	3	0	0	3	3

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3
10	22LS7410	Business Communication	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Data Science	Vertical II Full Stack Development for IT	Vertical III Cloud Computing and Data Centre Technologies	Vertical IV Internet of Things	Vertical V Creative Media	Vertical VI Emerging Technologies
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing and Automation	**22IT5307** Data Warehousing and Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cybersecurity
22IT5303 Computer Vision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry 4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** Stream Processing	**22IT6307** Fog Computing & Energy Management in Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big Data Analytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT Cloud and Data Analytics	**22IT6310** Video Analytics	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and video analytics	**22IT7302** Security and Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304** IOT Security	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Image and video analytics	PEC	3	0	0	3	3

Details of Vertical II: Full Stack Development for IT

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Security and Privacy in Cloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software Defined Networks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5310	Design of Smart Cities	PEC	3	0	0	3	3
2.	22IT5311	IoT Architectures and Protocols	PEC	3	0	0	3	3
3.	22IT5312	Industry 4.0	PEC	3	0	0	3	3
4.	22IT6307	Fog Computing & Energy Management In IoT Devices	PEC	3	0	0	3	3
5.	22IT6308	IoT cloud and data analytics	PEC	3	0	0	3	3
6.	22IT7304	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5313	Multimedia Data Compression and Storage	PEC	3	0	0	3	3
2.	22IT5314	Multimedia and Animation	PEC	3	0	0	3	3
3.	22IT5315	Digital marketing	PEC	3	0	0	3	3
4.	22IT6309	UI and UX Design	PEC	3	0	0	3	3
5.	22IT6310	Video Creation and Editing	PEC	3	0	0	3	3
6.	22IT7305	Visual Effects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5316	Augmented Reality	PEC	3	0	0	3	3
2.	22IT5317	Cyber security	PEC	3	0	0	3	3
3.	22IT5318	Tamil Computing	PEC	3	0	0	3	3
4.	22IT6311	Robotic Process Automation	PEC	3	0	0	3	3
5.	22IT6312	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	22IT7306	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. **Clause 4.10** of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree.

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5471	Sem5: Database System	MDC	3	0	0	3	3
2.	22IT6471	Sem6: Fundamentals of Data Science	MDC	3	0	0	3	3
3.	22IT6472	Sem6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3
4.	22IT7471	Sem7: Data Exploration and Visualization	MDC	3	0	0	3	3
5.	22IT7472	Sem7: Business Intelligence	MDC	3	0	0	3	3
6.	22IT8471	Sem8: Cyber Security	MDC	3	0	0	3	3

MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Block chain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

VERTICALS FOR HONOR DGREE

B Tech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5371	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	22IT6371	Ethics and Artificial Intelligence	PC	3	0	0	3	4	40	60	100
3.	22IT6372	Knowledge Engineering	PC	3	0	0	3	4	40	60	100
4.	22IT7371	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	22IT7372	Gaming Theory	PC	3	0	0	3	4	40	60	100
6.	22IT8371	Generative AI	PC	3	0	0	3	4	40	60	100

B Tech (Hons) Information Technology with Specialization in Cyber Security

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5372	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	22IT6373	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	22IT6374	Social Networks Security	PC	3	0	0	3	3	40	60	100
4.	22IT7373	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	22IT7374	Cryptocurrency and Block chain Technologies	PC	3	0	0	3	3	40	60	100
6.	22IT8372	Network Security	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Information Technology with Specialization in Block Chain Technology

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5373	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	22IT6375	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	22IT6376	Building Private Block chain	PC	3	0	0	3	3	40	60	100
4.	22IT7375	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	22IT7376	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	22IT8373	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	2	-	-	17
4	PCC	-	3	13	20	12	8	12	-	68
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	3	3	-	6
7	EEC	1	3	3	1	1	2	2	10	23
8	MCC	1	1	-	-	-	-	-	-	02
Total		18	23	25	23	22	24	20	10	165

CREDIT DISTRIBUTION R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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SEMESTER II
SYLLABUS

THEORY

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.TECH	22MA2103	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA (AIML,CSE,IT)	3	1	0	4

Course Objective

The learner should be able to

1. Describe some methods to solve different types of first order differential equations.
2. Understand the various approaches to find general solution of the ordinary differential equations of second order.
3. Form the various types of Partial differential equations and methods to find solution.
4. Extend the knowledge of vector spaces
5. Extend the knowledge of inner product spaces

Unit	Description	Instructional Hours
I	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER** Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation.	12
II	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER** Second order linear differential equations with constant with RHS of the form e^{ax},x^n , sinax, cos ax, $e^{ax}f(x)$– Cauchy's linear equations– Method of variation of parameters.	12
III	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form f(p,q)=0, Clairaut's equation – Lagrange's equation.	12
IV	**VECTOR SPACES** Definition and examples of vector spaces, subspaces of a vector space and the quotient space, Linearly dependence and linearly independence of a set of vectors, Linear span.	12
V	**INNER PRODUCT SPACES** Complex matrices – Conjugate of the matrix – **Symmetric and Skew symmetric matrices** - Hermitian and Skew Hermitian matrices – Properties (without proof) – Inner product spaces – Gram – Schmidt orthogonalization Unitary matrix – Properties (without proof) -	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Apply few methods to solve different types of first order differential equations.
CO2: Evaluate the solutions of second order ordinary differential equations and its properties.
CO3: Compute the solution of first order partial differential equations.
CO4: Infer the knowledge of vector space.
CO5: Infer the knowledge of Inner product space.

TEXT BOOKS:

T1 -Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2019.

T2 - Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence; Linear Algebra, Pearson 5th edition,2022.

REFERENCE BOOKS:

R1 -Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011

R2 - Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013.

R3 - David Lay , Steven Lay , Judi McDonald "Linear Algebra and Its Applications" 5th Edition, Pearson ,2019.

R4 -V.Krishnamurthi, J.L Arora of Linear Algebra,2015.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	-	-	1	2	2
CO2	3	3	3	2	3	1	1	-	-	1	2	2
CO3	3	3	3	3	3	1	1	-	-	1	2	2
CO4	3	3	3	3	3	1	-	-	-	1	-	2
CO5	3	3	3	3	3	1	-	-	-	1	-	2
AVG	3	3	3	2.6	2.8	1	1	-	-	1	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT2101	BASICS OF ELECTRONICS	2	0	0	2

Course Objective

The student should be made to

1. Provide foundational knowledge of electronic systems.
2. Develop a strong understanding of circuit theorems, focusing on series and parallel circuits.
3. Provide a comprehensive understanding of semiconductor devices.
4. Learn to analyze, design, and apply these concepts in electronic systems.
5. Learn the fundamentals and their role in designing and implementing real-world applications.

Unit	Description	Instructional Hours
	INTRODUCTION TO ELECTRONICS	
I	Overview of electronic systems - Voltage, current, resistance, inductance, capacitance and power - Ohm's Law and Kirchhoff's Laws – DC circuits – AC circuits	6
	CIRCUIT THEOREMS	
II	Series and parallel circuits - Network theorems: Maximum Power Transfer and superposition.	6
	SEMICONDUCTOR DEVICES	
III	Semiconductors (p-n junction) - Diodes – Rectifiers – SMPS – Transistors – FET.	6
	LOGIC CIRCUITS	
IV	Number systems - Boolean algebra - Logic gates - Operational amplifier – filter – ADC – DAC.	6
	APPLICATIONS	
V	Overview of microprocessors, microcontrollers, IoT devices and its Applications- Case study.	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, students would be able to:

CO1: Apply Ohm's Law and Kirchhoff's Laws to analyze DC circuits.

CO2: Evaluate the efficiency and performance of circuits based on given theorems.

CO3: Apply knowledge of rectifiers and SMPS to analyze power conversion in electronic circuits.

CO4: Apply operational amplifiers in signal processing and circuit design.

CO5: Apply knowledge of microprocessors and microcontrollers to control and automate systems.

TEXT BOOKS:

T1: William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.

T2: David A. Bell ,"Electronic devices and circuits", Oxford University higher education, 5th edition 2008.

T3: Goankar, R.S. - Microprocessor Architecture, Programming, and Applications with the 8085 (6th Edition). Pearson Education.

REFERENCE BOOKS:

R1: Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.

R2: Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

R3: Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition 2014.

R4: Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.

CO-PO MAPPING

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	1	2	-	1	-	-	-	-	-	1	-	2
CO2	3	3	2	2	2	1	2	-	-	-	-	-	2	1	2
CO3	3	3	2	1	2	-	2	-	-	-	-	-	1	-	2
CO4	3	2	3	2	2	-	1	-	-	-	-	-	1	1	2
CO5	3	3	3	2	3	-	2	-	3	2	1	-	2	2	3
AVG	3	2.8	2.2	1.6	2.2	1	1.6	-	3	2	1	-	1.4	1.3	2.2

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THEORY WITH LAB COMPONENT

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22PH2153	**Physics for Computational sciences (For B.E.CSE, CSE (CS), B.Tech. AIML, IT)**	2	0	2	3

Course Objective

The learner should be able to :

1. Extend the knowledge about laser in engineering field
2. Acquire knowledge about electrical properties of materials
3. Enhance the fundamental knowledge in semiconducting materials.
4. Gain knowledge about mechanical properties of materials
5. Enhance the knowledge on fiber optics and its properties.

Unit	Description	Instructional Hours
I	**PHOTONICS** Characteristics of Laser - Principle of spontaneous emission and stimulated emission - Active medium - Types of laser -. Principle, Construction, Working, Properties, Merits, Demerits and applications of Nd-YAG laser - Semiconductor laser - homojunction and heterojunction – Applications – Holography (3D profiling). Applications – Holography (3D profiling). **Determination of Wavelength and particle size using Laser Visit to IDA lab**	9
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures – Quantum theory – Postulates - Fermi - Dirac statistics – Effect of temperature on fermi function – Density of energy states – concentration of electrons.	6
III	**SEMICONDUCTING AND MAGNETIC MATERIALS** Introduction – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Intrinsic semiconductor – carrier concentration - electrical conductivity – band gap determination. Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials. **Determination of Bandgap of a semiconducting material.**	9
IV	**MECHANICS OF MATERIALS** Elasticity – Hooke's law –stress-strain diagram – bending moment – depression of a cantilever – derivation of young's modulus of the material of the beam by uniform bending - theory and experiment. Twisting couple - Torsion pendulum: theory and experiment. **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	12
V	**BASICS OF FIBRE OPTICS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Fiber optical communication link – Fiber optic sensors – Temperature and displacement sensors. **Determination of acceptance angle and numerical aperture in an optical fiber.**	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, the learner will be able to

CO1: Familiarize the concepts of optics in the field of Engineering
CO2: Recall the knowledge on basics of electrical properties of solid materials.
CO3: Relate the concept of acceptor or donor levels and the band gap of a semiconducting materials
CO4: Recall the basics of mechanical properties of materials of materials.
CO5: Relate the basics of fiber optics and its applications.

TEXTBOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2 - Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCEBOOKS:

R1 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2018.
R2 - Halliday, D., Resnick, R. and Walker, J. "Principles of Physics". Wiley, 2020.

WEB REFERENCES

1.https://nptel.ac.in/courses/112108150/

2.https://en.wikipedia.org/wiki/Aircraft/

3. https://en.wikipedia.org/wiki/Aerospace_materials/

4. https://nptel.ac.in/courses/112106227/

5. https://nptel.ac.in/courses/104104085/

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	-	1	-	2	2
CO2	3	3	3	2	2	-	3	-	-	-	-	3
CO3	3	3	3	2	2	-	3	-	-	-	-	2
CO4	2	3	2	1	2	1	1	-	2	-	2	3
CO5	3	2	3	1	2	1	1	-	1	-	2	2
AVG	2.6	2.8	2.8	1.6	2.0	1.0	1.8	-	1.3	-	2.0	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)	2	0	2	3

Course Objective

The learner should be able to

1. Improve essential business communication skills.
2. Enrich employability knowledge.
3. Acquire the crucial organizing ability in official forum.
4. Develop study skills and communication skills in formal and informal situations.
5. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.

Unit	Description	Instructional Hours
I	**Language Proficiency**: Sentence Pattern, writing definitions **Writing**: Describing product, work place and service (purpose, appearance, function) **Vocabulary** – Words on Nature **Practical Component:** **Listening**-Watching and interpreting advertisements /short films **Speaking**- Extempore / Public Speaking, Difference between Extempore / Public Speaking, Communication Guidelines for Practice	7+2
II	**Language Proficiency**: The Concept of Word Formation, Direct and Indirect Speech. **Writing: Formal** Memos, Job application and Resume preparation **Vocabulary** - Words on Offense and Ethics **Practical Component:** **Listening**- Comprehensions based on telephonic conversation **Speaking**- Vote of thanks& welcome address	7+2
III	**Language Proficiency**: Homophones and Homonyms, Question Tag **Writing**: Preparing a detail plan for an official visit, Schedule and Itinerary, Spotting Errors **Vocabulary**– Words on Society **Practical Component:** **Listening**- Listening-paraphrasing the listened content **Speaking**-Group Discussion with preparation	5+4
IV	**Language Proficiency**: Idioms, Commonly Confused Words Writing: Report Writing (marketing, investigating) **Vocabulary** - words involved in business **Practical Component:** **Listening**-Watching technical discussions and preparing Mom **Speaking**- On the spot Group Discussion	5+4
V	**Language Proficiency**: Relative Pronoun, Regular and Irregular verb **Writing:** Making/ Interpreting Chart, Sequencing of Sentences **Vocabulary**- Words involved in Finance **Practical Component:** **Listening**-Comprehensions based on announcements **Speaking**-Presentation on a technical topic with ppt.	6+3
	Total Instructional Hours	**45**

At the end of the course, learners will be able to

Course Outcome

CO1 Use English Language effectively in spoken and written forms.

CO2: Make oral and written presentation in corporate forum

CO3: Acquire basic proficiency in English including reading and listening comprehension, Writing and speaking skills.

CO4: Take an effective role and manage in an organizational sector.

CO5 Prepare and demonstrate a professional presentation.

TEXT BOOKS:

T1: Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] – 2019.

T2: Raymond Murphy, "Essential English Grammar", 5 the Edition Cambridge University Press, 2019

T3: Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.

REFERENCE BOOKS:

R1: A Course in Technical English–D Praveen Sam, KN Shoba, Cambridge University Press – 2020

R2: English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – 2019.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22IT2251R	PYTHON PROGRAMMING AND PRACTICES	2	0	2	3

Course Objective

The student should be made to

1. To understand and be aware of algorithmic problem solving
2. To read, understand and write simple Python programs
3. To develop Python functions/programs with conditionals and loops
4. To use Python data structures — lists, tuples, dictionaries
5. To do input and output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). **Illustrative problems: Finding LCM/GCD, Fahrenheit to Celsius conversion, Performing Matrix addition.**	6
II	**DATA, STATEMENTS and CONTROL FLOW** Data Types, Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if) alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass. **Illustrative problems: Area of the polygon, check the given year is Leap year or not, Factorial of a Number, Fibonacci series generation**	6
III	**FUNCTIONS and STRINGS** Functions, parameters and arguments; Fruitful functions: retsurn values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module. **Illustrative programs: Perform Linear Search, Selection sort, Sum of all elements in a List, Pattern Programs**	6
IV	**LISTS, TUPLES and DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension. **Illustrative programs: List and Dictionary manipulation, Finding Maximum/minimum/average in a List, String processing.**	6
V	**FILES, MODULES and PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages. **Illustrative programs: Creating/Reading/writing in a file, word count, Handling Exceptions scenarios with simple example.**	6
	Total Instructional Hours (Theory)	**30**
	Total Instructional Hours (Practicals)	**30**
	Total Instructional Hours	**60**

Laboratory (Practical) Exercises — 30 hours

(The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)\
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error,voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc

Course Outcome

At the end of the course, students would be able to:

- CO1 Design effective algorithms to solve computational problems by utilizing building blocks like statements, control flow, functions, and employing problem-solving techniques with iteration and recursion.
- CO2: Develop fundamental Python programs that utilize data types, operators, control flow with conditionals and iteration, while incorporating comments for readability.
- CO3: Construct Python functions that process and manipulate strings using parameters, return values, and understand its scope.
- CO4: Utilize Python's built-in data structures like lists, tuples, and dictionaries to effectively store, manipulate, and access data.
- CO5 Create robust Python programs that interact with the file system by reading and writing text files.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, - An Introduction to Python (Revised and updated for Python 3.6.2), Schroff Publishers, First edition, 2017.

T2: S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, - Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019.

REFERENCE BOOKS:

R1: M.Sabrigiriraj, K.Manoharan – Programming Prowess: Conquering 110 coding challenges illustrated with Python code, Publisher: Hindusthan Educational Institutions, 2024

R2: Charles Dierbach —Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

R3:Robert Sedgewick, Kevin Wayne, Robert Dondero —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

Web Links for Programming Practice:

1. **https://www.hackerrank.com/domains/python**
2. **https://leetcode.com/problemset/**

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	1	-	-	-	-	2	-	2	3	1	2
CO2	1	1	3	1	1	-	-	-	-	2	-	2	2	1	1
CO3	2	2	3	1	2	-	-	-	-	2	-	2	2	-	1
CO4	2	2	3	1	3	-	-	-	-	2	1	2	2	-	1
CO5	2	2	3	1	3	-	-	-	-	2	1	2	2	-	1
AVG	1.8	2	3	1.2	2	-	-	-	-	2	1	2	2.2	1	1.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech/B.E	22IT2253	DYNAMIC WEB DESIGN (AIML, CSE & IT)	2	0	2	2

Course Objective

The student should be made to

01. To get Introduction to Java Script.
02. To understand about Dialog box and functions in Java Script.
03. To learn about Control statements in Java script.
04. To study bout Arrays and objects in Java Script.
05. To have a knowledge in Event handling in JavaScript.

Unit	Description	Instructional Hours
I	**Introduction to JavaScript** Introduction-History of JavaScript -Simple Program: Displaying a dynamic Line of Text in a Web Page-Modifying Our First Program Obtaining – Data Type – Identifiers - Operators.	06
II	**Dialog Box and Functions** User Input with prompt Dialogs (alert, prompt, confirm) - Arithmetic operations using prompt(Detail) - Functions-Function Expression Arrow Function	06
III	**Control Statements** If statement-if else statement-else-if statement-Switch statement-repetition statements-while repetition statement -do-while repetition statement -for repetition statement –break and continue statements.	06
IV	**Arrays and Object** Arrays-Declaring and Allocation Arrays-Array Methods-Built in Object-Math –String-Date - Display Date and Time with Greeting– Boolean – documents	06
V	**Event Handling AND Regular Expression** Document Object Model-Element Access in JavaScripts- Events and Event Handling-Basic Concepts of Event Handling- Events, Attributes, and Tag-Event Handler Attributes Handling Events from Form Elements -Regular Expression	06
	Total Instructional Hours	**30**

Scenario:

01 Let the user input the radius of a circle and calculate its diameter, circumference, and area when a button is clicked. Display these values on the page in a styled format.

02 Design a stylish calculator to perform basic arithmetic operations such as addition, subtraction, multiplication, and division.

03 Imagine you are developing a simple web-based grade calculator. The user will input their score, and the system will give them their grade (A, B, C, D, or F) based on the score. The user can also confirm if they want to input a new grade.

04 Let's consider a real-time scenario where you are building a **Dashboard Application** for a web-based system, such as an employee portal or personal productivity dashboard. This application shows the current time and provides personalized greetings based on the time of day. For example, it should greet the user with "Good Morning," "Good Afternoon," or "Good Evening" depending on the time and display the date and time in a readable format.

05 You are developing a simple ATM system that allows users to check their balance, withdraw cash, deposit cash, and change their PIN. The system should handle various conditions based on the user's input.

06 As a data analyst in a company, you are tasked with getting input from the user regarding employee salaries. First, prompt the user to enter the number of employees. Then, ask the user to input the salary for each employee and store these values in an array. Once all salaries have been collected, sort the array in descending order. After sorting, display the sorted salaries along with the highest salary and the average salary. This will help provide valuable insights into the salary distribution across the company.

Total No Practical Hours : 15

At the end of the course, students would be able to:

Course Outcome

CO1 Understand the fundamentals of JavaScript, including its history and basic syntax.

CO2: Students will be able to implement prompt dialogs, perform calculations, and define functions using JavaScript to create interactive web pages.

CO3: Apply these control flow structures to solve complex programming problems and write efficient algorithms.

CO4: create, manipulate, and utilize arrays and built-in objects in JavaScript to solve programming problems.

CO5 Understand the fundamental concepts of the Document Object Model (DOM), including element access and manipulation in JavaScript.

TEXT BOOKS:

T1 Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Modern Information Retrieval: TheConcepts and Technology behind Searchl, Second Edition, ACM Press Books,2011.

T2 C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press,2009.

REFERENCE BOOKS:

T1 Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2016.

T2 David A Grossman and Ophir Frieder, Information Retrieval: Algorithms and Heuristics, 2nd Edition, Springer, 2004.

T3 Bruce Croft, Donald Metzler and Trevor Strohman, —Search Engines: Information Retrieval in Practice, Addison Wesley, (1st Edition) 2009.

T4 Mark Levene, —An Introduction to Search Engines and Web Navigation, Wiley Publications, 2nd edition, 2010

CO-PO MAPPING

PO & PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO1	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO2	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO3	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO4	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO5	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
AVG	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3

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PRACTICAL

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22ME2001	ENGINEERING PRACTICES (Common to all branches)	0	0	4	2

Course Objective: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit **Description of the Experiments**

GROUP A (CIVIL AND MECHANICAL)

1. Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2. Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3. Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4. Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5. Practice on sheet metal Models– Trays and funnels
6. Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7. Practice on simple step turning, taper turning and drilling.
8. Demonstration on Smithy operation.
9. Demonstration on Foundry operation.
10. Demonstration on Power tools.

GROUP B (ELECTRICAL ENGINEERING)

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5. Measurement of energy using single phase energy meter.
6. Soldering practice using general purpose PCB.
7. Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8. Study of Energy Efficient Equipment's and Measuring Instruments.

Total Instructional Hours **45**

Course Outcome
- Fabricate wooden components and pipe connections including plumbing works.
- Fabricate simple weld joints.
- Fabricate different electrical wiring circuits and understand the AC Circuits.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	1	1	-	-	1
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	-	-	-	-	-	-	1	1	-	-	1

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EEC COURSES (SE/AE)

Programme B.E/ B.TECH	Course Code	Name of the Course	L	T	P	C
	22HE2071	DESIGN THINKING	2	0	0	2

Course Objective

The student should be able to

1. To expose students to the design process
2. To develop and test innovative ideas through a rapid iteration cycle.
3. To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	6
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	5
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	6
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	6
V	**DESIGN THINKING TOOLS AND METHODS** Purposeful Use of Tools and Alignment with Process - Journey Mapping - Value Chain Analysis - Mind Mapping – Brainstorming - Design Thinking Application: Design Thinking Applied to Product Development	7
	Total Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able to

CO1: Develop a strong understanding of the Design Process
CO2: Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 - 1. Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.
R2 - 3. Tim Brown, "Change by Design", 2009.

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS0 1	PS0 2
CO1	3	3	1	3	2	1	-	-	2	-	-	1	1	-
CO2	3	2	1	3	2	3	-	1	2	-	-	2	1	1
CO3	3	3	1	3	2	1	-	1	2	-	-	1	1	1
CO4	3	2	1	3	-	1	-	1	-	-	-	2	1	1
CO5	3	1	1	3	2	2	-	-	2	-	-	1	1	-
AVG	3	2	1	3	2	2	-	1	2	-	-	1	1	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/ B.TECH	22HE2072	SOFT SKILLS AND APTITUDE	1	0	0	1

Course Objective

The student should be able to

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition demonstration and practice.
2. To enhance the students ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	4
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able to

CO1: Students will analyze interpersonal communication skills. public speaking skills.
CO2: Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3: Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4: Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity
CO5: Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

REFERENCE BOOKS:

R1 - Quantitative Aptitude – Dr. R S Agarwal
R2 -Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3 -Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4- Objective General English – S.P.Bakshi

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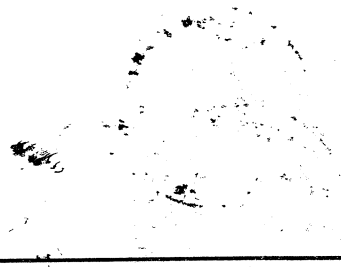
MANDATORY COURSE



	பாடநெறி குறியீடு	பாடத்தின் பெயர்	L	T	P	C
பி.இ/ க	22MC2094/2095	தமிழரும்தொழில்நுட்பமும் (முதலாம் ஆண்டு பி.இ பொது பாடப்பிரிவு)	2	0	0	0

பாடத்தின் நோக்கம்

கற்றவர்இயலவேண்டும்

1. சங்க காலத்தில் தொழில்துறை பற்றிய அறிவைப் பெறுதல்.
2. சங்க காலத்தில் வீட்டின் பொருள் ,சிற்பங்கள் மற்றும் கோவில்கள் வடிவமைப்பு பற்றி கூட்டு கற்றல்
3. வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் அறிவை வளர்த்துக் கொள்ளுங்கள்.
4. வேளாண்மை மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பண்டைய நுட்பங்களைப் பற்றிய அறிவைப் பெறுதல்.
5. தமிழ் மொழியின் மென்பொருள் பற்றி அறிதல்

அலகு	விளக்கம்	பயிற்சி நேரம்
I	**நெசவுமற்றும்பானைத்தொழில்நுட்பம்** சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம்-கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	3
II	**வடிவமைப்புமற்றும்கட்டிடத்தொழில்நுட்பம்** சங்க இலக்கியத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும்சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிப்பாடுத் தளங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோச்செனிக் கட்டிடக் கலை.	3
III	**உற்பத்தி தொழில்நுட்பம்** கப்பல் கட்டும் கலை- உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருகுதல் எஃகு - வரலாற்றுசாலை சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் , கண்ணாடிமணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின்வகைகள்.	3
IV	**வேளாண்மைமற்றும்நீர்பாசனத்தொழில்நுட்பம்** அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்க பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.	3
V	**அறிவியல்தமிழ்மற்றும்கணித்தமிழ்** அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	3
	மொத்தபயிற்றுவிக்கும்நேரம்	15

பாடத்தின் முடிவு

பாடநெறியின்முடிவில்கற்றவர்கற்றபின்

பா மு1: பண்டைய தொழில்நுப்பதை அடையாளம் கொள்ள தெரியும்

பா மு2: சங்க கால கட்டுமானப் பொருட்கள்- சிற்ப வகைகளை வேறுபடுத்த முடியும்

பா மு3: வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் பட்டியலிட்டு அடையாளம் காண முடியும்

பா மு4: விவசாயம் மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பழங்கால நுட்பங்களைப் பற்றி விளக்கத்துடன் நிரூபிக்க முடியும்

பா மு5: தமிழ் மொழியின் புதிய மென்பொருள் பற்றி உருவாக்கக் கூடிய திறன் மேம்படுத்துதல்.

உரைபுத்தகங்கள்

உ1- தமிழக வரலாறு - மக்களும் பண்பாடும் - கே .கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

உ2- எஸ்.கே. சிங், இடைக்கால இந்தியாவின் வரலாறு. புது தில்லி: ஆக்சிஸ் புக்ஸ் பிரைவேட் லிமிடெட், 2013.

குறிப்புகள்

கு1- கணிதத்தமிழ் -முனைவர் இல. சுந்தரம் .(விகடன் பிரசுரம்)

கு2- கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.

ஆய்வுவாரியதலைவர்டீன் கல்வியாளர் / முதல்வர்

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22MC2094/2095	TAMIL AND TECHNOLOGY	2	0	0	1

Course Objectives :

The student should be able to

1. Acquiring knowledge of industry during the Sangam Period.
2. Collaborate learning about house design, sculpture and temples during Sangam Period.
3. Develop Knowledge in metallurgical studies as a source of historical and archaeological evidence.
4. Acquiring knowledge about ancient techniques used in agriculture and agro processing
5. Knowledge of Tamil language literature.

UNIT I WEAVING AND CERAMIC TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and goldCoins as source of history – Minting of Coins – Beads making-industries Stone beads -Glass beads – Terracotta beads - Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Course Outcome:

After completion of the course the learner will be able to

CO1: Recognize ancient business

CO2: Distinguish Sangam period building material and types of sculpture.

CO3: Identify the source of historical and archaeological

CO4: Demonstrate the techniques used in agriculture and agro processing.

CO5: Understand the new software of Tamil language.

2MC2094/2095TAMILS AND TECHNOLOGY

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	2	3	3	-	-	-	-	-	2	-	-	2
CO2	2	3	3	-	-	-	-	-	2	-	-	2
CO3	2	3	3	-	-	-	-	-	2	-	-	2
CO4	2	3	-	-	-	-	-	-	2	-	-	2
CO5	2	3	-	-	-	-	-	-	2	-	-	2
AVG	2	3	3	-	-	-	-	-	2	-	-	2

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
IT - HiCET

DEAN – ACADEMICS

Dean (Ac...
HiCET

ACADEMIC COUNCIL ★ HICET ★ Chairman

Programme	Course Code	Name of the Course	L	T	P	C
BE/BTECH	22MC2093	SOCIAL SERVICES AND COMMUNITY DEVELOPMENT	1	0	0	1

Course Objectives:

The student should be able to

1. Acquire the knowledge and active participate in social service and community development activities.
2. Understand the concept of disaster management and role of NCC cadets in disaster management.
3. Understand the concept thinking and reasoning process.
4. Understand about maps and use of bearing and service protector
5. Know about the principles of flight and Aero foil structure and ATC procedures.

Unit	Description	Instructional Hours
I	**SOCIAL SERVICES AND COMMUNITY DEVELOPMENT** Basics of social services and its need - Rural development programs - Contribution of youth towards social welfare - NGOs in social services SwachbharathAbhiyan - Social evils - Mission Indradanush - BetibachoBetipado - Digital awareness - Constitution day.	3
II	**DISASTER MANAGEMENT** Organization of Disaster management -Types of emergencies - Natural and manmade disasters - fire service and fire fighting - prevention of fire.	3
III	**PERSONALITY DEVELOPMENT** Introduction to personality development - public speaking Intra and Inter personal skills -self awareness - critical thinking - Decision making and problem solving.	3
IV	**MAP READING** Types of maps - conventional signs - scales and Grid system - relief and contour gradient - cardinal points - Types of North - types of bearing and use of service protector - Prismatic compass and its uses - setting of map - finding North and own position.	3
V	**PRINCIPLES OF FLIGHT AND AIRMANSHIP** Introduction to principle of flight - Forces acting on the aircraft - Angle of attack - Angle of incidence - Newton's - law of motion - Bernauli's theorem and Venturi effect - Aerofoil - Airfield layout - ATC (Air Traffic Control) - circuit procedures - Aviation medicine.	3
	Total Instructional Hours	15

Course Outcome:

After completion of the course the learner will be able to

CO1: Perform the social services on various occasions for better community and social life

CO2: Appreciate the need and requirement for disaster management and NCC role in disaster management activities.

CO3: Define thinking, reasoning, critical thinking and creative thinking

CO4: Use of bearing and service protector and locate the places and objects on the ground.

CO5: Understand the principles of flight and Aerofoil structure

Reference:

1. UGC and AICTE circulated syllabus.

Text Books:

1. NCC cadet Guide (SD/SW) Army
2. NCC cadet Guide (SD/SW) Airforce.
3. ANOs Guide (SD/SW) by DG NCC, Ministry of Defence, New Delhi
4. Digital Forum App 1.0 & 2.0, by DG NCC DG NCC, Ministry of Defence, New Delhi

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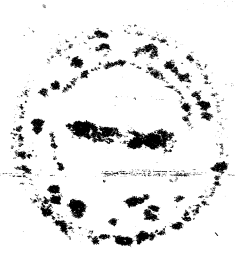
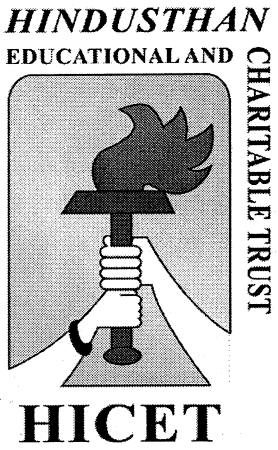
DEAN – ACADEMICS

Dean (Academics)
HiCET



HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi& Accredited by NAAC with 'A ++' Grade)
Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu

B.TECH. INFORMATION TECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for EVEN Semester

Academic Year 2024-2025

BATCH 2023-2027

CURRICULUM R2022

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS
CBCS PATTERN
UNDERGRADUATE PROGRAMME
B.TECH.INFORMATIO TECHNOLOGY (UG)
REGULATION-2022
For the students admitted during the academic year 2023-2024

SEMESTER I – 18 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	Matrices-and Calculus	BSC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
2.	22CY1151	Chemistry for Circuit Engineers	BSC	2	0	2	3	4	50	50	100
3.	22CS1151	Problem solving using C programming	HSC	2	0	2	3	4	50	50	100
4.	22HE1151	English for Engineers	ESC	2	0	2	3	4	50	50	100
5.	22IT 1152	Introduction to web Application Development	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	2	0	0	0	1	100	0	100
MANDATORY COURSE											
8.	22MC1093/ 22MC1094	தமிழரம்ரபு / Heritage of Tamil	MC	2	0	0	1	2	40	60	100
9.	22MC1095	Universal Human Values	MC	2	0	0	0	2	100	0	100
		TOTAL		**16**	**1**	**8**	**18**	**20**	**480**	**320**	**800**

SEMESTER II - 23 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2103	Differential Equations And Linear Algebra	BSC	3	1	0	4	4	40	60	100

2.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH2151	Physics for Circuit Engineering /Physics for Engineers	BSC	2	0	2	3	4	50	50	100
4.	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
5.	22IT2251	Python programming and Practices	PCC	2	0	2	3	4	50	50	100
6.	22IT2253	Dynamic Web Design	PCC	2	0	2	2	3	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2094/ 22MC2095	தமிழரும் தொழில்நுட்பமும்/ Tamil and Technology	MC	2	0	0	1	2	40	60	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**18**	**1**	**12**	**23**	**29**	**580**	**420**	**1000**

SEMESTER III– 25 Credit

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3101	Applied Statistics and Queuing Theory	BSC	3	1	0	4	4	40	60	100
2.	22IT3201	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	22IT3202	Operating System	PCC	3	1	0	4	4	40	60	100
4.	22IT3203	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22IT3251	Java Programming	PCC	3	0	2	4	4	50	50	100
PRACTICAL											

6.	22IT3001	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	22IT3002	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	22IT3003	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV – 23 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22IT4201	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	22IT4203	Object Oriented Software Engineering	PCC	3	0	0	3	3	40	60	100
4.	22IT4204	Database Management System	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22IT4251	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	22IT4253	Computer Networks	PCC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	22IT4001	Case Tools Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	22IT4003	Data Base Management System Laboratory	PCC	0	0	3	1.5	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills and Aptitude –III	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC4091	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**16**	**0**	**12**	**23**	**29**	**480**	**420**	**900**

Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V – 22 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT5201**	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	**22IT5202**	Embedded System and IOT	PCC	3	0	0	3	3	40	60	100
3.	**22IT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22IT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22IT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	**22IT5251**	Application Development	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22IT5001**	Artificial Intelligence and Machine Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills-4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	18	1	6	22	25	410	390	800

SEMESTER VI – 24 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	**22IT6201**	Foundations of Data Science	PCC	3	0	0	3	3	40	60	100
2.	**22IT6202**	Principles of Compiler Design	HSC	3	0	0	3	3	40	60	100
3.	**22HE6101**	Professional Ethics	PEC	3	0	0	3	3	40	60	100
4.	**22IT63XX**	**Professional Elective-4**	PEC	3	0	0	3	3	40	60	100
5.	**22XX63XX**	**Professional Elective-5**	OEC	3	0	0	3	3	40	60	100

6.	22XX64XX	**Open Elective–1***	OEC	3	0	0	3	3	40	60	100
7.	22CY6101	Environmental Science	ESC	2	0	0	2	3	40	60	100
PRACTICAL											
8.	22IT6001	Project Based Learning	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII – 20 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22IT7201	Distributed and Cloud Computing	PCC	3	0	0	3	3	40	60	100
2.	22IT7202	Quantum Computing	PCC	3	1	0	4	4	40	60	100
3.	22IT7203	Edge Computing	PCC	3	0	0	3	3	40	60	100
4.	22XX73XX	**Professional Elective-6**	PEC	3	0	0	3	3	40	60	100
5.	22XX74XX	**Open Elective–2***	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22IT7001	Cloud Computing Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22IT7701	Internship - II*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII – 10 Credits

S. No	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC COURSES (SE/AE)											
1.	22IT8901	Project Work	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. * As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I

(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3
5	22BM6401	3D printing	OEC	3	0	0	3	3
6	22AE6401	Space Science	OEC	3	0	0	3	3
7	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
8	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
9	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
10	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
11	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
12	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3

13	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
14	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3
15	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3
16	22FT6401	Traditional Foods	OEC	3	0	0	3	3
17	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
18	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3
19		NCC Level - I	OEC	3	0	0	3	3

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3
10	22LS7410	Business Communication	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Data Science	Vertical II Full Stack Development for IT	Vertical III Cloud Computing and Data Centre Technologies	Vertical IV Internet of Things	Vertical V Creative Media	Vertical VI Emerging Technologies
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing and Automation	**22IT5307** Data Warehousing and Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cybersecurity
22IT5303 Computer Vision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry 4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** Stream Processing	**22IT6307** Fog Computing & Energy Management in Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big Data Analytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT Cloud and Data Analytics	**22IT6310** Video Analytics	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and video analytics	**22IT7302** Security and Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304** IOT Security	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Image and video analytics	PEC	3	0	0	3	3

Details of Vertical II: Full Stack Development for IT

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Security and Privacy in Cloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software Defined Networks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5310	Design of Smart Cities	PEC	3	0	0	3	3
2.	22IT5311	IoT Architectures and Protocols	PEC	3	0	0	3	3
3.	22IT5312	Industry 4.0	PEC	3	0	s0	3	3
4.	22IT6307	Fog Computing & Energy Management in IoT Devices	PEC	3	0	0	3	3
5.	22IT6308	IoT cloud and data analytics	PEC	3	0	0	3	3
6.	22IT7304	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5313	Multimedia Data Compression and Storage	PEC	3	0	0	3	3
2.	22IT5314	Multimedia and Animation	PEC	3	0	0	3	3
3.	22IT5315	Digital marketing	PEC	3	0	0	3	3
4.	22IT6309	UI and UX Design	PEC	3	0	0	3	3
5.	22IT6310	Video Creation and Editing	PEC	3	0	0	3	3
6.	22IT7305	Visual Effects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5316	Augmented Reality	PEC	3	0	0	3	3
2.	22IT5317	Cyber security	PEC	3	0	0	3	3

3.	22IT5318	Tamil Computing	PEC	3	0	0	3	3
4.	22IT6311	Robotic Process Automation	PEC	3	0	0	3	3
5.	22IT6312	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	22IT7306	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. **Clause 4.10** of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree.

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5471	Sem5: Database System	MDC	3	0	0	3	3
2.	22IT6471	Sem6: Fundamentals of Data Science	MDC	3	0	0	3	3
3.	22IT6472	Sem6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3
4.	22IT7471	Sem7: Data Exploration and Visualization	MDC	3	0	0	3	3
5.	22IT7472	Sem7: Business Intelligence	MDC	3	0	0	3	3
6.	22IT8471	Sem8: Cyber Security	MDC	3	0	0	3	3

MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Block chain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

VERTICALS FOR HONOR DGREE

B Tech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5371	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	22IT6371	Ethics and Artificial Intelligence	PC	3	0	0	3	4	40	60	100
3.	22IT6372	Knowledge Engineering	PC	3	0	0	3	4	40	60	100
4.	22IT7371	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	22IT7372	Gaming Theory	PC	3	0	0	3	4	40	60	100
6.	22IT8371	Generative AI	PC	3	0	0	3	4	40	60	100

B Tech (Hons) Information Technology with Specialization in Cyber Security

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5372	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	22IT6373	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	22IT6374	Social Networks Security	PC	3	0	0	3	3	40	60	100
4.	22IT7373	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100

5.	22IT7374	Cryptocurrency and Block chain Technologies	PC	3	0	0	3	3	40	60	100
6.	22IT8372	Network Security	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Information Technology with Specialization in Block Chain Technology

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5373	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	22IT6375	Block chain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	22IT6376	Building Private Block chain	PC	3	0	0	3	3	40	60	100
4.	22IT7375	Block chain Business Models	PC	3	0	0	3	3	40	60	100
5.	22IT7376	Block chain and IoT	PC	3	0	0	3	3	40	60	100
6.	22IT8373	Block chain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	Course Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	2	-	-	17
4	PCC	-	3	13	20	12	8	12	-	68
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	3	3	-	6
7	EEC	1	3	3	1	1	2	2	10	23
8	MCC	1	1	-	-	-	-	-	-	02
Total		18	23	25	23	22	24	20	10	165

CREDIT DISTRIBUTION R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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SYLLABUS

THEORY

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT4201	DESIGN AND ANALYSIS OF ALGORITHMS	3	0	0	3

Course Objective

The student should be made to

1. Analyze the performance of algorithms
2. Understand the various designing techniques and methods for algorithms
3. Understand and design algorithms using greedy strategy, divide and conquer approach and dynamic programming
4. Solve problems using greedy approach
5. Understand the Backtracking and Branch and Bound problems

Unit	Description	Instructional Hours
I	**ALGORITHM ANALYSIS TECHNIQUES** Notion of an Algorithm - Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties. Analysis Framework - Mathematical analysis for Recursive and Non-recursive algorithms.	9
II	**BRUTE FORCE and DIVIDE-AND-CONQUER** Brute Force – Selection sort– Exhaustive Search – Travelling Salesman Problem – Knapsack Problem – Assignment problem. Divide-And Conquer-Binary Search – Merge sort – Quick sort – Finding maximum and minimum in an array.	9
III	**DYNAMIC PROGRAMMING** Principle of optimality- Computing a Binomial Coefficient – Warshall's algorithm- Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions.	9
IV	**GREEDY APPROACH** Container loading problem-Prim's algorithm and Kruskal's Algorithm Dijkstra's Algorithm– 0/1 Knapsack problem, Optimal Merge pattern – Huffman Trees.	9
V	**BACKTRACKING AND BRANCH AND BOUND** Backtracking – n-Queen problem – Hamiltonian Circuit Problem – Subset Sum Problem- Graph coloring-Branch and Bound – LIFO Search and FIFO search – Assignment problem – Knapsack Problem – Travelling Salesman Problem.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze the time and space complexity of algorithms
CO2:	Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO3:	Analyze the different algorithm design techniques for a given problem
CO4:	Apply graphs to model engineering problems
CO5	Solve complex problems using backtracking. branch and bound techniques

Programme	Course code	Name of the course	L	T	P	C
B.E.	22HE4101	IPR AND START-UPS	2	0	0	2

Course Objective

The student should be able

1. To the main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right,
3. To learn about the trademarks in our country and foreign countries of their invention.
4. To know the designs and information Technology Act of IPR
5. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IPR** Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights Introduction to Trade-Related of Intellectual Property Rights (TRIPS) and World Trade Organization (WTO). - Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	6
II	**PATENT RIGHTS AND COPY RIGHTS** Origin, Meaning of Patent, Types, Procedure to follow the methods of IP agents, Inventions, which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties. COPY RIGHT- Origin, Definition &Types of Copy Right, Patent Ethics, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.	9
III	**TRADE MARKS** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing off, Penalties. Domain Names on cyber space.	6
IV	**DESIGN** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	6
V	**BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000** IT Act – Introduction, Latest Amendments, E-Commerce and legal provisions, E-Governance and legal provisions, Digital signature and Electronic Signature, Cybercrimes.	3
	Total Instructional Hours	**30**

Course Outcome

Upon completion of the course, the students will be able to:

CO1: Understand IPR and aware the invention rights.

CO2: The students once they complete their academic projects, they get awareness of acquiring the patent

CO3: They also learn to have copyright for their innovative works.

CO4: Understand the designs and information Technology Act of IPR

CO5: They also get the knowledge of plagiarism in their innovations which can be questioned legally.

TEXT BOOK:

T1. Intellectual Property Rights (IPR) by M.K Bhandari 2021

T2. Law relating to Intellectual Property Rights, by V.K Ahuja 2017

T3. Intellectual Property Rights (IPR) for Start-ups by Vinay Vaish 2016

T4. Intellectual Property - Patents, Copyright, Trade Marks and Allied Rights (South Asian Edition) by W Cornish and D Llewelyn and T Pain 8th South Asian Edition, 2016

Chairman, Board of Studies

Chairman - BoS
IT - HiCET

ACADEMIC COUNCIL * Chairman * KONGUNADU COLLEGE OF ENGG & TECH

Dean–Academics

Dean (Academics)
HiCET

TEXT BOOKS:

T1: Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012

T2: Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2008.

REFERENCE BOOKS:

R1: Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

R2:Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson Publications, 3rd Edition, 2008.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	2	-	-	-	-	1	-	1	-	2	2	3
CO3	3	3	3	2	-	-	-	-	1	-	2	-	2	2	3
CO4	3	3	3	2	1	-	-	-	1	-	3	-	2	2	3
CO5	3	3	3	2	1	-	-	-	1	-	1	-	2	2	3
AVG	2.8	2.8	2.8	2	1	-	-	-	1	-	1.8	-	2	2	2.8

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT4203	OBJECT ORIENTED SOFTWARE ENGINEERING	3	0	0	3

Course Objective

The student should be made to:

1. Learn various Software Development Life Cycle Models.
2. Understand how to gather and analyze the customer requirements.
3. Learn design concepts and different architectural styes for designing software.
4. Understand various testing methods to verify and validate the software.
5. Study the software metrics and managing the artifacts of the software project.

Unit	Description	Instructional Hours
I	**SOFTWARE PROCESS AND AGILE DEVELOPMENT** Defining software- software engineering- software process, generic process model perspective process models: waterfall models -increment process models – evolutionary process models-concurrent models introduction to agility-agile process-extreme programming(XP) case study	9
II	**REQUIREMENTS ANALYSIS AND SPECIFICATION** Requirements engineering - Eliciting requirements - Developing use cases -Building the requirements model -Elements of the requirements - Validating requirements - Software Requirement Specification- UML diagrams: use case model – class diagrams.	9
III	**SOFTWARE DESIGN** Design process- Design concepts- Modularity-Information hiding -Functional independence-Design classes- Design model elements – Architectural styles- Data Flow Diagram -Architectural mapping using data flow-UML diagrams: Interaction diagrams–Activity diagrams – State chart diagrams.	9
IV	**SOFTWARE TESTING AND DEBUGGING** White-Box Testing: basis path testing- Loop testing; Black-Box Testing: equivalence partitioning- boundary value analysis; Verification and Validation- software testing strategy- criteria for completion of testing - Unit testing-Integration testing-Regression testing- Smoke testing - Alpha and Beta testing- System testing-debugging process.	;9
V	**PROJECT MANAGEMENT AND METRICS** Project management concepts: People - Product - Process -Project - the W5HH principle- Software Configuration Management- Metrics: Process metrics- Project metrics; Software measurement: Direct measures- Indirect measures- Size-oriented metrics- Function-oriented metrics- Object-oriented metrics- Web app project metrics.	9
	Total Instructional Hours	**45**

Upon completion of this course, the students will be able to:

Course Outcome

CO1: Apply the appropriate SDLC Model for software project.
CO2: Gather the correct requirements and analyse requirements using UML diagrams.
CO3: Design Document by applying architecture styles and GUI using UML diagrams.
CO4: Test the developed software using various testing methods.
CO5: Manage the developers, customers, Project and measure the software metrics.

TEXT BOOKS:

T1: Roger S. Pressman, 'Software Engineering: A Practitioner's Approach', Seventh Edition, Mc Graw-Hill International Edition, 2010.

T2: Bernd Bruegge and Allen H. Dutoit, 'Object-Oriented Software Engineering: Using UML, Patterns and Java', Third Edition, Pearson Education, 2009.

REFERENCES:

R1: Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, 'Fundamentals of Software Engineering', 2nd edition, PHI Learning Pvt. Ltd., 2010.

R2: Rajib Mall,' Fundamentals of Software Engineering', 3rd edition, PHI Learning Pvt. Ltd., 2009.

R3: Stephen Schach,'Object-Oriented and Classical Software Engineering', 8th edition, McGraw-Hill, 2010.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	-	-	-	-	-	-	-	2	2	2	2
CO2	2	3	2	3	3	-	-	-	-	-	-	2	3	3	2
CO3	2	3	3	2	3	-	-	-	-	-	-	2	3	3	2
CO4	2	2	2	2	3	2	-	-	-	-	3	2	3	3	2
CO5	2	1	1	2	-	2	-	-	3	3	3	2	3	3	2
AVG	2	2.4	2	2.2	3	2	-	-	3	3	3	2	2.8	2.8	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT4204	DATABASE MANAGEMENT SYSTEM	3	0	0	3

Course Objective

The student should be made to

1. Learn the fundamentals of data models.
2. Acquire knowledge about ER diagrams and Normalization.
3. Study various SQL Query and optimization techniques.
4. Understand internal storage structure and indexing techniques for Database Design.
5. Explore the fundamentals of unstructured database systems.

Unit	Description	Instructional Hours
I	**RELATIONAL DATABASES** Purpose of Database System- Database characteristics–Views of Data- Data Models– Database Architecture – Key issues and challenges in Database Systems - Introduction to relational databases – Relational Model – Relational Algebra	9
II	**DATABASE DESIGN** Entity Relationship model - Extended ER –ER to Relational mapping Functional Dependencies, Non - loss Decomposition, Anomaly - 1NF to5NF	9
III	**SQL & QUERY OPTIMIZATION** SQL fundamentals - SQL Standards- Data types - DDL – DML – DCL – TCL – Keys - Integrity – Views – Trigger – Cursors - Embedded SQL - Dynamic SQL - Query Processing and Optimization	9
IV	**TRANSACTION PROCESSING AND CONCURRENCY CONTROL** Transaction Concepts - ACID Properties - Serializability - Concurrency – Need for Concurrency- Concurrency Control - Transaction Recovery – Locking Protocols – Two Phase Locking – SQL Facilities for Concurrency and recovery –Two Phase Commit Protocol	9
V	**NOSQL** Need for NO SQL , Characteristics of NOSQL , Key-value database , Columnar Databases , Apache Cassandra , Click House , Document Databases , MongoDB : CRUD operations with MongoDB . MongoDB JDBC Connectivity, MongoDB Testing, Graph Databases, Metabase.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Describe the purpose, architecture of databases and use relational algebra for data queries.

CO2: Design databases using ER models, relational mapping, and normalization.

CO3: Use SQL commands and optimization techniques to manage and query databases.

CO4: Explain transaction concepts and apply concurrency control and recovery methods.

CO5: Apply NoSQL database concepts and operations using tools like MongoDB.

TEXT BOOKS:

T1: Ramez Elmasri and Shamkant B. Navathe, 'Fundamentals of Database Systems', Seventh Edition, Pearson Education, 2016.

T2: Abraham Silberschatz, Henry F. Korth and S. Sudharshan, 'Database System Concepts', Seventh Edition, Tata McGraw Hill, 2019.

REFERENCE BOOKS:

R1: C.J.Date, A.Kannan and S.Swamynathan, 'An Introduction to Database Systems', Eighth Edition, Pearson Education, 2012.

R2: Raghu Ramakrishnan, 'Database Management Systems', Fourth Edition, Tata McGraw Hill, 2014.

R3: Bradshaw, Shannon, Eoin Brazil, and Kristina Chodorow "MongoDB: The Definitive Guide", 3rd edition, O'Reilly Media, 2019.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2
CO2	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2
CO3	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2
CO4	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2
CO5	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2
AVG	3	3	3	2	3	-	-	-	2	-	-	2	3	2	2

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THEORY WITH LAB COMPONENT

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT4251	WEB FRAMEWORK	3	0	2	4

The student should be made to

Course Objective

1. Understand the fundamentals of web framework
2. Know the concept of Javascript web framework
3. Be exposed to the concepts of AngularJS
4. Learn the technologies of AngularJS
5. Be familiar with high level python Web framework

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF WEB FRAMEWORK** Web framework-History-Types of framework architectures-Model–view–controller (MVC)-Three-tier organization-Introduction to frameworks-Framework applications - General-purpose website frameworks -Server-side-Client-side-Features.	9
II	**INTRODUCTION TO AngularJS** Introducing AngularJS2, What Is MVC (Model-View-Controller), AngularJS Benefits, The AngularJS Philosophy, Starting Out with AngularJS, What Backend Do I Need?, Does My Entire Application Need to Be an AngularJS App?, A Basic AngularJS Application, AngularJS Hello World	9
III	**BASIC AngularJS DIRECTIVES AND CONTROLLERS** AngularJS Modules, Creating Our First Controller, Working with and Displaying Arrays, More Directives, Working with ng-repeat, ng-repeat Over an Object, Helper Variables in ng-repeat, Track by ID, ng-repeat Across Multiple HTML Elements.	9
IV	**AngularJS - FORMS, INPUTS, AND SERVICES** Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, Displaying Error Messages, Styling Forms and States , Nested Forms with ng-form, Other Form Controls, Textareas, Checkboxes, Radio Buttons, Combo Boxes/Drop-Downs.	9
V	**HIGH LEVEL PYTHON WEB FRAMEWORK - FLASK** Flask – Overview, Environment, Application, Routing, Vaiable Rules, URL Binding, HTTP Methods, Templates, Static Files, Request Objects, Sending Form Data to Template, Cookies, Sessions.	9)
	Total Hours	**45 Hrs**

LAB EXERCISES

Ex 1	Create a simple web page that displays "Hello".
Ex 2	Use the MVC pattern to organize your code. Define a model.
Ex 3	Create a Basic AngularJS Hello World App.
Ex 4	Create a simple AngularJS application that demonstrates the Model-View-Controller (MVC) architecture.
Ex 5	Build a basic to-do list application using AngularJS.
Ex 6	Create a basic weather application using AngularJS to fetch data from a weather API.

Ex 7	Develop a program for Form Validation in AngularJS.
Ex 8	Implement Web 2.0 features using traditional Python web frameworks.
Ex 9	Create a Flask web application Routing and Request Handling.
Ex 10	Create a Flask web application, with Form Handling and Sessions.

Total Hours: 30 Hrs

Course Outcome

Upon completion of this course the students will be able to:

CO1 Analyze the fundamentals of web framework.

CO2 Implement the concepts in AngularJS.

CO3 Use the concept of BASIC AngularJS Directives and Controllers.

CO4 Apply the concept AngularJS - FORMS, INPUTS, AND SERVICES.

CO5 Analyze the High Level Web framework - Flask.

TEXT BOOK:

T1 AngularJS : Up and Running: ENHANCED PRODUCTIVITY WITH STRUCTURED WEB APPS By Brad Green and Shyam Seshadri,' AngularJS', O'Reilly,1st Edition,2014.

T2 Dana Moore, Raymond Budd, William Wright, 'Professional Python Frameworks Web 2.0 ', John wiley& sons, 2008.

T3 Flask Web Development, 2nd Edition by Miguel Grinberg, O'Reilly Media, Inc.

REFERENCES:

R1 The Ultimate Flask Course,by Anthony Herbert,September 2019

R2 https://www.tutorialspoint.com/flask/flask_environment.html

CO V/S POs and PSOs Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	-	2	-	-	-	-	-	-	2	2	2	1
CO2	1	3	3	-	2	-	-	-	2	-	-	2	2	2	1
CO3	2	3	3	-	3	-	-	-	2	-	-	2	2	2	1
CO4	2	3	3	-	3	-	-	-	2	-	-	2	2	2	1
CO5	2	3	3	-	3	-	-	-	2	-	-	2	2	2	1
AVG	1.8	3	2.6	-	2.6	-	-	-	2	-	-	2	2	2	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT4253	COMPUTER NETWORKS	3	0	2	4

Course Objective

The student should be made to

1. To study the Protocol Layering and Physical Level Communication
2. To understand the Data Communication System and the purpose of Layered Architecture.
3. To analyze the concepts of Routing Methods and Sub-netting.
4. To learn the functions of Transport Layer Protocols.
5. To familiarize the Protocols and functions of the Application Layer

Unit	Description	Instructional Hours
I	**OVERVIEW & PHYSICAL LAYER** Introduction - Network Types - TCP/IP Protocol suits - OSI Reference Model - Network Topologies – Physical Layer: Transmission Media: Guided Media, Unguided Media - Switching-Circuit Switched Networks-Packet Switching.	9
II	**DATA LINK LAYER** Introduction – Link-Layer Addressing – DLC Services: Error detection and correction – Data-Link Layer Protocols – HDLC– PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction –IEEE 802.11, Bluetooth – Connecting Devices.	9
III	**NETWORK AND ROUTING** Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms- IPV6 Addressing – IPV6 Protocol.	9
IV	**TRANSPORT LAYER** Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.	9
V	**APPLICATION LAYER** WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.	9
	Total Instructional Hours	45

PRACTICAL EXERCISES: **30 Hours**

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Use a tool like Wireshark to capture packets and examine the packets
3. Write a code simulating ARP /RARP protocols.
4. Simulation of an error correction code (like CRC)
5. Simulation of Distance Vector/ Link State Routing algorithm.
6. Applications using TCP sockets like: a) Echo client and echo server b) Chat
7. Study of TCP/UDP performance using Simulation tool.
8. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
9. Simulation of DNS using UDP sockets.
10. Write a HTTP web client program to download a web page using TCP sockets.

At the end of the course, students would be able to:

Course Outcome

CO1 Explain the basic layers and its functions in computer networks.

CO2 Understand the protocols, and mechanisms of the Data Link Layer.

CO3 Analyze the network layer services.

CO4 Describe the Transport Layer protocol services, and their functionalities.

CO5 Analyze the working of various application layer protocols.

TEXT BOOKS:

T1: Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

T2: Larry Peterson, Bruce Davie, Computer Networks: A Systems Approach, Morgan Kaufmann Publishers Inc., Sixth Edition, 2022.

REFERENCE BOOKS:

R1: Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

R2: William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

R3: Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

R4: Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	2	1	-	1	2	-	-	-	-	-	-	2	-	2	-
CO3	2	2	2	1	3	-	-	-	-	-	-	-	-	3	-
CO4	3	-	3	1	2	-	-	-	-	3	-	-	3	-	3
CO5	3	3	2	-	2	-	-	-	-	-	-	-	2	-	3
AVG	2.6	2.0	2.3	1.3	2.3	-	-	-	-	3.0	-	2.0	2.7	2.5	3.0

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PRACTICAL

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT4001	CASE TOOLS LABORATORY	0	0	3	1.5

Course Objective

The student should be able to:

1. Capture the requirements specification for an intended software system
2. Draw the UML diagrams for the given specification
3. Map the design properly to code
4. Test the software system thoroughly for all scenarios
5. Improve the design by applying appropriate design patterns

Exp. No	List of Experiments
1	Identify a software system that needs to be developed.
2	Document the Software Requirements Specification (SRS) for the identified system.
3	Identify use cases and develop the Use Case model.
4	Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5	Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6	Draw relevant State Chart and Activity Diagrams for the same system.
7	Implement the system as per the detailed design
8	Test the software system for all the scenarios identified as per the usecase diagram
9	Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10	Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference management system
13. BPO management system
14. Library management system
15. Student information system

Total Instructional Hours 45

Upon completion of this course,the students will be able to:

Course Outcome

CO1	Perform Object Oriented analysis and design for a given problem specification.
CO2	Differentiate advance Object Oriented Approach from the traditional approach for design and development system
CO3	Construct various UML Models using the appropriate notations
CO4	Identify and map basic software requirements in UML
CO5	Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns,test the compliance of the software with the SRS.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	1	-	1	2	1	2	-	1	-	1
CO2	2	2	3	2	2	3	--	1	2	1	2	1	1	1	1
CO3	2	2	3	2	2	3	-	1	2	1	2	2	1	1	2
CO4	2	2	3	2	2	3	-	1	1	1	2	2	1	1	2
CO5	2	2	2	2	2	1	-	1	2	1	2	2	1	1	2
AVG	2	2	2.8	2	2	2.2	-	1	1.8	1	2	1.4	1	1	1.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT4003	DATABASE MANAGEMENT SYSTEM LABORATORY	0	0	3	1.5

Course Objective

The student should be made to

1. Apply essential SQL commands effectively.
2. Construct nested and join queries to retrieve complex data.
3. Explain functions, procedures, and procedural database extensions.
4. Design and implement typical database applications.
5. Develop GUI-based applications using front-end tools.

Ex. No **List of experiments:**

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
10. Create an XML database and validate it using XML schema.
11. Create Document, column and graph based data using NOSQL database tools.
12. Develop a simple GUI based database application and incorporate all the above- mentioned features
13. Case Study using any of the real life database applications from the following list
    a. Inventory Management for a EMart Grocery Shop
    b. Society Financial Management
    c. Cop Friendly App – Eseva
    d. Property Management – eMall
    e. Star Small and Medium Banking and Finance
    - Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
    - Apply Normalization rules in designing the tables in scope.
    - Prepared applicable views, triggers (for auditing purposes), and functions for enabling enterprise grade features.
    - Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.

Total Instructional Hours 45

Course Outcome

At the end of the course, students would be able to:

CO1: Construct database tables, define constraints, and enforce relationships using SQL DDL and DML commands.

CO2: Query databases effectively using advanced filtering, aggregate functions, subqueries, and various join techniques.

CO3: Implement advanced database features like user-defined functions, stored procedures, triggers, and transactions.

CO4: Create and manage structured (XML) and unstructured (NoSQL) databases, along with views and indexes for large datasets.

CO5: Design and implement real-world database applications incorporating comprehensive database functionalities and tools.

REFERENCES:

R1: Beaulieu, Alan, "Learning SQL: Master SQL Fundamentals", 3rd edition, O'Reilly Media, 2020.

R2: Ramakrishnan, Raghu, and Johannes Gehrke, "*Database Management Systems*", 3rd edition, McGraw-Hill Education, 2003.

R3: McCreary, Don, and Kristina Chodorow, "Making Sense of NoSQL: A Guide for Managers and the Rest of Us", Manning Publications, 2013.

R4: Connolly, Thomas, and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management", 6th edition, Pearson, 2015.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1	2
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
AVG	2	3	2	2	1	-	-	-	2	1	3	2	2	2	2

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EEC COURSES (SE/AE)

Programme	Course Code	Course Name	L	T	P	C
BE/BTECH	22HE4071	Soft Skills and Aptitude - III	0	0	0	1

Course Objectives:

1. Solve Logical Reasoning questions of easy to intermediate level
2. Solve Quantitative Aptitude questions of easy to intermediate level
3. Solve Verbal Ability questions of easy to intermediate level
4. Crack mock interviews with ease

Unit	Description	Instructional Hours
	Logical Reasoning	
I	Logical Connectives - Syllogisms - Venn Diagrams: Interpretation - Venn Diagrams - Solving- Critical Reasoning	6
	Quantitative Aptitude	
II	Logarithm - Arithmetic Progression - Geometric Progression - Surds and Indices - Geometry - Mensuration - Heights and Distance- Coded inequalities - Quadratic Equations - Permutation, Combination: Fundamental Counting Principle, Permutation and Combination, Computation of Permutation, Circular Permutations, Computation of Combination - Probability	14
	Verbal Ability	
III	Idioms and Phrasal Verbs, Collocations, Gerund and Infinitives - Reading Comprehension for placements: Types of questions, Comprehension strategies - Articles.	6
	Recruitment Essentials	
IV	Cracking interviews - demonstration through a few mocks - Sample mock interviews to demonstrate how to crack the: HR interview, MR interview, Technical interview - Cracking other kinds of interviews: Skype/ Telephonic interviews, Panel interviews, Stress interviews - Resume building – workshop: A workshop to make students write an accurate resume	4
	Total Instructional Hours	30

Course Outcome:

CO1: Students will excel in the complex reasoning.
CO2: Students will be proficient to create and verify their own conjectures.
CO3: Imbibe effective relevant knowledge in English.
CO4: Students will identify different life skills required in personal and professional life.

REFERENCE BOOKS:

R1:	Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
R2:	A Modern Approach To Verbal Reasoning by R S Aggarwal.
R3:	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R4:	Verbal Ability & Reading Comprehension by Ajay Singh

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MANDATORY COURSE

Programme	CourseCode	Name of the Course	L	T	P	C
B.E./B.Tech	22MC4091	INDIAN CONSTITUTION	2	0	0	0

(Common for all Branches)

Course Objectives

The student should be made to

1. To introduce students to the foundational aspects of the Indian Constitution.
2. To explore the scope, significance, and limitations of Fundamental Rights in the Constitution of India.
3. To explain the framework of **the** parliamentary system of government in India as enshrined in the Constitution.
4. To examine the role and structure of local governance in India, particularly focusing on rural and urban local bodies.
5. To analyze the role of political parties, pressure groups, and civil society in protecting rights and promoting social justice

Unit	Description	Instructional Hours
	BASIC FEATURES AND FUNDAMENTAL PRINCIPLES	
I	Meaning of the constitution law and constitutionalism–Historical perspective of the constitution of India– salient features and characteristic of the constitution of India.	6
	FUNDAMENTAL RIGHTS	
II	Scheme of the fundamental rights–fundamental duties and its legislative status–The directive principles of state policy–its importance and implementation-Federal structure and distribution Of legislative and financial powers between the union and states.	6
	PARLIAMENTARY FORM OF GOVERNMENT	
III	The constitution powers and the status of the president in India.–Amendment of the constitutional Powers and procedures–The historical perspective of the constitutional amendment of India– Emergency provisions: National emergency, President rule, Financial emergency.	6
	LOCALGOVERNANCE	
IV	Local self-government-Rural Local Government-Panchayath Raj, Elections of Panchayat-State Election Commission- Urban Local Government-Amendment Act, Urban Local Government Structures in India -	6
	INDIANSOCIETY	
V	Constitutional Remedies for citizens–Political Parties and Pressure Groups; Right of Women,Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able to

CO1: Students will gain an understanding of the evolution of the Indian Constitution, its basic features, and the principles.

CO2: Students will be able to identify the different categories of Fundamental Rights.

CO3: Students will understand the structure of the **Indian parliamentary system**, the division of power, and the relationship between different branches of government.

CO4: Students will learn about the framework and functioning of local governance in India, including Panchayat Raj and Urban Local Bodies.

CO5: Students will critically analyze the challenges in the implementation of these provisions

TEXTBOOKS:

T1: DurgaDasBasu,"IntroductiontotheConstitutionofIndia",PrenticeHallofIndia,NewDelhi,1997.

T2: Agarwal R C.,"Indian Political System", S.Chand and Company, NewDelhi,1997.

T3: MaciverandPage,"Society:AnIntroductionAnalysis",MacMilanIndiaLtd.,NewDelhi.

T4: Sharma K L., "Social Stratification in India: Issues and Themes ",Jawaharlal NehruUniversity,NewDelhi,1997.

REFERENCEBOOKS:

R1-Sharma,Brij Kishore,"Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.

R2-GahaiUR.,"IndianPoliticalSystem",NewAcademicPublishingHouse, Jalaendhar.

R3-Sharma R N., "Indian Social Problems",Media Promoters and Publishers Pvt. Ltd.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
IT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

DEAN – ACADEMICS

Dean (Academics)
HiCET

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
(Approved by AICTE, New Delhi, Accredited by NAAC with 'A ++'Grade)
Coimbatore - 641032.

HICET

TÜVRheinland CERTIFIED

SYLLABUS REVISION DETAILS FOR THE REGULATION2022

ACADEMIC YEAR 2024-25 EVEN SEMESTER

S. No	Year	Semester	Course Code with Name	Existing content (in academic Year 2023-24)	Revised Content (for 2024-25)	Percentage of Revision
1.	II	IV	22IT4204- Database Management System	**22IT4252 - Database Management System** **Unit –V** **TRANSACTION PROCESSING AND CONCURRENCY CONTROL** Transaction Concepts - ACID Properties - Serializability - Concurrency – Need for Concurrency- Concurrency Control - Transaction Recovery – Locking Protocols – Two Phase Locking – SQL Facilities for Concurrency and recovery –Two Phase Commit Protocol	**22IT4204- Database Management System** **Unit –V** ***NOSQL*** Need for NO SQL , Characteristics of NOSQL , Key-value database , Columnar Databases , Apache Cassandra , Click House , Document Databases , MongoDB : CRUD operations with MongoDB . MongoDB JDBC Connectivity, MongoDB Testing, Graph Databases, Metabase.	20

Chairman-BoS

Chairman - BoS
IT - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

HINDUSTHAN COLLEGE OF ENGG & TECH ACADEMIC COUNCIL Chairman

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

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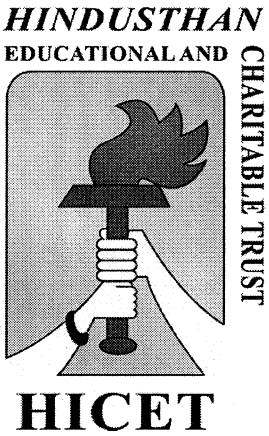
Coimbatore-641032.

B.TECH.INFORMATIONTECHNOLOGY



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the EVEN Semester

Academic year 2024-2025

BATCH 2022-2026

CURRICULUM
R2022

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM &SYLLABUS CBCS PATTERN
UNDER GRADUATE PROGRAMME
B.TECH. INFORMATIO TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023and onwards

SEMESTER I – 19 Credit

S. No	COURSECODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
THEORYWITHLABCOMPONENT											
2.	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
3.	22CY1151	Engineering Applications of Chemistry	BSC	2	0	2	3	4	50	50	100
4.	22CS1151/ 22CS1152	Problem solving using C /Object Oriented Programming using Python	ESC/ICC	2	0	2	3	4	50	50	100
5.	22IT1152	Introduction to Web ApplicationDevelopment	ESC	2	0	2	3	4	50	50	100
EEC COURSES(SE/AE)											
6.	22HE1071	Universal Human Values	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
MANDATORYCOURSE											
8.	22MC1091/ 22MC1092	தமிழரும்த தொழில்நுட்பமும் /Indian Constitution	MC	2	0	0	0	2	0	0	0
TOTAL				**16**	**1**	**8**	**19**	**26**	**480**	**320**	**800**

SEMESTER II–22Credits

S. No	COURSE CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2103	Differential Equations and Linear Algebra	BSC	3	1	0	4	4	40	60	100
2.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORYWITHLABCOMPONENT											
3.	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
4.	22PH2151	Physics for Engineers	BSC	2	0	2	3	4	50	50	100

5.	22IT2251/ 22IT2252	Python programming and Practices/Relational Database Management System	PCC/ICC	2	0	2	3	4	50	50	100

	22IT2253	DynamicWeb Design	PCC	2	0	2	2	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES(SE/AE)											
8.	22HE2071	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	SoftSkills and Aptitude1	AEC	1	0	0	1	1	100	0	100
MANDATORYCOURSE											
10.	22MC2091/ 22MC2092	தமிழர் மரபு/ Heritage of Tamils	MC	2	0	0	0	1	0	0	0
11.	22MC2093	NCC*/NSS/YRC/Sports/Clubs/ Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**17**	**1**	**14**	**22**	**32**	**640**	**360**	**1000**

SEMESTER III–25Credits

S. No	COURSE CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3101	Applied Statistics and Queuing Theory	BSC	3	1	0	4	4	40	60	100
2.	22IT3201	Data Structures	PCC	3	0	0	3	4	40	60	100
3.	22IT3202	Operating System	PCC	3	1	0	4	4	40	60	100
4.	22IT3203	Digital Principles and Computer Organization	ESC	3	0	0	3	3	40	60	100
THEORYWITHLABCOMPONENT											
5.	22IT3251/ 22IT3252	JavaProgramming/ DataVisualization	PCC/ICC	3	0	2	4	4	50	50	100
PRACTICAL											
6.	22IT3001	Operating System Laboratory	PCC	0	0	4	2	4	60	40	100
7.	22IT3002	Digital Principles and Computer Organization Laboratory	ESC	0	0	4	2	4	60	40	100
EEC COURSES(SE/AE)											
8.	22HE3071	Soft Skills and Aptitude-II	SEC	0	0	0	1	1	100	0	100
9.	22IT3003	Data Structures Laboratory	AEC	0	0	4	2	4	60	40	100
MANDATORYCOURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	40	60	100
			TOTAL	**17**	**2**	**14**	**25**	**34**	**530**	**470**	**1000**

SEMESTER IV-23Credits

S. No	COURSE CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22IT4201	Design and Analysis of Algorithms	PCC	3	0	0	3	4	40	60	100
3.	22IT4202	Computer Networks	PCC	3	0	0	3	3	40	60	100
4.	22IT4203/ 22IT4204	Object Oriented Software Engineering/ Design Thinking	PCC/ICC	3	0	0	3	3	40	60	100
THEORYWITHLABCOMPONENT											
5.	22IT4251	Web Framework	PCC	3	0	2	4	4	50	50	100
6.	22IT4252	Database Management System	PCC/ ICC	3	0	2	4	4	50	50	100
PRACTICAL											
7.	22IT4001/ 22IT4003	Case Tools Laboratory/ Design Thinking Laboratory	PCC	0	0	3	1.5	4	60	40	100
8.	22IT4002	Network Laboratory	PCC	0	0	3	1.5	4	60	40	100
EECCOURSES(SE/AE)											
9.	22HE4071	Soft Skills and Aptitude -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**10**	**23**	**29**	**480**	**420**	**900**

*Twoweeksinternshipcarries1creditanditwillbedoneduringSemesterIIIsummervacationandsamewillbe evaluated in Semester IV.
IfstudentsunabletoundergoinsemesterIII,thentheInternship Iofferedinthesemester IVcan beclubbedwith Internship II (Total: 4 weeks-2 credits)

SEMESTER V-22Credits

S. No	COURSE CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22IT5201	Artificial Intelligence and Machine Learning	PCC	3	1	0	4	4	40	60	100
2.	22IT5202	Embedded System and IoT	PCC	3	0	0	3	3	40	60	100
3.	22IT53XX/ 22IT5319	Professional Elective-I / Business Intelligence	PEC	3	0	0	3	3	40	60	100
4.	22IT53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22IT53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORYWITHLABCOMPONENT											
6.	22IT5251	Application Development	PCC/ICC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22IT5001	Artificial Intelligence and Machine Learning Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE5071	SoftSkills-4/Foreign Languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**1**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI-24Credits

S. NO	COURSE CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
			THEORY								
1.	**22IT6201/ 22IT6313**	Foundations of Data Science /Data Science	PCC	3	0	0	3	3	40	60	100
2.	**22IT6202**	Principles of Compiler Design	PCC	3	0	0	3	3	40	60	100
3.	**22HE6101**	Professional Ethics	HSC	3	0	0	3	3	40	60	100
4.	**22IT63XX/ 22IT6314**	**Professional Elective - 4**/Predictive Modelling	PEC/ ICC	3	0	0	3	3	40	60	100
5.	**22IT63XX**	**Professional Elective-5**	PEC/ ICC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	**Open Elective–1***	OEC	3	0	0	3	3	40	60	100
7.	**22CY6101**	Environmental Science and Engineering	ESC	2	0	0	2	3	40	60	100
			PRACTICAL								
8.	**22IT6001**	Project Based Learning	PCC	0	0	4	2	4	60	40	100
			EE CCOURSES(SE/AE)								
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**22**	**0**	**4**	**24**	**27**	**440**	**460**	**900**

SEMESTER VII-20Credits

S. No	COURS ECODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
			THEORY								
1.	**22IT7201/ 22IT7205**	Distributed and Cloud Computing/Big DatawithSecurity	PCC	3	0	0	3	3	40	60	100
2.	**22IT7202**	QuantumComputing	PCC	3	1	0	4	4	40	60	100
3.	**22IT7203**	Edge Computing	PCC	3	0	0	3	3	40	60	100
4.	**22XX73XX**	**Professional Elective-6**	PEC	3	0	0	3	3	40	60	100
5.	**22XX74XX**	**Open Elective–2***	OEC	3	0	0	3	3	40	60	100
			PRACTICAL								
6.	**22IT7001/ 22IT7002**	Cloud Computing Laboratory / Big Data withSecurityLaboratory	PCC	0	0	4	2	4	60	40	100
			EEC COURSES(SE/AE)								
7.	**22IT7701**	Internship-II*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

*-Two weeks internship carries1credit and it will be done during Semester VI summer vacation / placement Training and same will be evaluated in Semester VII.

SEMESTER VIII–10 Credits

S. No	COURS CODE	COURSETITLE	CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EECCOURSES(SE/AE)											
1.	**22IT8901**	Project Work	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. * As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I

(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3
5	22BM6401	3D printing	OEC	3	0	0	3	3
6	22AE6401	Space Science	OEC	3	0	0	3	3

7	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
8	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
9	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
10	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
11	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
12	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
13	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
14	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3
15	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3
16	22FT6401	Traditional Foods	OEC	3	0	0	3	3
17	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
18	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3
19		NCC Level - I	OEC	3	0	0	3	3

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3

7	22LS7407	NCC Level - II	OEC	3	0	0	3	3
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3
10	22LS7410	Business Communication	OEC	3	0	0	3	3

PROFESSIONALELECTIVECOURSES:VERTICALS

Vertica II Data Science	**VerticalII Full Stack Developmentfor IT**	**VerticalIII Cloud Computing and Data Centre Technologies**	**Vertical IV Internet of Things**	**Vertica IV Creative Media**	**Vertical VI Emerging Technologies**
22IT5301 Exploratory Data Analysis	**22IT5304** Software Testing and Automation	**22IT5307** Data Warehousing and Data Mining	**22IT5310** Design of Smart Cities	**22IT5313** Multimedia Data Compression and Storage	**22IT5316** Augmented Reality
22IT5302 Recommender Systems	**22IT5305** UI and UX Design	**22IT5308** Virtualization	**22IT5311** IoT Architectures and Protocols	**22IT5314** Multimedia and Animation	**22IT5317** Cybersecurity
22IT5303 Computer Vision	**22IT5306** Cloud Services Management	**22IT5309** Cloud Computing	**22IT5312** Industry4.0	**22IT5315** Digital marketing	**22IT5318** Tamil Computing
22IT6301 Text and Speech Analysis	**22IT6303** Dev-ops	**22IT6305** Stream Processing	**22IT6307** Fog Computing & Energy Management in Iot Devices	**22IT6309** UI and UX Design	**22IT6311** Robotic Process Automation
22IT6302 Big Data Analytics	**22IT6304** Web Application Security	**22IT6306** Storage Technologies	**22IT6308** IoT Cloud and Data Analytics	**22IT6310** Video Analytics	**22IT6312** Neural Networks and Deep Learning
22IT7301 Image and video analytics	**22IT7302** Security and Privacy in Cloud	**22IT7303** Software Defined Networks	**22IT7304** IOT Security	**22IT7305** Visual Effects	**22IT7306** Cryptocurrency and Block chain Technologies

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONALELECTIVECOURSES:VERTICALS

Details of Vertical I: Data Science

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5301	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	22IT5302	Recommender Systems	PEC	3	0	0	3	3
3.	22IT5303	Computer Vision	PEC	3	0	0	3	3
4.	22IT6301	Text and Speech Analysis	PEC	3	0	0	3	3
5.	22IT6302	Big Data Analytics	PEC	3	0	0	3	3
6.	22IT7301	Imageandvideoanalytics	PEC	3	0	0	3	3

Details of Vertical II: Full Stack Development for IT

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5304	Software Testing and Automation	PEC	3	0	0	3	3
2.	22IT5305	UI and UX Design	PEC	3	0	0	3	3
3.	22IT5306	Cloud Services Management	PEC	3	0	0	3	3
4.	22IT6303	Dev-ops	PEC	3	0	0	3	3
5.	22IT6304	Web Application Security	PEC	3	0	0	3	3
6.	22IT7302	Security and Privacy inCloud	PEC	3	0	0	3	3

Details of Vertical III: Cloud Computing and Data Centre Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5307	Data Warehousing and Data Mining	PEC	3	0	0	3	3
2.	22IT5308	Virtualization	PEC	3	0	0	3	3
3.	22IT5309	Cloud Computing	PEC	3	0	0	3	3
4.	22IT6305	Stream Processing	PEC	3	0	0	3	3
5.	22IT6306	Storage Technologies	PEC	3	0	0	3	3
6.	22IT7303	Software DefinedNetworks	PEC	3	0	0	3	3

Details of Vertical IV: Internet of Things

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5310	Design of Smart Cities	PEC	3	0	0	3	3
2.	22IT5311	IoT Architectures and Protocols	PEC	3	0	0	3	3
3.	22IT5312	Architecting Smart IoT Devices	PEC	3	0	0	3	3
4.	22IT6307	Fog Computing & Energy Management in IoT Devices	PEC	3	0	0	3	3
5.	22IT6308	IoT Cloud and Data Analytics	PEC	3	0	0	3	3
6.	22IT7304	IOT Security	PEC	3	0	0	3	3

Details of Vertical V: Creative Media

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5313	Multimedia DataCompressionandStorage	PEC	3	0	0	3	3
2.	22IT5314	Multimedia andAnimation	PEC	3	0	0	3	3
3.	22IT5315	Digitalmarketing	PEC	3	0	0	3	3
4.	22IT6309	UI and UX Design	PEC	2	0	2	3	3
5.	22IT6310	Video Analytics	PEC	3	0	0	3	3
6.	22IT7305	VisualEffects	PEC	3	0	0	3	3

Details of Vertical VI: Emerging Technologies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5316	AugmentedReality	PEC	3	0	0	3	3
2.	22IT5317	Cybersecurity	PEC	3	0	0	3	3
3.	22IT5318	Tamil Computing	PEC	3	0	0	3	3
4.	22IT6311	Robotic Process Automation	PEC	3	0	0	3	3
5.	22IT6312	Neural Networks and Deep Learning	PEC	3	0	0	3	3
6.	22IT7306	Cryptocurrency and Block chain Technologies	PEC	3	0	0	3	3

EnrollmentforB.E./B.TECH.(HONOURS)/MinorDegree(optional)

A student can also optionally register for additional courses (18credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semesterVonwards.Thesecoursesshallbefromthesameverticaloracombinationofdifferentverticalsofthe same programme of study only. For minor degree, a students hall register for the additional courses (18credits) from semester onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause4.10ofRegulation2022 isapplicablefortheEnrolmentofB.E./B.TECH.(HONOURS)/MinorDegree(Optional).

VERTICALSFORMINORDEGREE

- Headsarerequestedtoprovideoneverticalfromtheirprogramtooffer for otherprogramstudentstoregister for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODSPER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22IT5471	Sem5:Database System	MDC	3	0	0	3	3
2.	22IT6471	Sem6:Fundamentals of Data Science	MDC	3	0	0	3	3
3.	22IT6472	Sem 6: Artificial Intelligence And Expert Systems	MDC	3	0	0	3	3
4.	22IT7471	Sem7:Data Exploration And Visualization	MDC	3	0	0	3	3
5.	22IT7472	Sem 7: Business Intelligence	MDC	3	0	0	3	3
6.	22IT8471	Sem 8:Cyber Security	MDC	3	0	0	3	3

*MDC–MinorDegreeCourse

In addition to the above the followingadditionalcoursesforMinorDegreecanalsobegiventothestudent'scommonto all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Block chain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

VERTICALS FOR HONOR DGREE

BTech (Hons) Information Technology with Specialization in Artificial Intelligence and Machine Learning

S. NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODSPER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5371	Deep Learning	PC	3	0	0	3	4	40	60	100
2.	22IT6371	Ethics and Artificial Intelligence	PC	3	0	0	3	4	40	60	100
3.	22IT6372	Knowledge Engineering	PC	3	0	0	3	4	40	60	100
4.	22IT7371	Affective Computing	PC	3	0	0	3	4	40	60	100
5.	22IT7372	Gaming Theory	PC	3	0	0	3	4	40	60	100
6.	22IT8371	Generative AI	PC	3	0	0	3	4	40	60	100

BTech (Hons) Information Technology with Specialization in Cyber Security

S NO.	COURSECODE	COURSETITLE	CATEGORY	PERIODSPER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5372	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	22IT6373	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	22IT6374	Social Network Security	PC	3	0	0	3	3	40	60	100
4.	22IT7373	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	22IT7374	Cryptocurrency and Block chain Technologies	PC	3	0	0	3	3	40	60	100
6.	22IT8372	Network Security	PC	3	0	0	3	3	40	60	100

BTech (Hons) Information Technology with Specialization in Block Chain Technology

S NO.	COURSECODE	COURSETITLE	CATEGORY	PERIODSPER WEEK				TCP	CIA	ESE	TOTAL
				L	T	P	C				
1.	22IT5373	Fundamentals of Block chain Technology	PC	3	0	0	3	3	40	60	100
2.	22IT6375	Block chain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	22IT6376	Building Private Block chain	PC	3	0	0	3	3	40	60	100
4.	22IT7375	Block chain Business Models	PC	3	0	0	3	3	40	60	100
5.	22IT7376	Block chain and IoT	PC	3	0	0	3	3	40	60	100
6.	22IT8373	Block chain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEM. NO	COURSE	COURSETITLE	L	T	P	C	TCP	CIA	ESE	TOTAL
SKILLED/INTEGRATED COURSES OFFERED THROUGH CHOICE BASED CREDIT SYSTEM										
1	**22CS1152**	Object Oriented Programming using Python	2	0	2	3	4	50	50	100
2	**22IT2252**	Relational Database Management System	2	0	2	3	4	50	50	100
3	**22IT3252**	Data Visualization	3	0	2	4	4	50	50	100
4	**22IT4204**	Design Thinking	3	0	0	3	3	40	60	100
5	**22IT4003**	Design Thinking Laboratory	0	0	3	1.5	3	60	40	100
6	**22IT5252**	Business Intelligence	3	0	0	3	3	40	60	100
7	**22IT6313**	Data Science	2	0	2	3	4	40	60	100
8	**22IT6314**	Predictive Modelling	3	0	0	3	3	40	60	100
9	**22IT7205**	Big Data with Security	3	0	0	3	4	40	60	100
10	**22IT7002**	Big Data with Security Laboratory	0	0	4	2	4	60	40	100

SEMESTER-WISE CREDITDISTRIBUTION

B.E./B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	2	5	-	-	2	-	-	15
4	PCC	-	5	13	20	12	8	12	-	70
5	PEC	-	-	-	-	9	6	3	-	18
6	OEC	-	-	-	-	-	3	3	-	06
7	EEC	3	3	3	1	1	2	2	10	25
8	MCC	-	-	-	-	-	-	-	-	-
Total		**19**	**22**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

CREDITDISTRIBUTIONR2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	**165**

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SYLLABUS

THEORY

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6201	FOUNDATIONS OF DATA SCIENCE	3	0	0	3

Course Objective

The student should be made to

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

Unit	Description	Instructional Hours
I	**INTRODUCTION** Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications	7
II	**DESCRIBING DATA** Types of Data - Types of Variables -Describing Data with Tables and Graphs – Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores **Use the diabetes data set for performing the following: Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.**	9
III	**DESCRIBING RELATIONSHIPS** Correlation –Scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression –regression line – least squares regression line – Standard error of estimate – interpretation of r2 – multiple regression equations –regression towards the mean **Use the diabetes data set for performing the following: Bivariate analysis: Linear and logistic regression Modeling, Multiple Regression analysis**	9
IV	**PYTHON LIBRARIES FOR DATA WRANGLING** Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables **Working with Numpy arrays, Working with Pandas data frames**	10
V	**DATA VISUALIZATION** Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn. **Apply and explore various plotting functions on UCI data sets, Visualizing Geographic Data with Basemap**	10
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Gain knowledge of Data Science fundamentals, processes and steps from data collection to insight presentation.

CO2: Describe and analyze data using variables, tables, graphs, averages, variability, normal distributions, and z-scores.

CO3: Gain knowledge on relationships between data through correlation, scatter plots, regression analysis.

CO4: Use the Python Libraries for Data Wrangling

CO5: Apply visualization Libraries in Python to interpret and explore data

TEXT BOOKS:

T1: David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)

T2: Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)

T3: Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCE BOOKS:

R1: Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
CO3	2	2	1	2	2	-	-	-	1	2	1	3	2	2	3
CO4	3	2	2	1	2	-	-	-	1	1	2	2	3	3	2
CO5	2	2	1	2	2	-	-	-	1	1	1	2	1	2	2
AVG	2.2	1.8	1.25	1.6	1.8	-	-	-	1.2	1.2	1.2	2.2	2	2.4	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6202	PRINCIPLES OF COMPILER DESIGN	3	0	0	3

Course Objective

The student should be made to

1. Understand the fundamental concepts of language processors and the overall structure and workflow of a compiler.
2. Understand parsing techniques for validating syntax structure, error recovery mechanisms.
3. Develop intermediate representations like syntax trees and three-address codes for effective type checking, control flow, and procedural abstraction.
4. Explore the challenges in code generation and implement strategies for generating efficient target code.
5. Study optimization techniques for improving code performance and understand memory management strategies in run-time environments.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Language Processors- The Structure of a Compiler **Lexical Analysis:** The Role of the Lexical Analyzer- Input Buffering- Specification of Tokens- Recognition of Tokens - Conversion of Regular Expression to Minimized DFA - The Lexical-Analyzer Generator: LEX.	9
II	**SYNTAX ANALYZER** The Role of the Parser- Error-Recovery Strategies- Top-Down Parsing- Bottom-Up Parsing: SLR, CLR, LALR- The Parser Generator YACC	9
III	**INTERMEDIATE CODE GENERATION** Variants of syntax trees- Three address codes – Types and Declarations – Translation of expression- Type checking - Control flow-Back patching- Switch statements-Intermediate code for procedures	9
IV	**CODE GENERATION** Issues in the design of code generation – Target language-Addresses in target code- Basic Blocks and Flow Graphs- Optimization of Basic Blocks – A simple Code generator – Peephole optimization.	9
V	**CODE OPTIMIZATION AND RUN-TIME ENVIRONMENTS** **Machine-Independent Optimizations:** The Principal Sources of Optimization - Loops in Flow Graphs. **Run-Time Environments:** Storage organization- Stack allocation space- Access to non-local data on the stack-Heap management	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1	Identify the role of lexical analysis in recognizing tokens
CO2	Experiment with various Top-down and Bottom-up parsing techniques
CO3	Apply intermediate code generation techniques for expression and control s Translation.
CO4	Construct machine code from the intermediate code
CO5	Identify the different optimization techniques and storage organizations

TEXTBOOKS:

T1: Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman," Compilers: Principles, Techniques and Tools", 2nd Edition, Pearson, 2012.

REFERENCE BOOKS:

R1: Torbengidius Mogensen," Basics of Compiler Design", Springer, 2011.

R2: Charles N, Ron K Cytron, Richard J LeBlanc Jr., "Crafting a Complier", Pearson Education, 2010

R3:. D. Grune, H.E. Bal, C.J.H. Jacobs, K.G. Langendoen, "Modern Compiler Design", Wiley, 2008

R4:. Kennath C. Louden, "Compiler Construction Principles and Practice". Vikas publishing House, New Delhi,2006

R5: Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2007.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3		3	-	-	-	-	-	-	2	2	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	2	2	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
AVG	2.8	2.7	3	-	3	-	-	-	-	-	-	2	2	-	2

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Programme	Course code	Name of the Course	L	T	P	C
B.E./ B.Tech	22HE6101	Professional Ethics	3	0	0	3

Course Objective

The student should be made

1. To foster ethical behavior and life skills for holistic development.
2. To educate the value of Engineering Ethics
3. To inculcate the social responsibility of an engineer.
4. To impart knowledge on issues related to safety, responsibility and rights
5. To educate on professional practice on global issues

Unit	Description	Instructional Hours
I	**VALUE EDUCATION** Moral values and Right understanding- Holistic development and the Role of Value Education- Understanding Value Education- Self-exploration as the process for value Education- Integrity -Work Ethics- Empathy- Spirituality	9
II	**ENGINEERING ETHICS** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.	9
V	**GLOBAL ISSUES** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility	9
	Total Instructional Hours	**45**

Course Outcomes

At the end of the course, students would be able to:

CO1: Understand the importance of various components of human values
CO2: Apply ethics in society
CO3: Discuss the ethical issues related to engineering and
CO4: Realize the responsibilities and rights in the society
CO5: Apply professional ethics in solving global issues

TEXT BOOKS:

T1 - Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata Mc Graw Hill, New Delhi, 2003.
T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2009.

REFERENCES BOOKS:

R1 - Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
R2 - John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
R3 - Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

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OPEN ELECTIVE

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6401	DATA SCIENCE AND ANALYTICS FUNDAMENTALS	3	0	0	3

Course Objective

The student should be made to

1. Know the fundamental concepts of data science and analytics.
2. Know about preprocessing and visualization.
3. Gain knowledge about finite state machines and recurrent models
4. Learn data analysis, classification and clustering
5. Learn various NoSql databases and map reduce

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA SCIENCE AND BIG DATA** Data Science and Analytics - Big Data - Relations: Data Scales - Set and Matrix Representations-Similarity Measures - Dissimilarity Measures.	9
II	**PREPROCESSING AND VISUALIZATION** Sampling and Quantization - Error Types - Error Handling - Data Transformation – Visualization: Diagrams - Principal Component Analysis– Histograms.	9
III	**CORRELATION, REGRESSION AND FORECASTING** Linear Correlation - Correlation and Causality - Chi-Square Test for Independence-Linear Regression-Basics of Neural Networks- Finite State Machines – Recurrent Models.	9
IV	**CLASSIFICATION AND CLUSTERING** Classification Criteria - Naive Bayes Classifier - Linear Discriminant Analysis – Support Vector Machine –k-Nearest Neighbour Classifier -Decision Trees - Clustering: Cluster Partitions - Sequential - Prototype-Based - Cluster Tendency Assessment- Self Organizing Maps.	9
V	**SYSTEM ARCHITECTURE AND APPLICATIONS** Lambda Architecture - Nosql Stores: Key-Value - Columnar - Document - Graph. Case Studies: Hbase - Mongodb -Hadoop - MapReduce.	9
Total Instructional Hours		**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Apply the concept of data scale and understand its impact on data analysis methods.

CO2: Apply data preprocessing techniques and analyze data for further exploration and modeling.

CO3: Evaluate the relationships between variables using correlation analysis.

CO4: Apply appropriate classification and clustering techniques to categorize and group data based on its characteristics.

CO5: Evaluate and design big data processing architectures.

TEXT BOOKS:

T1: Runkler TA,‖Data Analytics: Models and algorithms for intelligent data analysis‖, Springer, 2012.

T2: Marz N and Warren J,‖Big Data‖, Manning Publications, 2015

REFERENCE BOOKS:

R1: Dean J.‖Big Data, Data Mining and Machine learning‖, Wiley publications, 2014

R2: Provost F and Fawcett T,‖Data Science for Business‖, O_Reilly Media Inc, 2013.

R3: Janert PK, Data Analysis with Open Source Tools‖, O_Reilly Media Inc, 2011

CO-PO MAPPING

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	2	-	-	2	-	-	-	-	-	-	-	3	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2	2
CO4	3	2	2	-	2	-	-	-	-	-	-	-	3	3	2
CO5	3	3	2	2	2	-	-	-	1	3	-	3	2	2	3
AVG	3	2.2	2	2	2	-	-	-	1	3	-	3	2.6	2.2	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E., B.Tech	22CY6101	ENVIRONMENTAL SCIENCE AND ENGINEERING (CSE, IT, AIML)	2	0	0	2

The student should be made to

Course Objective

1. Introduce the basic concepts of environment, ecosystems, and biodiversity and emphasize on the biodiversity of India and its conservation.
2. Facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation, and measures to preserve them.
3. Impart knowledge on the causes, effects, and control or prevention measures of environmental pollution and natural disasters.
4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems.
5. Familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit, and the challenges of environmental management.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - Eco-system and Energy flow–ecological succession- Structure and function of the forest and ponds ecosystem – Types of biodiversity:– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: Insitu and ex-situ.	6
II	**RENEWABLE SOURCES OF ENERGY** Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	6
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution.	6
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry-Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	6
V	**SUSTAINABILITY AND MANAGEMENT** Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols – GDP - Sustainable Development Goals-targets, indicators and intervention areas.	6
		45
	Total Instructional Hours	

Course Outcome

At the end of the course, students would be able to:

CO1: Recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: Identify and apply the understanding of renewable and non-renewable resources and contribute to sustainable measures to preserve them for future generations.

CO3: Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

CO4: Demonstrate an appreciation for need for sustainability, management and understand the various social issues and solutions to solve the issues.

CO5: Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXTBOOKS

T1 - Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.

T2 - Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCES

R1 – Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.

R2 - Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	2	3	-	-	-	-	2	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	2	-	-
CO3	3	-	1	-	-	2	2	-	-	-	-	2	-	-
CO4	3	2	1	1	-	2	2	-	-	-	-	2	-	-
CO5	3	2	1	-	-	2	2	-	-	-	-	1	-	-
AVG	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-

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PRACTICAL

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6001	Project Based Learning	0	0	4	2

Course Objective

The student should be made to

- Provide students with hands-on experience in solving real-world problems through technology.
- Integrate multidisciplinary knowledge from programming, database management, networking, and system design.
- Encourage teamwork, critical thinking, and problem-solving through project-based learning.
- Enable students to present and deploy functional prototypes.

Module	Description	Hours
I	**Project Planning and Design** Overview of project-based learning principles. Guidelines for teamwork, project planning, and version control (Git/GitHub). Team formation and brainstorming project ideas. Create a detailed workflow diagram. Draft wireframes or basic UI mockups. Design system architecture and database schema.	8
II	**Technology-Specific Training** Choose topics/tools based on the project requirements. Example areas: Frontend Development: React.js, Angular, or plain HTML/CSS/JS. Backend Development: Node.js, Django, Flask, or Spring Boot. Database Management: MySQL, MongoDB, or Firebase. Networking Basics: Implement simple APIs, secure communication protocols. Cloud Deployment: AWS, Google Cloud, or Azure (optional).	12
III	**Prototype Development** Begin development with iterative progress. Create and integrate individual modules (e.g., frontend, backend, and database). Perform unit testing for individual components.	20
IV	**System Integration and Testing** Integrate all modules into a cohesive system. Perform end-to-end testing, debugging, and optimization. Introduce performance monitoring tools	12
V	**Documentation, Presentation and Evaluation** Prepare detailed project documentation, including: System design, user manual, and testing logs. Create a presentation highlighting project goals, implementation, and results. Teams demonstrate their project functionality. Peer review and faculty evaluation. Discussion on lessons learned and potential future improvements.	08
	Total Hours	60

Course Outcome

At the end of the course, students would be able to:

CO1: Identify and formulate research problem

CO2: Design and develop solution to the problem

CO3: Analyze and solve the complex problems

CO4: Plan, implement and execute the project

CO5: Write effective technical report and demonstrate through presentation

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	3	3	-	3	-	-	3	-	-	-
CO2	3	3	3	-	2	-	-	3	3	-	-	3	3	3	3
CO3	3	3	3	3	3	2	2	3	3	-	-	3	3	3	3
CO4	-	-	-	-	3	2	3	3	3	3	3	3	3	3	3
CO5	-	-	-	-	-	2	-	2	3	3	-	3	-	-	-
AVG	3	3	3	3	2.6	2.3	2.6	2.75	3	3	3	3	3	3	3

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EEC COURSES (SE/AE)

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE6071	Soft Skills - V	0	0	0	1

Course Objectives:

The student should be made

1. To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback.- Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Team Building– Mock Presentations & Feedback	10
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Leadership Skills - Interpersonal skills-creative thinking-problem solving-analytical skills	10
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress - Crisis Management - Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	10
	Total Instruction Hours	**30**

Course Outcome:

At the end of the course:

CO1: Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.

CO2: Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations

CO3: Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment

REFERENCE BOOKS:

R1: Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan

R2: BPB Publications Soft Skills Personality Development For Life Success-Prashant Sharma

R3: Soft Skills and Employability Skills by Sabina Pillai

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PROFESSIONAL ELECTIVE IV & V

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6301	TEXT AND SPEECH ANALYSIS	3	0	0	3

The student should be made to

Course Objective

1. Learn about the source of sound and its representation from a signal perspective
2. Understand the features necessary for Speech processing
3. An insight on the steps involved in Speech Recognition
4. An insight on the steps involved in Speech Synthesis
5. Learn about the mapping and features for identifying and extracting in music signal processing

Unit	Description	Instructional Hours
I	**SPEECH SOURCE AND REPRESENTATION** Speech Fundamentals - Articulatory Phonetics - Production and Classification of Speech Sounds - Acoustic Phonetics - acoustics of speech production - Review of Digital Signal Processing concepts - Short-Time Fourier Transform - Filter-Bank and LPC Methods.	9
II	**SPEECH FEATURES** Speech Analysis - Features - Feature Extraction and Pattern Comparison Techniques: Speech distortion measures - mathematical and perceptual - Spectral Distance - Cepstral Distances - LPC - PLP and MFCC Coefficients - Time Alignment and Normalization - Dynamic Time Warping - Multiple Time - Alignment Paths.	9
III	**SPEECH RECOGNITION** Speech Modeling - Hidden Markov Models: Markov Processes - HMMs - Evaluation - Optimal State Sequence - Viterbi Search - Baum-Welch Parameter Re-estimation - Implementation issues - Speech Recognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system - acoustics and language models - N-grams - context dependent sub-word units - Applications and present status - Speech Recognition - Framework.	9
IV	**SPEECH SYNTHESIS** Speech Synthesis - Text-to-Speech Synthesis - Concatenative and waveform synthesis methods - subword units for TTS - intelligibility and naturalness - role of prosody - Applications and present status - Speech synthesis framework - Case study.	9
V	**APPLICATIONS** Speaker Recognition - Verification - voice biometrics - music processing - issues - representation - Pitch – Melody Timbre - Music Features - Singer identification - Instrument identification.	9
	Total Instructional Hours	**45**

At the end of the course, students would be able to:

Course Outcome

CO1: Understanding basics of speech and signal processing.

CO2: Appreciate the Time, Spectral and Cepstral features' influence in recognizing and synthesising speech.

CO3: Decide and design the appropriate combination of features for applications involving speech processing andrecognition.

CO4: Propose new strategies and approaches for language independent speech synthesis and recognition

CO5: Decide on combination of signal features for music processing.

TEXT BOOKS:

T1 Lawrence Rabiner, Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.

T2 Daniel Jurafsky, James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2013.

REFERENCE BOOKS:

R1 Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing.

R2 Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.

R3 Claudio Becchetti, Lucio PrinaRicotti, "Speech Recognition", John Wiley and Sons, 1999.

R4 Ben Gold, Nelson Morgan, "Speech and Audio Signal Processing, Processing and Perception of Speech and Music", Wiley India Edition.

CO-PO MAPPING

PO & PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO1	2	-	-	-	2	-	-	1	-	-	-	-	1	1	-
CO2	3	-	-	-	-	2	-	-	-	-	-	-	2	2	-
CO3	-	3	2	-	3	2	-	-	2	-	2	-	2	2	1
CO4	3	3	2	-	-	2	-	-	-	-	-	1	2	2	-
CO5	3	3	-	-	-	2	-	-	-	-	2	-	2	2	1
AVG	2.7	3	2	-	2.5	2	-	1	2	-	2	1	2	2	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH	22IT6302	BIG DATA ANALYTICS	3	0	0	3

Course Objective

The student should be made to

1. Gain a comprehensive understanding of Big Data concepts its relation to business intelligence, data warehouses.
2. Gain expertise in Hadoop's features, architecture, HDFS, data processing, YARN, and tools like Hadoop Streaming.
3. Gain expertise in Pig, HiveQL, and PySpark for data modeling, scripting, RDD operations, and visualizations.
4. Learn Databricks architecture, DBFS, Delta Lake, secret scopes, clustering, and tools like Autoloader and Unity Catalog.
5. Understand NoSQL concepts, including data models, key-value, document, graph databases, sharding, replication, and distribution techniques.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF BIG DATA** Introduction to Big Data: Types of Digital Data-Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – 3Vs of Big Data – Non Definitional traits of Big Data – Business Intelligence vs. Big Data – Data warehouse and Hadoop environment – Coexistence. Big Data Analytics: Classification of analytics – Data Science – Terminologies in Big Data – CAP Theorem – BASE Concept.	09
II	**HADOOP BASICS** Introduction to Hadoop: Features – Advantages – Versions – Overview of Hadoop Eco systems – Hadoop distributions – Hadoop vs. SQL – RDBMS vs. Hadoop – Hadoop Components – Architecture – HDFS – Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression. Hadoop 2 (YARN): Architecture – Interacting with Hadoop Eco systems.	09
III	**BIG DATA TOOLS** Pig - Grunt - pig data model - Pig Latin - developing and testing Pig Latin scripts. Hive – data types and file formats - HiveQL data definition - HiveQL data manipulation - HiveQL queries. Setting up PySpark environment -PySpark basics- PySpark background - PySpark RDD- Data manipulation- Utility function and Visualizations.	09
IV	**AZURE DATABRICKS** Introducing Azure Databricks, Azure Databricks: Databricks File System (DBFS), Databricks Architecture, Control and Data Plane DBFS in detail Object Store, Blob, Datalake Gen2 Filesystem utility,dbutils Data Utility &Notebook Utility &Widgets Utility Parameter passing from one Notebook to another Mount Point, Howto create Mount Point Databricks, Workspace Databricks, CLI; Ways to access Storage Account:AccessKey, Account Key,SASKey&Service Principal Secret Scope, Azure Keyvault Backed Secret Scope,Databricks Backed Secret Scope; Delta Lake: Delta Table Creation, Lakehouse Architecture, Azure Delta Engine, Optimizations Delta Architecture, Medallian Architecture Cluster Creation, Autoloader Delta Live Table Unity Catalog.	11
V	**WORKING WITH NOSQL** Introduction to NoSQL:Aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models,sharding, master-slave replication, peer-peer replication,sharding and replication.	07
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Apply the introductory knowledge on big data to create basic analytics for a dataset.

CO2: Implement the HDFS commands for a given dataset.

CO3: Apply big data tools to analyse details.

CO4: Implement Azure Databricks for storing, analysing and visualising data.

CO5: Understand the detailed architecture and apply it to define objects, load data, query data and performance tune Column-oriented NoSQL databases.

TEXT BOOKS:

T1 Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015.

REFERENCE BOOKS:

R1 Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013.

R2 Tom White, "Hadoop: The Definitive Guide", O'Reilly Publications, 2011.

R3 Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012.

R4 Russell Bradberry, Eric Blow, "Practical Cassandra A developers Approach", Pearson Education, 2014.

CO-PO MAPPING

PO & PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO1	-	2	2	-	2	-	-	-	-	1	-	1	-	2	2
CO2	-	2	2	1	2	-	-	-	-	1	-	1	-	2	2
CO3	-	2	2	-	2	-	-	-	-	1	-	1	-	2	2
CO4	-	2	2	-	2	-	-	-	-	1	-	1	-	2	2
CO5	-	2	2	1	2	-	-	-	-	1	-	1	-	2	2
AVG	-	2	2	1	2	-	-	-	-	1	-	1	-	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6303	DEV-OPS	3	0	0	3

Course Objective

The student should be made to

1. Introduce DevOps terminology, definition & concepts.
2. Understand the different Version control tools like Git, Mercurial.
3. Understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
4. Understand Configuration management using Ansible
5. Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DEVOPS** Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.	9
II	**COMPILE AND BUILD USING MAVEN & GRADLE** Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build,test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle.	9
III	**CONTINUOUS INTEGRATION USING JENKINS** Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins Workspace.	9
IV	**CONFIGURATION MANAGEMENT USING ANSIBLE** Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.	9
V	**BUILDING DEVOPS PIPELINES USING AZURE** Create Github Account, Create Repository, Create Azure Organization,Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Understand different actions performed through Version control tools like Git.

CO2: Evaluate Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.

CO3: Develop and Optimize Automated Continuous Deployment.

CO4: Apply configuration management practices using Ansible to automate and streamline infrastructure management.

CO5: Apply Cloud-based DevOps tools using Azure DevOps.

TEXT BOOKS:

T1: Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
T2: Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.

REFERENCE BOOKS:

R1:Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni.
R2: Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
R3: David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
R4: MariotTsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition,2019.

CO-PO MAPPING

PO &PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	-	-	-	1	1	1	2	2	2	2
CO2	2	2	1	1	1	-	-	-	2	2	1	2	1	1	2
CO3	2	2	1	2	1	-	-	-	1	2	1	2	2	2	2
CO4	2	1	2	2	1	-	-	-	1	1	1	2	2	2	2
CO5	2	2	1	2	1	-	-	-	1	2	1	2	2	2	2
AVG	2	1.8	1.4	1.6	1.2	-	-	-	1	1.6	1	2	1.8	1.8	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6304	WEB APPLICATION SECURITY	3	0	0	3

Course Objective

The student should be made to

1. Understand the fundamentals of web application security.
2. Focus on wide aspects of secure development and deployment of web applications.
3. Learn how to build secure APIs
4. Learn the basics of vulnerability assessment and penetration testing
5. Get an insight about Hacking techniques and Tools.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF WEB APPLICATION SECURITY** The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation	9
II	**SECURE DEVELOPMENT AND DEPLOYMENT** Web Applications Security - Security Testing, Security Incident Response Planning,The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM).	9
III	**SECURE API DEVELOPMENT** API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.	9
IV	**VULNERABILITY ASSESSMENT AND PENETRATION TESTING** Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Databasebased vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing	9
V	**HACKING TECHNIQUES AND TOOLS** Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Understanding the basic concepts of web application security and the need for it.
CO2: Acquainted with the process for secure development and deployment of web applications.
CO3: Design and develop Secure Web Applications that use Secure APIs.
CO4: Get the importance of carrying out vulnerability assessment and penetration testing
CO5: Acquire the skill to think like a hacker and to use hacker's tool sets.

TEXT BOOKS:

T1: Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
T2: Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.
T3: Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCE BOOKS:

R1: Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc
R2:Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
R3: Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA
R4: Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	3	-	-	-	-	-	-	1	1	2	1
CO2	2	1	2	1	3	-	-	-	-	-	-	-	-	2	-
CO3	1	1	1	2	3	-	-	-	-	-	-	1	1	2	1
CO4	1	2	1	1	2	-	-	-	-	-	-	-	1	2	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	-	2	1
AVG	1.2	1.6	1.6	1.4	2.6	-	-	-	-	-	-	1	1	2	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6305	STREAM PROCESSING	3	0	0	3

Course Objective

The student should be made to

1. Expertise the concept of data processing methods, analytics and management strategies.
2. Learn big data to design and implement solutions for streaming data analytics.
3. Proficient in diverse data models, query languages, and semantic web systems.
4. Update skills in Apache Kafka ad tools for building real-time event-driven applications.
5. Equip with the skills to implement real-time analytics using Spark Streaming.

Unit	Description	Instructional Hours
I	**FOUNDATIONS OF DATA SYSTEMS:** Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges	9
II	**REAL-TIME DATA PROCESSING:** Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage	9
III	**DATA MODELS AND QUERY LANGUAGES:** Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Manyto-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL	9
IV	**EVENT PROCESSING WITH APACHE KAFKA:** Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API	9
V	**REAL-TIME PROCESSING USING SPARK STREAMING :** Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1: Analyze and process data in various data management Strategy

CO2: Design and implement real-time data processing solutions in Big data infrastructures.

CO3: Apply diverse data models and query languages to effectively manage datasets

CO4: Analyze and Design and manage scalable event streaming systems using Apache Kafka API.

CO5: Solve problems in real-world applications that process data streams.

TEXT BOOKS:

T1: Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication 2018
T2: Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media 2017

REFERENCE BOOKS:

R1: Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing
R2: https://spark.apache.org/docs/latest/streaming-programming-guide.html 2. Kafka.apache.org

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	-	-	-	-	-	-	2	-	3	3
CO2	1	2	2	2	2	2	-	-	-	-	-	2	2	3	2
CO3	1	2	3	2	2	-	-	-	-	-	-	3	2	3	2
CO4	2	3	3	2	2	1	-	-	-	-	-	2	2	3	3
CO5	2	3	2	2	2	2	-	-	-	-	-	2	2	3	3
AVG	1.4	2.4	2.5	2	2	1.6	-	-	-	-	-	2.2	2	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6306	STORAGE TECHNOLOGIES	3	0	0	3

Course Objective

The student should be made to

1. Describe fundamentals of storage technology and Components of a Storage Environment.
2. Classifydifferent types of RAID technologies and intelligent storage systems.
3. Illustratestorage networking technologies and storage virtualization technologies.
4. Study different cloud based backup and recovery strategies.
5. Understand common storage management activities and security systems.

Unit	Description	Instructional Hours
I	**STORAGE SYSTEMS:** Introduction to Information Storage Technology: Review data creation and the amount of data being created and understand the value of data to a business, Challenges in Data Storage and Management, Data Storage Infrastructure. Storage Systems Environment: Components of a Storage System Environment: Disk drive components, Disk Drive Performance, Logical Components.	9
II	**INTELLIGENT STORAGE SYSTEMS AND RAID:** Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale out storage Architecture.	9
III	**STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION** Evolution of networked storage, Architecture, Overview of FC-SAN, NAS, and IP-SAN. Network-Attached Storage (NAS): Benefits of NAS, Components, Implementations, File Sharing, I/O operations, Performance and Availability. Content Addressed Storage (CAS): features and Benefits of a CAS. CAS Architecture, Storage and Retrieval, Examples. Storage Virtualization: Forms, Taxonomy, Configuration, Challenges, Types of Storage Virtualizations.	9
IV	**BACKUP, ARCHIVE AND REPLICATION:** Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).	9
V	**SECURING STORAGE INFRASTRUCTURE** Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Demonstrate the fundamentals of information storage Technology and Components of a Storage System Environment.

CO2: Classify the usage of advanced intelligent storage systems and RAID.

CO3: Interpret various storage networking architectures - SAN, including storage subsystems and Virtualization.

CO4: Examine the different role in providing disaster recovery and remote replication technologies.

CO5: Infer the security needs and security measures to be employed in information storage Management.

TEXT BOOKS:

T1: EMC Corporation, Information Storage and Management, Wiley, India 2012

T2: Jon Tate, Pall Beck, Hector Hugo Ibarra, ShanmuganathanKumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017

REFERENCE BOOKS:

R1: Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein,Storage Networks Explained, Second Edition, Wiley, 2009

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	-	-	-	-	-	-	2	-	-	-
CO2	3	-	2	2	3	-	-	-	3	-	-	2	2	2	2
CO3	2	-	3	2	2	-	-	-	3	-	-	2	2	2	2
CO4	3	2	1	2	2	-	-	-	-	-	-	2	2	2	2
CO5	2	3	2	-	2	-	-	-	-	-	-	2	2	2	2
AVG	2.4	2.3	1.8	2	2.4	-	-	-	3	-	-	2	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH	22IT6307	FOG COMPUTING & ENERGY MANAGEMENT IN IoT DEVICES	3	0	0	3

Course Objective

The student should be made

1. To understand the concept, need, and applications of Fog Computing while exploring its integration with IoT and Cloud Computing.
2. To analyze the architectural components, performance, and challenges involved in designing and implementing Fog Computing systems.
3. To gain knowledge about the protocols and tools used for communication and development in Fog Computing environments.
4. To explore the power generation, conversion methods, and challenges of energy harvesting in Wireless Sensor Networks.
5. To study practical applications of energy harvesting in fields such as medical devices, RF sensors, and structural health monitoring.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FOG COMPUTING** Fog Computing-Definition-Characteristics-Application Scenarios - Issues -Fog Computing and Internet of Things-Pros and Cons-Myths of Fog Computing - Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT, FOG, Cloud	9
II	**ARCHITECTURE** Working Procedure -Performance Evaluation Components- Software Systems – Architecture-Modeling and Simulation –Challenges	9
III	**FOG PROTOCOLS** Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols.	9
IV	**ENERGY HARVESTING WIRELESS SENSORS** Power sources for WSN – Power generation – conversion – examples – case studies. Harvesting microelectronic circuits – power conditioning and losses	9
V	**SELECTED APPLICATIONS OF ENERGY HARVESTING SYSTEMS** Case studies for Implanted medical devices – Bio-MEMS based applications – harvesting for RF sensors and ID tags – powering wireless SHM sensor nodes.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Explain the fundamental concepts and characteristics of advanced computing systems and energy management.

CO2: Analyze the architectures, protocols, and components used in computing systems and energy solutions.

CO3: Evaluate the efficiency and applicability of various tools, techniques, and protocols in solving technical challenges.

CO4: Apply the principles of system design and energy optimization to develop practical solutions for complex problems.

CO5: Design innovative systems and frameworks by integrating advanced technologies for real-world applications.

TEXT BOOKS:

T1: Lewson, S. Charles, "Fog Protocol and FogKit: A JSON-Based Protocol and Framework for Communication Between Bluetooth-Enabled Wearable Internet of Things Devices", DigitalCommons, 2015.

T2: Dastjerdi, Amir Vahid, and Rajkumar Buyya,"Fog Computing: Helping the Internet of Things Realize Its Potential", COMPUTER, vol. 49, no. 8, 2016.

T3: Carvalho, Carlos Manuel Ferreira, and Nuno Filipe Silva Veríssimo Paulino, "CMOS Indoor Light Energy Harvesting System for Wireless Sensing Applications", Springer Cham, 2015.

T4: Briand, Danick, Eric Yeatman, and Shad Roundy,"*Micro Energy Harvesting",* Wiley-VCH Verlag GmbH & Co. KGaA, 2015.

REFERENCE BOOKS:

R1: Anil Saroliya, Ajay Rana, Vivek Kumar, José Sebastián Gutiérrez Calderón, Senthil Athithan," Internet of Things and Fog Computing-Enabled Solutions for Real-Life Challenges", Taylor and Francis Books Limited U.K, 2023, 9781032136318.

R2: Balakrishnan, P., et al. "Fog Computing: Introduction, Architecture, Analytics, and Platforms." Handbook of Research on Cloud and Fog Computing Infrastructures for Data Science, edited by Pethuru Raj and Anupama Raman, IGI Global, 2018.

R3: Abbas, Assad, Samee U. Khan, and Albert Y. Zomaya, "Fog Computing: Theory and Practice", 1st ed., Kindle ed., Wiley, 2020.

R4: Rajkumar Buyya, Satish Narayana Srirama "Fog and Edge Computing", Wiley Publications, 2019.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	-	2	3	-	2	3	3	2
CO2	3	3	-	3	3	2	2	-	2	2	-	2	3	3	3
CO3	3	3	2	3	3	3	2	2	2	2	2	3	2	2	3
CO4	3	2	3	3	2	3	3	2	2	2	2	2	3	2	2
CO5	3	2	3	2	3	2	3	3	3	3	3	3	3	3	3
AVG	3.0	2.4	2.6	2.6	2.6	2.4	2.6	2.33	2.2	2.4	2.33	2.4	2.8	2.6	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6308	IoT CLOUD AND DATA ANALYTICS	3	0	0	3

Course Objective

The student should be made to

1. Understand the concepts, applications, and integration of Fog Computing with IoT and Cloud.
2. Analyze the architecture, performance, and challenges of Fog Computing systems.
3. Learn protocols and tools for communication and development in Fog Computing.
4. Explore energy harvesting methods and challenges in Wireless Sensor Networks.
5. Study practical energy harvesting applications in medical, RF sensors, and structural monitoring.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CLOUD COMPUTING** Cloud Computing Basics-Cloud Computing Overview- Cloud Components – Infrastructure – Services, Applications – Storage- Database Services, Intranets and the Cloud – Components – Hypervisor Applications, First Movers in the Cloud.	9
II	**IOT AND CLOUD** Cloud Computing Concept–Grid/SOA and Cloud Computing– Cloud Middleware NIST's SPI Architecture and Cloud Standards– The Cloud of Things– The Internet of Things and Cloud Computing The Cloud of Things Architecture–Four Deployment Models	9
III	**IOT AND MACHINE LEARNING** Advantages of IoT and Machine Learning Integration– Implementation of Supervised Algorithm–Regression (Linear and Logistic) – SVM for IoT–Neural Network on case study: Agriculture and IoT– Smart Home etc. Regression–SVM.	9
IV	**INTRODUCTION DATA ANALYTICS FOR IOT** Data Analytics-Structured data-Semi structured data-Unstructured data-Data in Motion vs Data at rest-Characteristics of Data-Evolution of Big data-Why Big Data-Importance of Big data-Big data applications - IoT Data analytics Overview - IoT Data Analytics Challenges	9
V	**BIG DATA TRENDS AND CLOUD COMPUTING** Edge streaming analytics-Comparing Big Data and Edge Analytics-Distributed Analytics System-Network Analytics-Flexible Net Flow Architecture-FNF Components-Cloud computing-Massive Data challenges.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Explain the basics, components, and applications of cloud computing, including infrastructure and services.

CO2: Compare various cloud computing architectures and deployment models, emphasizing their integration with IoT.

CO3: Implement supervised machine learning algorithms like regression and SVM to solve IoT-related problems.

CO4: Analyze the types of data and challenges in IoT data analytics while understanding the evolution and importance of Big Data.

CO5: Evaluate edge streaming analytics and distributed systems for handling massive data challenges in cloud environments.

TEXT BOOKS:

T1: Lewson, S. Charles, "Fog Protocol and FogKit: A JSON-Based Protocol and Framework for Communication Between Bluetooth-Enabled Wearable Internet of Things Devices", DigitalCommons, 2015.

T2: Dastjerdi, Amir Vahid, and Rajkumar Buyya,"Fog Computing: Helping the Internet of Things Realize Its Potential", COMPUTER, vol. 49, no. 8, 2016.

T3: Carvalho, Carlos Manuel Ferreira, and Nuno Filipe Silva Veríssimo Paulino, "CMOS Indoor Light Energy Harvesting System for Wireless Sensing Applications", Springer Cham, 2015.

T4: Briand, Danick, Eric Yeatman, and Shad Roundy,"*Micro Energy Harvesting",* Wiley-VCH Verlag GmbH & Co. KGaA, 2015.

REFERENCE BOOKS:

R1: Anil Saroliya, Ajay Rana, Vivek Kumar, José Sebastián Gutiérrez Calderón, Senthil Athithan," Internet of Things and Fog Computing-Enabled Solutions for Real-Life Challenges", Taylor and Francis Books Limited U.K, 2023, 9781032136318.

R2: Balakrishnan, P., et al. "Fog Computing: Introduction, Architecture, Analytics, and Platforms." Handbook of Research on Cloud and Fog Computing Infrastructures for Data Science, edited by Pethuru Raj and Anupama Raman, IGI Global, 2018.

R3: Abbas, Assad, Samee U. Khan, and Albert Y. Zomaya, "Fog Computing: Theory and Practice", 1st ed., Kindle ed., Wiley, 2020.

R4: Rajkumar Buyya, Satish Narayana Srirama "Fog and Edge Computing", Wiley Publications, 2019.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	-	2	3	-	2	3	3	2
CO2	3	3	-	3	3	2	2	-	2	2	-	2	3	3	3
CO3	3	3	2	3	3	3	2	2	2	2	2	3	2	2	3
CO4	3	2	3	3	2	3	3	2	2	2	2	2	3	2	2
CO5	3	2	3	2	3	2	3	3	3	3	3	3	3	3	3
AVG	3.0	2.4	2.6	2.6	2.6	2.4	2.6	2.33	2.2	2.4	2.33	2.4	2.8	2.6	2.6

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT6309	UI AND UX DESIGN	2	0	2	3

Course Objective

1. Develop the ability to apply the Design Thinking Framework and empathy techniques to create user-centered solutions.
2. Master the application of visual design standards, UI components, and branding integration to create cohesive and engaging interfaces.
3. Conduct UX research and develop strategies that align user needs with business goals for impactful design solutions.
4. Design and refine interactive prototypes through effective wireframing, usability testing, and iterative processes.
5. Utilize Figma and other low-code/no-code tools to efficiently create and manage professional-grade UI/UX designs.

Unit	Description	Instructional Hours
I	**INDUSTRY-RELEVANT DESIGN THINKING** Understanding UI vs. UX Design, Design Thinking Framework, Innovative Thinking Methods,Empathy Techniques for User Insights.	6
II	**UI DESIGN PRINCIPLES FOR INDUSTRY** Visual Design Standards, UI Components and Design Patterns, User Interaction and Engagement,Branding Integration and Style Guides.	6
III	**UX RESEARCH AND STRATEGY IN THE INDUSTRY** UX Fundamentals for Business Impact Design Process, Industry Research Techniques, Aligning Userand Business Goals.	6
IV	**WIREFRAMING, PROTOTYPING AND TESTING** Sketching Principles - Sketching Red Routes - Responsive Design - Wireframing - Creating Wireflows - Building a Prototype - Building High Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods – Synthesizing Test Findings - Prototype Iteration.	6
V	**LOW CODE -NO CODE TOOLS** Low code- No code Tools Essential Concepts of Figma - Setup and Configure Figma - Images, Shapes, and Tools - Working with Figma - Figma Components - Styles and Libraries in Figma - Cardsand Layout Grids in Figma.	6
	Total Instructional Hours	**30**

LAB CONTENTS:

Experiments

1. Designing a Responsive layout for a societal application.
2. Exploring various UI Interaction Patterns
3. Developing an interface with proper UI Style Guides
4. Developing Wireflow diagram for application using open-source software
5. Exploring various open-source collaborative interface Platform
6. Hands on Design Thinking Process for a new product
7. Designing a User Interface with Figma
8. Creating and Managing Layout Grids and Components in Figma.

Total Instructional Hours: 30

Course Outcome

At the end of the course, students would be able to:

CO1: Summarize the difference between UI and UX design to explain the significance of empathy techniques in gathering user insights.

CO2: Apply UI design principles to implement visual design standards and UI components to enhance user interaction.

CO3: Illustrate UX research techniques to align user and business goals with the industry-based design process.

CO4: Apply wireframing and prototyping techniques to create and test responsive designs.

CO5: Apply essential concepts of Figma to create interactive user centered design.

TEXT BOOKS:

T1 Joel Marsh, UX for Beginners, O'Reilly, 2022.

T2 Jon Yablonski, Laws of UX: Using Psychology to Design Better Products & Services, O'Reilly, 2021.

T3 Don Norman, The Design of Everyday Things: Revised and Expanded Edition, Basic Books, 2013.

REFERENCES:

R1 Steve Krug, Don't Make Me Think: A Commonsense Approach to Web Usability, New Riders, 2014.

R2 Jeffrey Zeldman and Ethan Marcotte, Responsive Web Design, A Book Apart, 2011.

R3 Kim Goodwin, Designing for the Digital Age: How to Create Human-Centered Products and Services, Wiley, 2009

Online course:

https://www.coursera.org/learn/designing-user-interfaces-and-experiences-uiux

CO-PO Mapping

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	-	-	-	-	-	2	-	2	2	2	2
CO2	3	-	2	-	-	-	-	-	-	2	-	2	2	2	2
CO3	-	3	-	2	-	-	-	-	-	-	-	-	2	2	2
CO4	-	3	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	3	-	2	-	-	-	-	-	-	2	-	2	2	2	2
AVG	3	3	2	2	-	-	-	-	-	2	-	2	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22IT6310	VIDEO ANALYTICS	3	0	0	3

Course Objective

The student should be made to

1. To familiarize students with foundational deep learning tools and techniques, enabling them to implement a basic handwritten digit recognition system.
2. To develop expertise in CNN architectures and operations, optimizing and evaluating models for computer vision tasks.
3. To equip students with the knowledge of feature extraction, object detection, and segmentation using traditional and advanced CNN-based methods.
4. To introduce generative models like GANs, for exploring applications such as image translation and artistic style transfer.
5. Utilize Figma and other low-code/no-code tools to efficiently create and manage professional-grade UI/UX designs.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Deep Neural Networks – Introduction to Tensor flow – Keras Deep Learning library – OpenCV Library - Handwritten Number Recognition with Keras and OpenCV.	9
II	**CONVOLUTIONAL NEURAL NETWORK FOR COMPUTER VISION** Convolution Neural Network – CNN architectures and drawbacks of DNN-convolution and pooling operations in tensor flow – training and evaluating CNN – model performance optimization – ImageNet – LeNet – AlexNet – VGGNet – GoogleLENet – ResNet.	9
III	**FEATURE EXTRACTION,OBJECT DETECTION AND SEGMENTATION** Feature extraction approach – transfer learning example – multi-task learning – Auto encoders of CNN – difference between object detection and image classification - Traditional, Non-CNN approaches to object detection - R-CNN – Regions with CNN features - Fast R-CNN – fast region-based CNN - Faster R-CNN – faster region proposal network-based CNN -Mask R-CNN – Instance segmentation with CNN.	9
IV	**GENERATIVE MODELS** Pix2pix - Image-to-Image translation - GAN – code Example – feature matching –applications of generative models – neural artistic style transfer – generative adversarial networks – visual dialogue model.	9
V	**Video Classification** Understanding and classifying videos – exploring video classification dataset – splitting videos into frames – approaches for classifying videos – extending image-based approaches to videos: Regressing the human pose- segmenting videos – generating videos.	9
	Total Instructional Hours	45

At the end of the course, students would be able to:

Course Outcome

CO1 Explain the basic concepts of image processing and its libraries.
CO2 Make use of the various CNN models used for image analytics.
CO3 Apply the various levels of segmentation and interpret the results for object detection and feature extraction.
CO4 Make use of the GAN model to solve the real-world problems.
CO5 Experiment with various approaches for classifying and segmenting videos.

TEXT BOOKS:

T1: Mohit Sewak, Md. Rezaul Karim and Pradeep Pujari, "Practical Convolutional Neural Networks", Packt Publishing, 2018. (For Units I,II,III).
T2: Raja lingappaa Shanmugamani, "Deep Learning for Computer Vision", Packt Publishing, 2018. (For Units IV,V)

REFERENCE BOOKS:

R1: D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012
R2: Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012

Online course:
https://www.coursera.org/learn/designing-user-interfaces-and-experiences-uiux

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	-	2	2	2	3	2	2	2
CO2	2	2	-	-	-	-	2	-	2	2	2	3	2	2	2
CO3	2	2	1	-	-	-	2	-	2	2	2	3	2	2	2
CO4	2	2	2	-	-	-	2	-	2	2	2	3	2	2	2
CO5	2	2	1	-	-	-	2	-	2	2	2	3	2	2	2
AVG	2	2	1.3	-	-	-	2	-	2	2	2	3	2	2	2

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Programme	Course code	Name of the course	L	T	P	C
B.TECH	22IT6311	ROBOTIC PROCESS AUTOMATION	3	0	0	3

Course Objective

The Student should be made to

1. Understand the basic concepts of Robotic Process Automation.
2. Expose to the key RPA design and development strategies and methodologies.
3. Learn the fundamental RPA logic and structure.
4. Explore the Exception Handling, Debugging and Logging operations in RPA.
5. Learn to deploy and Maintain the software bot.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ROBOTIC PROCESS AUTOMATION** Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.	9
II	**AUTOMATION PROCESS ACTIVITIES** Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events.	9
III	**APP INTEGRATION, RECORDING AND SCRAPING** App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.	9
IV	**EXCEPTION HANDLING AND CODE MANAGEMENT** Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.	9
V	**DEPLOYMENT AND MAINTENANCE** Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA.	9
	Total Instructional Hours	**45**

		At the end of the course, students would be able to:
Course Outcome	CO1	Identify the features, benefits, and applications of RPA, differentiate it from automation, and explain its components, tools, and workflows.
	CO2	Describe workflows and control flow in automation processes, demonstrate data manipulation and apply techniques for handling controls effectively.
	CO3	Perform app integration, recording, and data scraping using workflows, apply process mining to analyze and improve processes
	CO4	Use UiPath Studio to detect, and handle exceptions in automation processes and organize projects, reuse workflows, and implement state machines."
	CO5	Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes

TEXT BOOKS:

T1	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.
T2	Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.

REFERENCE BOOKS:

R1	Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018.
R2	Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018.
R3	A Gerardus Blokdyk, "Robotic Process Automation Rpa A Complete Guide ", 2020.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	-	-	2	-	1	-	-	3
CO2	3	3	3	2	3	-	-	-	-	2	-	1	2	2	2
CO3	3	3	3	3	3	-	-	-	-	2	-	1	2	2	2
CO4	3	3	3	3	3	-	-	-	-	2	2	1	2	-	2
CO5	3	2	3	2	3	-	-	-	-	3	3	1	-	-	2
Avg	3	2.8	3	2.4	3	-	-	-	-	2.2	2.5	1	2	2	2.2

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Programme	Course code	Name of the course	L	T	P	C
B.TECH	22IT6312	NEURAL NETWORKS AND DEEP LEARNING	3	0	0	3

Course Objective

The student should be made to

1. Understand the basics in deep neural networks
2. Understand the basics of associative memory and unsupervised learning networks
3. Apply CNN architectures of deep neural networks
4. Analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
5. Apply auto encoders and generative models for suitable applications.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An IntroductionEvolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies ofANNs-Supervised Learning Network.	9
II	**ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS** Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.	9
III	**THIRD-GENERATION NEURAL NETWORKS** Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation –Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression	9
IV	**DEEP FEEDFORWARD NETWORKS** History of Deep Learning- A Probabilistic Theory of Deep Learning-Gradient Learning – Chain Ruleand Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping,Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.	9
V	**RECURRENT NEURAL NETWORKS** Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.	9
	Total Instructional Hours	45

Course Outcome		**At the end of the course, students would be able to:**
	CO1	Identify the scope, evolution, and basic models of Neural Networks, key terminologies of ANNs, and the concept of supervised learning and Apply Convolution Neural Network for image processing.
	CO2	Describe training algorithms for pattern association and Understand the basics of associative memory and unsupervised learning networks.
	CO3	Apply the concepts of third-generation neural networks, including Spiking Neural Networks, Convolutional Neural Networks, and Deep Learning, to real-world applications in computer vision and image processing
	CO4	Analyze the history and probabilistic theory of deep learning, and evaluate techniques such as gradient learning, backpropagation, regularization, and batch normalization for improving neural network performance.
	CO5	Apply Recurrent Neural Networks and autoencoders to tasks like image generation, compression, and natural language processing

TEXT BOOKS:

T1	Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
T2	Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

R1	AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly,2018.
R2	Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media,2017
R3	Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018
R4	S Rajasekaran, G A VijayalakshmiPai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
R5	James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003

CO-PO MAPPING:

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	-	-	2	-	-	2	-	2	3
CO2	3	2	2	2	3	-	-	-	-	-	-	2	-	1	-
CO3	3	3	3	2	3	3	-	-	2	-	3	3	3	3	3
CO4	3	3	3	3	3	2	-	-	-	-	2	2	-	1	-
CO5	1	3	3	2	3	2	-	-	2	-	3	3	3	3	3
Avg	**2.6**	**2.8**	**2.8**	**2.2**	**3**	**2.2**	**-**	**-**	**2**	**-**	**2.6**	**2.4**	**3**	**2**	**3**

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IBM SYLLABUS

Program	Course code	Name of the course	L	T	P	C
B. TECH.	22IT6313	DATA SCIENCE	3	0	0	3

Course Objective

The student should be able

1. Learn the scientific method for science projects and understand the key roles within a data science team.
2. Develop technical skills using popular open-source tools like Apache Hadoop and Apache Spark.
3. Gain expertise in Big Data Engineering and Spark practices with a focus on Scala concepts.
4. Explore industry case studies and applications of Apache Spark.
5. Participate in role-playing and challenge-based scenarios to propose practical, real-world solutions.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA SCIENCE:** Data science Introduction and overview-Data science domains-data science roles- Data science methodology-data analytics lifecycle-Business Analytics-Business Understanding-Data Science Methodology.	9
II	**INTRODUCTION TO SPARK** Big Data-Challenges in Big data- Frameworks-Apache Hadoop-Modules andComponents- Installation-Environment Setup-Apache Spark-History-Run Time Architecture-Hadoop vs Spark-Spark Ecosystem -Spark Environment Setup.	9
III	**SPARK FUNDAMENTALS** Spark Libraries-Resilient Distributed Datasets (RDD)-Spark Configuration-Monitoring-Spark Tuning-Spark Web UI-Applications- Apache Spark Core-Unified Stack- Cluster Managers-Big Data Analytics.	9
IV	**INTRODUCTION TO SCALA** Scala Language-Object Oriented & Function Programming-JVM-Dependencies - Scala Interpreter-IntelliJ IDEA IDE-Variables-Identifiers-Inference & types- Comments -Data Types-Operators-Control Structure-Conditional Statements- Looping.	9
V	**SPARK STREAMING SCALA:** Scala Expressions-Exception Handling-Classes and Methods-Singleton Objects- Functions-Closures-List Literals-List Operations-Sequences-Sets and Maps-Collections- Pattern Matching -Traits-Scala Word Count-Scala Character Count - Analyze Twitter Text-Spark shell-Spark Context.	9
	Total Instructional Hours	**45**

At the end of the course, students would be able to:

Course Outcome

CO1 Understand the evolution and significance of data science in today's world.
CO2 Explore Spark use cases through the Big Data lifecycle.
CO3 Learn the fundamentals of Spark in the context of data science.
CO4 Develop proficiency in the Scala functional programming language.
CO5 Build and implement Spark Streaming applications using Scala functions.

TEXTBOOK:

T1 IBM Data Engine for Hadoop and Spark, by "Dino Quintero, Luis Bolinches, Aditya Gandakusuma Sutandyo"
T2 "Spark: The Definitive Guide"Author: Bill Chambers, Matei Zaharia

REFERENCE BOOKS

R1 "Scala for the impatient" author: cay s. Horstmann
R2 "Learning Spark: Lightning-Fast Big Data Analysis" Authors: Holden Karau, Andy Konwinski"
R3 "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data" Authors: Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch (IBM).

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2		-	-	3	-	3	-	1	-	-
CO2	3	1	2	2	2	3	-	1	2	-	3	2	1	-	-
CO3	3	2	2	2	2	3	-	1	2	-	2	2	1	-	-
CO4	3	1	2	2	-	3	-	1	-	-	2	2	1	-	-
CO5	3	1	2	1	2	-	-	-	-	-	2	3	1	-	-
Avg	**3**	**1**	**2**	**2**	**2**	**2**	-	**1**	**1**	-	**2**	**2**	**1**	-	-

CHAIRMAN, BOARD OF STUDIES

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Program	Course code	Name of the course	L	T	P	C
B. TECH.	22IT6314	PREDICTIVE MODELLING	3	0	0	3

Course Objective

The student should be able to

1. Understand the development of models for predicting categorical and continuous outcomes using techniques such as neural networks, decision trees, logistic regression, support vector machines, and Bayesian network models.
2. Learn to utilize binary classifier and numeric predictor nodes for automated model selection.
3. Gain insights on selecting appropriate models based on specific scenarios and learn methods to combine multiple models to enhance prediction accuracy.

Unit	Description	Instructional Hours
I	INTRODUCTION TO PREDICTIVE MODELLING What is Predictive Analytics? - What does a predictive model do? - Descriptive v/s Predictive v/s Prescriptive Analytics - There is a need for a methodology called CRISP-DM (Cross-Industry Standard Process for Data Mining). *Illustrative program: Collect and understand the data*	9
II	INTRODUCTION TO SPSS MODELER IBM SPSS Modeler (Nodes, Streams), Manager Pane and Project Pane-collecting Initial Data-Understand data- Set the unit of Analysis (DISTINCT, AGGREGATE, SETTOFLAG)- Integrate data (APPEND, MERGE), Relationship between a categorical and continuous field, Relationship between two continuous fields. *Illustrative program: Set the unit of analysis for the data* *Remove duplicate records* *Aggregate transactional data* *Create flag fields and aggregate the dataIntegrate data* *Appending Report* *Merge field*	9
III	USING FUNCTIONS IN SPSS Date and Time Functions-Conversion Functions-String Functions-Statistical Functions, Measure of Central Tendency, Measures of Variability-Missing Value Functions, Undefined and Blank Values Function. *Illustrative program:* *Identify relationships in the data* *Examine the relationship between categorical fields* *Examine the relationship between a categorical and continuous field Predict customer churn in telecom dataset* *Build Model using CHAID* *Examine the CHAID Model* *Apply the model to new data*	9
IV	DATA FIELD TRANSFORMATION Field transformation- Additional Field Transformation-Sequence, Data-Sampling- balancing- partitioning data, Derive, Binning, Reclassify, Control Language for Expression Manipulation (CLEM), Filler, Transform, Sequence Functions, Restructure Data.	9

Illustrative program: Create a Segmentation Model
Create homogeneous groups (clusters) of customers based on usage patterns.
Using functions in IBM SPSS Modeler
a. Date and Time Functions
b. String Functions
c. Statistical Functions
d. Missing Value Function
Add fields to the data
a. Derive fields as formula
b. Derive fields as a flag or nominal
c. Reclassify categorical fields
d. Bin a continuous field into a categorical field with equal counts

V	**INTRODUCTION TO MODEL** Modeling Algorithms-Supervised Models- Partition the data- Segmentation Models-Creating a model in IBM SPSS Modeler-Introduction to Linear Regression-Introduction to Logistic Regression-Introduction to Neural Networks-Multilayer Perceptron (MLP)-Radial Basis Function (RBF). *Illustrative program: Create a Linear Regression Model to Predict Employee Salaries.* *Use Logistic Regression to Predict Response to a Charity Promotion Campaign.* *Predicting Credit Risk Using Neural Networks*	9
	Total Instructional Hours	**45**

At the end of the course, students would be able to:

Course Outcome	CO1	Learn to design, build, evaluate, and implement predictive models tailored to various business applications.
	CO2	Compare and analyze different predictive modeling techniques.
	CO3	Identify and select the most suitable predictive modeling approaches for specific use cases.
	CO4	Apply predictive modeling techniques using tools like SPSS Modeler.
	CO5	Gain insights on the appropriate usage of each model and methods for combining multiple models to enhance prediction accuracy.

REFERENCES:

R1 IBM Courseware
R2 Fundamentals of Machine Learning for Predictive Data Analytic, by john D Kelleher
R3 Applied Predictive Modeling, by Max Kuhn
R4 IBM SPSS Modeler Essentials, by Jesus Salcedo, Keith McCormick

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	-	-	-	3	-	3	-	1	-	-
CO2	3	1	2	2	2	3	-	1	2	-	3	2	1	-	-
CO3	3	2	2	2	2	3	-	1	2	-	2	2	1	-	-
CO4	3	1	2	2	-	3	-	1	-	-	2	2	1	-	-
CO5	3	1	2	1	2	-	-	-	-	-	2	3	1	-	-
Avg	**3**	**1**	**2**	**2**	**2**	**2**	**-**	**1**	**1**	**-**	**2**	**2**	**1**	**-**	**-**

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HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
(Approved by AICTE, New Delhi, Accredited by NAAC with 'A ++'Grade)
Coimbatore - 641032.

NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2022

ACADEMIC YEAR 2024-25 EVEN SEMESTER

S. No	Regulation	Course Code with Name	Credits
1.	2022	22IT6201- Foundations of Data Science	3
2.	2022	22IT6301 - Text and Speech Analysis	3
3.	2022	22IT6303 – Dev-ops	3
4.	2022	22IT6304 - Web Application Security	3
5.	2022	22IT6305 - Stream Processing	3
6.	2022	22IT6306 - Storage Technologies	3
7.	2022	22IT6307 - Fog Computing & Energy Management In Iot Devices	3
8.	2022	22IT6309 - UI and UX Design	3
9.	2022	22IT6310 - Video Analytics	3
10.	2022	22IT6312 – Neural Networks and Deep Learning	3

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HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

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Coimbatore - 641 032.

B.TECH. INFORMATION TECHNOLOGY

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the EVEN Semester

Academic year 2024-2025

Batch 2021-2025

CURRICULUM
R2019

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMME

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2019

For the students admitted during the academic year 2021-2022 and onwards

The course code 21 indicates that the students joined in the academic year 2021

SEMESTER I – 20 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2.	21MA1101	Calculus	BS	3	1	0	4	40	60	100
THEORY & LAB COMPONENT										
3.	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4.	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5.	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6.	21EC1154	Basics of Electron Devices and Electric Circuits	ES	2	0	2	3	50	50	100
PRACTICAL										
7.	21HE1071	Language Competency Enhancement Course-I	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
8.	21HE1072	**Career Guidance Level** – I Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9.	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total:	**16**	**2**	**10**	**20**	**580**	**320**	**900**

SEMESTER II - 22 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2.	21MA2104	Differential Equations and Linear Algebra	BS	3	1	0	4	40	60	100
THEORY & LAB COMPONENT										
3.	21IT2151*	Programming in C	ES	2	0	2	3	50	50	100

4.	21ME2154	Engineering Graphics	ES	1	0	4	3	50	50	100
5.	21PH2151	Material Science	BS	2	0	2	3	50	50	100
6.	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICALS										
7.	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8.	21HE2071	Language Competency Enhancement Course-II	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
9.	21HE2072	Career Guidance Level – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total:	**14**	**2**	**16**	**22**	**530**	**370**	**900**

SEMESTER III – 20 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA3151	Statistics and Queuing Theory	BS	3	0	2	4	50	50	100
2.	21IT3201	Data Structures and Algorithm Design	PC	3	0	0	3	40	60	100
3.	21IT3202	Object Oriented Programming Using C++	PC	3	0	0	3	40	60	100
4.	21IT3203	Computer Organization and Architecture	PC	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
5.	21IT3251*	Digital Principles and System Design	PC	3	0	2	4	50	50	100
PRACTICALS										
6.	21IT3001	Data Structures and Algorithm Laboratory	PC	0	0	3	1.5	50	50	100
7.	21IT3002	Object Oriented Programming using C++ Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8.	21MC3191	Indian Constitution	AC	2	0	0	0	100	0	100
9.	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10.	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total:	**20**	**0**	**10**	**20**	**575**	**425**	**1000**

SEMESTER IV - 21 Credits

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA4102	Discrete Mathematics	~~BS~~	~~3~~	~~1~~	0	4	~~40~~	~~60~~	~~100~~
2.	21IT4201	Java Programming	PC	3	0	0	3	40	60	100

3.	21IT4202	Advanced Database Management Systems	PC	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
4.	21IT4251*	Object Oriented Software Engineering	PC	3	0	2	4	50	50	100
5.	21IT4253	Principles of Operating Systems	PC	3	0	2	4	50	50	100
PRACTICALS										
6.	21IT4001	Java Programming Laboratory	PC	0	0	3	1.5	50	50	100
7.	21IT4002	Database Management Systems Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8.	21MC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100	0	100
9.	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10.	21HE4073	Ideation Skills	EEC	1	0	0	0	100	0	100
			Total:	**20**	**2**	**8**	**21**	**620**	**380**	**1000**

SEMESTER V – 23 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
1.	21IT5201	Mobile Computing	PC	3	0	0	3	40	60	100
2.	21IT5202	Computer Networks	PC	3	0	0	3	40	60	100
3.	21IT5209	Embedded Systems Design	PC	3	0	0	3	40	60	100
4.	21IT5204	Artificial Intelligence and Machine Learning	PC	3	0	0	3	40	60	100
5.	21IT5205	Data Warehousing and Data Mining	PC	3	0	0	3	40	60	100
Theory with Lab Component										
6.	21IT53XX* /21IT5358	**Professional Elective-I/ Business Intelligence Analyst**	PE/ ICC	2	0	2	3	50	50	100
PRACTICALS										
7.	21IT5001	Machine Learning Laboratory	PC	0	0	3	1.5	50	50	100
8.	21IT5002	Mobile Application Development Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10.	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	**19**	**0**	**8**	**23**	**550**	**450**	**1000**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21IT5351	Internet and Web Technology	PE	2	0	2	3	50	50	100
2	21IT5352	Advanced Java Programming	PE	2	0	2	3	50	50	100
3	21IT5353	C# and .Net Programming	PE	2	0	2	3	50	50	100
4	21IT5354	Advanced Data Structure	PE	2	0	2	3	50	50	100
5	21IT5355	Advanced Database Technology	PE	2	0	2	3	50	50	100
6	21IT5356	Ethics and AI	PE	2	0	2	3	50	50	100

SEMESTER VI – 25 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	21IT6181	Software Project Management	HS	3	0	0	3	40	60	100
2.	21IT6201	Internet of Things	PC	3	0	0	3	40	60	100
3.	21IT6202	Principles of Compiler Design	PC	3	0	0	3	40	60	100
4.	21IT63XX / 21IT6309	**Professional Elective II** / Predictive Modeling	PE	3	0	0	3	40	60	100
5.	21XX64XX	**Open Elective I**	OE	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
6.	21IT6251 /21IT6252	Cryptography and Network Security **/ Data Sciences**	PC	3	0	2	4	50	50	100
PRACTICALS										
7.	21IT6001	Internet of Things Laboratory	PC	0	0	3	1.5	50	50	100
8.	21IT6003	Project Based Learning	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	21IT6701	Internship/Industrial Training	EEC	0	0	0	1	100	0	100
10.	21HE6071	Soft Skill-II	EEC	1	0	0	1	100	0	100
11.	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			TOTAL	**20**	**0**	**8**	**25**	**575**	**525**	**1100**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE II										
1	**21IT6301**	Business Intelligence And Analysis	PE	3	0	0	3	40	60	100
2	**21IT6302**	Information Security	PE	3	0	0	3	40	60	100
3	**21IT6303**	Software Design	PE	3	0	0	3	40	60	100
4	**21IT6304**	Natural Language Processing	PE	3	0	0	3	40	60	100
5	**21IT6305**	Soft Computing	PE	3	0	0	3	40	60	100
6	**21IT6307**	Virtual Reality andAugmented Reality	PE	3	0	0	3	40	60	100
7	**21IT6308**	Web Development - I	PE	0	0	3	3	50	50	100

OPEN ELECTIVE

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	**21IT6402**	Machine Learning for Engineers	OE	3	0	0	3	40	60	100

SEMESTER VII – 20 Credits

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	**21IT7201**	Introduction to Distributed and Cloud Computing	PC	3	0	0	3	40	60	100
2.	**21IT7202/ 21IT7204**	Data Science and Analytics/Big Data with security	PC	3	0	0	3	40	60	100
3.	**21IT7203**	Software Testing and Quality Assurance	PC	3	0	0	3	40	60	100
4.	**21IT73XX**	**Professional Elective III**	PE	3	0	0	3	40	60	100
5.	**21XX74XX**	**Open Elective – II**	OE	3	0	0	3	25	75	100
PRACTICALS										
6.	**21IT7001**	Distributed and Cloud Computing Laboratory	PC	0	0	3	1.5	50	50	100
7.	**21IT7002/ 21IT7003**	Data Analytics Laboratory / Big Data with Security Laboratory	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8.	**21IT7901**	Project Work - Phase I	EEC	0	0	4	2	50	50	100
			TOTAL	**15**	**0**	**10**	**20**	**335**	**465**	**800**

PROFESSIONAL ELECTIVE III										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT7301	Social Network analysis	PE	3	0	0	3	40	60	100
2.	21IT7302	Cyber Forensics	PE	3	0	0	3	40	60	100
3.	21IT7303	Software Documentation	PE	3	0	0	3	40	60	100
4.	21IT7304	Principles of Management	PE	3	0	0	3	40	60	100
5.	21IT7305	Software Architecture	PE	3	0	0	3	40	60	100
6.	21IT7306	Green Computing	PE	3	0	0	3	40	60	100
7.	21IT7307	Web Development - II	PE	0	0	3	3	50	50	100

OPEN ELECTIVE - II										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT7401	Cyber Security	OE	3	0	0	3	40	60	100

SEMESTER VIII – 14 Credit

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21IT83XX	Professional Elective –IV	PE	3	0	0	3	25	75	100
2.	21IT83XX	Professional Elective- V	PE	3	0	0	3	25	75	100
PRACTICAL										
3.	21IT8901	Project Work – Phase II	EEC	0	0	24	8	50	50	100
			TOTAL	6	0	24	14	100	200	300

PROFESSIONAL ELECTIVE IV										
1.	21IT8301	Graphics and Multimedia	PE	3	0	0	3	40	60	100
2.	21IT8302	Software Process	PE	3	0	0	3	40	60	100
3.	21IT8303	Service Oriented Architecture	PE	3	0	0	3	40	60	100
4.	21IT8304	Human Computer Interaction	PE	3	0	0	3	40	60	100
5.	21IT8305	Mobile Edge Systems	PE	3	0	0	3	40	60	100
6.	21IT8311	Robotics and its Applications	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE V										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21IT8306	Information Retrieval Technologies	PE	3	0	0	3	40	60	100

2.	21IT8307	Block Chain Technology	PE	3	0	0	3	40	60	100
3.	21IT8308	Professional Ethics	PE	3	0	0	3	40	60	100
4.	21IT8309	Deep Learning Techniques	PE	3	0	0	3	40	60	100
5.	21IT8310	Management Information System	PE	3	0	0	3	40	60	100

	LIFE SKILL COURSES									
1.	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
2.	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
3.	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
4.	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
5.	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21IT5601	Sem 5:Database System	MDC	3	0	0	3	3
2.	21IT6601	Sem 6: Foundation of Data Science	MDC	3	0	0	3	3
3.	21IT6602	Sem 6: Artificial Intelligence and Expert Systems	MDC	3	0	0	3	3

.	21IT7601	Sem 7: Foundations of Digital Marketing	MDC	3	0	0	3	3
5.	21IT7602	Sem 7: Business Analytics	MDC	3	0	0	3	3

6.	21IT8601	Sem 8: Cyber Security	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I - Fintech and Block Chain								
S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21CS5602	Financial Management	MDC	3	0	0	3	3
2.	21CS6603	Fundamentals of Investment	MDC	3	0	0	3	3
3.	21CS6604	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4.	21XXXXXX	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5.	21XXXXXX	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6.	21XXXXXX	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II - Entrepreneurship								
S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21BA5601	Foundation of Entrepreneurship	MDC	3	0	0	3	3
2.	21BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3.	21BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4.	21BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5.	21BA7602	Principles of Marketing Management for Business	MDC	3	0	0	3	3
6.	21BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7.	21BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III - Environment and Sustainability								
S. No	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	22CEXXXX	Sustainable infrastructure Development	MDC	3	0	0	3	3

2.	22CE6603	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3.	22CE6604	Sustainable Bio Materials	MDC	3	0	0	3	3
4.	22CEXXXX	Materials for Energy Sustainability	MDC	3	0	0	3	3
5.	22CEXXXX	Green Technology	MDC	3	0	0	3	3
6.	22CEXXXX	Environmental Quality Monitoringand Analysis	MDC	3	0	0	3	3

VERTICALS FOR HONOURS DEGREE

B.Tech. (Hons) Information Technology (Artificial Intelligence and Machine Learning)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5206	Fundamentals of Machine Learning	PC	3	0	0	3	4	40	60	100
2.	21IT6203	Knowledge Engineering	PC	2	0	2	3	4	40	60	100
3.	21IT6204	Deep Learning	PC	3	0	0	3	4	40	60	100
4.	21IT7205	Applied Natural Language Processing	PC	3	0	0	3	4	40	60	100
5.	21IT7206	Ethics and Artificial Intelligence	PC	3	0	0	3	4	40	60	100
6.	21IT8201	Generative Artificial Intelligence	PC	3	0	0	3	4	40	60	100

B.Tech. (Hons) Information Technology (Cyber Security and Data Privacy)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5207	Ethical Hacking	PC	3	0	0	3	3	40	60	100
2.	21IT6205	Digital and Mobile Forensics	PC	3	0	0	3	3	40	60	100
3.	21IT6207	Social Network Security	PC	3	0	0	3	3	40	60	100
4.	21IT7207	Engineering Secure Software Systems	PC	3	0	0	3	3	40	60	100
5.	21IT7208	Cryptocurrency and Blockchain Technologies	PC	3	0	0	3	3	40	60	100
6.	21IT8202	Network Security	PC	3	0	0	3	3	40	60	100

B.Tech. (Hons) Information Technology (Block Chain Technology)

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21IT5208	Fundamentals of Blockchain Technology	PC	3	0	0	3	3	40	60	100

2.	**21IT6208**	Blockchain Architecture and Design	PC	3	0	0	3	3	40	60	100
3.	**21IT6209**	Building Private Blockchain	PC	3	0	0	3	3	40	60	100
4.	**21IT7209**	Blockchain Business Models	PC	3	0	0	3	3	40	60	100
5.	**21IT7210**	Blockchain and IoT	PC	3	0	0	3	3	40	60	100
6.	**21IT8203**	Blockchain and AI	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honors degree

Sem. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
SKILLED / INTEGRATED COURSES OFFERED THROUGH CHOICE BASED CREDIT SYSTEM									
1	**21CS1152**	Object Oriented Programming Using Python	2	0	2	3	50	50	100
2	**21IT2153**	Relational Database Management System	2	0	2	3	50	50	100
3	**21IT3252**	Data Visualization	3	0	2	4	50	50	100
4	**21IT4252**	Design Thinking	3	0	0	4	50	50	100
5	**21IT5358**	Business Intelligence Analyst	2	0	2	3	50	50	100
6	**21IT6309**	Predictive Modeling	3	0	0	3	40	60	100
7	**21IT6252**	Data Science	3	0	2	4	50	50	100
8	**21IT7204**	Big Data with Security	3	0	0	3	40	60	100
9	**21IT7003**	Big Data with Security Laboratory	0	0	3	1.5	50	50	100

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	Course Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	04	04	-	-	-	03	-	-	11
2	BS	10	10	04	04	-	-	-	-	28
3	ES	06	08	-	-	-	-	-	-	11
4	PC	-	-	16	17	18	13	12		79
5	PE	-	-	-	-	03	03	03	06	15
6	OE	-	-	-	-	-	03	03	-	06
7	EEC	-	-	-	-	02	03	02	08	15
Total		**20**	**22**	**20**	**21**	**23**	**25**	**20**	**14**	**165**

CREDIT DISTRIBUTION R2019

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	23	25	20	14	**165**

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PROFESSIONAL ELECTIVE IV

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8301	Graphics and Multimedia	3	0	0	3

Course Objective

The student should be made to

1. Learn the basics of Computer Graphics System and Line Drawing Algorithms.
2. Understand Two Dimensional Transformations and Clipping Algorithms.
3. Familiar with Three-Dimensional Graphics and Three-Dimensional Transformations.
4. Gain knowledge of various color models and their application in digital imaging and graphics.
5. Study the Multimedia and various Compression Techniques.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Raster Scan Displays, Pixels, Frame Buffer, Vector & Character generation, Random Scan Systems, Graphics Primitives, Display Devices, Display File Structure, Scan I Conversion Techniques, Line Drawing: Simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms. Scan Line Polygon Fill Algorithm, Boundary-Fill and FloodFill Algorithms.	9
II	**2D TRANSFORMATION** Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogenous Coordinate System, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping, Cohen Sutherland, Midpoint Line Clipping Algorithms, Polygon Clipping: Sutherland –Hodgeman, Weiler-Atherton algorithms	9
III	**3D TRANSFORMATIONS** Translation, rotation & scaling. Parallel & Perspective Projection, Types of Parallel & Perspective Projection. Hidden Surface elimination: Depth comparison, Back Face Detection Algorithm, Painters Algorithm, Z-buffer Algorithm. Curve generation, Bezier and B-spline methods.	9
IV	**REFLECTIONS AND SHADING** Diffuse Reflection, Specular reflection, Phong Shading Gourand Shading, Ray Tracing, Color Models like RGB, YIQ, CMY, HSV.	9
V	**MULTIMEDIA SYSTEM** Introduction, Multimedia Hardware, Multimedia System Architecture. Data & File Format Standards. i.e. RTF, TIFF, MIDI, JPEG, DIB, MPEG,Audio: Digital Audio, MIDI, Processing Sound, Sampling, Compression. Video: Avi,3GP, MOV, MPEG , Compression Standards, Compression through spatial and Temporal Redundancy. Multimedia Authoring.	9
Total Instructional Hours		45

Course Outcome

At the end of the course, students would be able to:

CO1: Understand the fundamentals of graphics systems and apply graphics for rendering shapes and images effectively.

CO2: Apply geometric transformations and use clipping techniques to manipulate and render graphical objects in 2D spaces.

CO3: Apply geometric transformations and projection techniques to manipulate 3D objects

CO4: Apply reflection models, shading and work with various color models for accurate color representation in computer graphics.

CO5 Understand the fundamentals of multimedia systems and gain practical knowledge in audio and video processing, sampling, and multimedia authoring for effective multimedia content creation.

TEXT BOOKS:

T1: Donald Hearn and M.P. Becker —Computer Graphics‖ Pearson Publications, 3rd Edition, 2012.

T2: David.Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill, 2nd Edition, 2011.

REFERENCE BOOKS:

R1: James D. Folay,Andries van Dam,Steven K.Feiner, John F.Hughes, Computer Graphics Principle & Practice, Pearson Publications, 2nd Edition, 2008.

R2: Ranjan Parekh, Principles of Multimedia, Tata McGraw Hill, 2008.

R3: F.S.Hill Jr. and Stephen M.Kelley, —Computer Graphics using Open GL,PHI Publication, 3rd Edition, 2010.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	2	2	-	-	-	-	-	-	2	1	1	1
CO4	3	3	3	3	1	-	-	-	-	-	-	-	1	1	1
CO5	3	2	1	1	1	1	1	-	1	2	-	-	1	1	1
AVG	3	2.8	2	1.6	1.2	1	1	-	1	2	-	2	1	1	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8302	Software Process	3	0	0	3

Course Objective

The student should be made to

1. Understand the principles of software engineering and the importance of time management in software development.
2. Identify, analyze, and mitigate software defects using techniques such as code reviews and design quality assessment.
3. Gain insights into the Team Software Process (TSP) framework and its logical structure.
4. Collaborate effectively within teams to design software systems and implement solutions.
5. Understand and perform various team roles such as Team Leader, Development Manager, Planning Manager, Quality Process Manager, and Support Manager.

Unit	Description	Instructional Hours
I	**Introduction** Software Engineering – Time Management – Tracking Time – Period and Product Planning –Product Planning – Product Size – Managing your Time - Managing Commitments – Managing Schedules	9
II	**Planning** The Project Plan – The Software Development Process – Defects – Finding Defects – The Code Review Checklist – Design Defects – Product Quality – Process Quality	9
III	**TSP Strategy** Team Software Process Overview – The logic of the Team Software Process – Launching a Team Project - The Development Strategy – The Development Plan – Defining the Requirement	9
IV	**PRODUCT IMPLEMENTATION** Designing with Teams – Product Implementation – Integration & System Testing – The Postmortem.	9
V	**TEAM MANAGEMENT** The Team Leader Role – Development Manager Role – The Planning Manager Role – The Quality – Process Manager Role – The Support Manager Role	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1: Develop skills to effectively manage time, commitments, and schedules.

CO2: Create effective project plans, identify and address software defects.

CO3: Apply the Team Software Process, plan development phases and define requirements for team based software projects.

CO4: Learn to collaboratively design, implement, integrate and test software products.

CO5 Understand and differentiate the roles of team gaining insights into each role's responsibilities within a software project team.

TEXT BOOKS:

T1: Watt S Humphrey, Introduction to Personal Software Process, Addison Wesley, 2002.

T2: Watt S Humphery, Introduction to Team Software Process, Addison Wesley, 2002.

REFERENCE BOOKS:

R1: William A. Florac and Anita D. Carleton, Measuring the Software Process: Statistical Proces Control for Software Process Improvement, Addison-Wesley Professional, I Edition, 2000

R2: Gopalaswamy Ramesh, Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models, McGraw Hill Education

R3: Phillip G. Armour, The Laws of Software Process: A New Model for the Production and Management of Softwarel, Auerbach Publications, I Edition,2003

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	-	-	-	3	2	2	3	1	-	1
CO2	3	3	3	3	-	-	-	-	2	2	3	3	2	-	1
CO3	3	3	3	3	-	-	-	-	3	2	3	3	3	1	1
CO4	3	3	3	3	-	-	-	-	3	2	3	3	3	1	1
CO5	3	2	2	1	-	-	-	-	3	3	2	2	2	1	1
AVG	3	2.4	2.4	2.2	-	-	-	-	2.8	2.2	2.6	2.8	2.2	1	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8303	Service Oriented Architecture	3	0	0	3

Course Objective

The student should be made to

1.To learn XML fundamentals
2.Be exposed to build applications based on XML.
3.Understand the key principles behind SOA.
4.Be familiar with the web services technology elements for realizing SOA.
5.To study various web service standards

Unit	Description	Instructional Hours
I	**INTRODUCTION TO XML** XML Document Structure – Well-formed and Valid Documents – Namespaces – DTD – XMLSchema –X-Files.	9
II	**BUILDING XML- BASED APPLICATIONS** Parsing XML – Using DOM, SAX – XML Transformation and XSL –XSL Formatting –Modeling Databases in XML.	9
III	**SERVICE ORIENTED ARCHITECTURE** Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures –Benefits of SOA -- Principles of Service orientation – Service layers.	9
IV	**WEB SERVICES** Web Services Framework –Services as Web Services-Service Descriptions – WSDL –Messaging with SOAP – Message Exchange Pattern- Atomic Transaction- Orchestration	9
V	**BUILDING SOA-BASED APPLICATIONS** WS-Addressing - WS-Reliable Messaging - WS-Policy – WS-Coordination – WS -Transactions - WS-Security.	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1: Understand XML Technologies.
CO2: Design the application based on XML.
CO3: Understand web services and WS standards
CO4: Develop web services using technology elements
CO5: Apply service modeling, service oriented analysis and design for application development

TEXT BOOKS:

T1: Ron Schmelzer et al. XML and Web Services‖, Pearson Education, 2014.
T2: Thomas Erl, Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2016.

REFERENCE BOOKS:

R1: James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, Java Web Services Architecture, Elsevier, 2013.
R2: Frank P.Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2002 .
R3: SandeepChatterjee and james Webber, Developing Enterprise Web Services:An Architect's Guide‖, Prentice Hall,2004.
R4: James McGovern, Sameer Tyagi,Michael E Stevens, Sunil Mathew, Java Web Services Architecture,Elsevier,2003.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	2	2	-	-	-	2	-	3	2	3
CO2	2	3	2	3	2	3	3	2	-	2	3	-	2	3	3
CO3	3	2	3	3	2	3	2	3	-	3	3	2	3	2	2
CO4	2	3	3	3	3	3	3	3	-	3	3	-	3	3	3
CO5	3	3	3	3	2	3	3	3	-	2	3	2	3	3	3
AVG	2.6	2.6	2.8	2.8	2.3	2.8	2.6	2.8	-	2.5	2.8	2.0	2.8	2.6	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8304	HUMAN COMPUTER INTERACTION	3	0	0	3

Course Objective

The student should be made to

1.To learn the foundations of Human Computer Interaction.
2.To become familiar with the Interaction model.
3.To know about the designing process and guidelines of HCI.
4.To study the models in User Interface.
5.Be familiar with web HCI.

Unit	Description	Instructional Hours
I	**FOUNDATIONS OF HCI:** The Human: The Human: I/O channels – Memory – Reasoning and Problem solving; TheComputer: Devices – Memory – Processing and Networks.	9
II	**INTERACTION AND SOFTWARE PROCESS:** Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity-Paradigms. Interactive Design: Basics – Process – Scenarios – Navigation – Screen Design –Iteration and Prototyping.	9
III	**DESIGN & SOFTWARE PROCESS:** HCI in Software process: Software Life Cycle – Usability Engineering – Prototyping in practice – Design Rationale. Design rules: Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.	9
IV	**MODELS AND THEORIES:** HCI Models: Cognitive Models: Socio-Organizational issues and Stakeholder Requirements –Communication and Collaboration models.	9
V	**HYPERTEXT, MULTIMEDIA AND WWW:** Understanding Hypertext-Finding Things-Web Technology and issues-Static Web Content-Dynamic Web Content	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Design effective dialog for HCI.
CO2: Design effective HCI for individuals and persons with disabilities.
CO3: Assess the importance of user feedback.
CO4: Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5: Develop meaningful user interface.

TEXT BOOKS:

T1: Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education,2004

T2: Andrew Sears, Julie A. Jocko, Human-Computer Interaction: Development Process-CRC Press,2017

T3: Handbook of Human-Computer Interaction

REFERENCE BOOKS:

R1: Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009.

R2: Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	2	2	3	-	2	2	-	3	2	3
CO2	2	3	2	3	2	3	3	2	-	2	3	3	2	3	3
CO3	3	3	3	2	2	3	2	3	2	3	3	2	3	2	2
CO4	3	3	2	3	3	3	3	3	-	3	3	2	3	3	3
CO5	3	2	3	3	3	3	3	3	2	2	3	-	3	3	3
AVG	2.8	2.6	2.6	2.6	2.5	2.8	2.6	2.8	2.0	2.4	2.8	2.3	2.8	2.6	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8305	Mobile Edge Systems	3	0	0	3

Course Objective

The student should be made to

1. Learn the basics of edge computing.
2. Understand evolution of computing architecture.
3. Learn the various concepts in mobile edge computing and its services.
4. Gain knowledge about Edge computing in Internet of Things.
5. Learn various standards and role of open source and IoT.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Edge Computing-Concept-Basic Characteristics and Attributes-Benefits of Edge Computing-CROSS values of Edge Computing- Collaboration of Edge Computing and Cloud Computing-Fog and Edge Computing-Use cases of Edge Computing-Drawbacks of Edge Computing.	9
II	**EVOLUTION OF COMPUTING MODELS** Shared and central resources Vs Exclusive and local computation-IoT disrupts the cloud-Characteristics of new computing model-Blueprint of edge computing intelligence-High level architecture-Key drivers of Edge Computing-Application areas.	9
III	**MOBILE EDGE COMPUTING** Mobile cloud computing-Cloudlets-Mobile edge computing-Edge Computing Reference Architecture: Model-Driven Reference Architecture-Multi-View Display-ECNs, Development frameworks and Product Implementation-Edge Computing Domain Models-Services.	9
IV	**EDGE COMPUTING IN IoT** Introduction-Key Benefits of Edge for the IoT-Unique Requirements of Edge for IoT-Usecase-IoT Foundation-Device Management-Security- ervice Enablement-Message Prioritization-Data Replication-Cloud Enablement IoT Solutions.	9
V	**STANDARDS AND ROLE OF OPEN SOURCE** Standards for Self-organization, self-configuration, self-discovery-E/W communication standards between multiple ECNs-Open standard for implementation of algorithms for machine learning-Role of open source- IIoT using Edge Computing-Introduction-Use case Industry oriented- Technical Analytics	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1 Learn the basics of edge computing.
CO2: Understand evolution of computing architecture and its concepts.
CO3: Implement the concepts of mobile edge computing and its services in real time.
CO4: Learn the concepts of Edge computing in Internet of Things.
CO5: Learn various standards and role of open source and IoT.

TEXT BOOKS:

T1: Ajit Singh, Edge Computing: Simple in Depth, Shroff Publishers and Distributors Private Limited, 1st Edition, 2019.
T2: Jie Cao, Quan Zhang, Weisong Shi, Edge Computing: A Primer, Springer, 1st Edition, 2018.

REFERENCE BOOKS:

R1: Rajkumar Buyya, Satish Narayana Srirama, Fog and Edge Computing, Principles and Paradigms, Wiley Series on Parallel and Distributed Computing, 1st Edition, 2019.
R2:Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 1st Edition, 2015.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	3	2	-	-	-	3	2	1	2	1	3	2
CO2	2	2	2	3	3	-	-	-	1	2	2	3	2	3	2
CO3	2	1	1	3	2	-	-	-	1	2	1	1	2	3	2
CO4	3	3	3	3	2	-	-	-	1	1	1	1	1	1	2
CO5	1	3	2	2	2	-	-	-	1	1	3	1	1	2	2
AVG	2.2	2	2	2.8	2.2	-	-	-	1.4	1.6	1.6	1.6	1.4	2.4	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8311	Robotics and its Applications	3	0	0	3

Course Objective

The student should be made to

1. To learn the basic working concepts of Robots.
2. To introduce localization in robots
3. To know more about the path planning of robot
4. To explore about Robotics Vision
5. To discuss the applications and implementation of robots

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics. Types of actuators-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge base.	9
II	**LOCALIZATION** Self-localizations and mapping - Challenges in localizations – IR based Localizations – vision-based localizations – Ultrasonic based localizations - GPS localization systems.	9
III	**PATH PLANNING** Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies.	9
IV	**VISION SYSTEM** Robotic vision systems-image representation-object recognition and categorization-depth measurement- image data compression-visual inspection-Software considerations.	9
V	**APPLICATION** Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Understand the basic working concepts of robots CO2: Gain the knowledge about localization in Robotics.
CO2:	Gain the knowledge about localization in Robotics.
CO3:	Express fundamentals of path planning of robot using robotic vision.
CO4:	Use the advanced techniques for robot processing.
CO5	Understand the applications and implementation of robots.

TEXT BOOKS:

T1: Richared D.Klafter. Thomas Achmielewski and Mickael Negin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001.
T2: Saeed B.Nikku, Introduction to Robotics, Analysis, Control and Applications, Wiley-India, 2nd Edition 2020.

REFERENCE BOOKS:

R1: Nicholas G Odrey, Mikell P Groover, Mitchell Weiss, Roger N Nagel, "Industrial Robotic Technology-Programming and Application", Mc Graw-Hill 2017.
R2: S. R. Deb, Sankha Deb, "Robotics Technology and Flexible Automation", McGraw Hill Education, 2nd Edition, 2017.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	-	-	-	1	1	3	3	1	3	2
CO2	3	3	3	3	3	-	-	-	2	2	1	2	1	3	2
CO3	3	3	2	3	1	-	-	-	3	2	1	1	3	2	2
CO4	3	1	2	2	3	-	-	-	1	3	3	3	1	3	2
CO5	1	3	2	3	2	-	-	-	2	3	2	1	1	2	2
AVG	2.6	2.2	2.4	2.6	2	-	-	-	1.8	2.2	2	2	1.4	2.6	2

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PROFESSIONAL ELECTIVE V

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21IT8306	INFORMATION RETRIEVAL TECHNOLOGIES	3	0	0	3

Course Objective

The student should be made to

01. To understand the basics of Information Retrieval.
02. To acquire knowledge in Query Languages in Information Retrieval.
03. To analyze various Search Engine System Operations.
04. To use different information retrieval techniques in various application areas.
05. To apply IR principles to locate relevant information large collections of data.

Unit	Description	Instructional Hours
I	**Information Retrieval: Motivation and Modeling:** Motivation – Information Vs Data Retrieval – Formal Characterization of IR Models – Classical Information Retrieval – Set Theoretic Model – Algebraic Model – Probabilistic Models – Structured Text Retrieval Model.	09
II	**Retrieval Evaluation Query Languages** Retrieval Performance Evaluation – Query Languages: Keyword Based Querying – Pattern Matching Structural Queries – Query Protocols –Query Operations: User Relevance Feedback – Automatic Local Analysis – Automatic Global Analysis	09
III	**Indexing and Searching** Inverted Files – Boolean Queries – Sequential Searching – Pattern Matching – Parallel and Distributed IR – Searching the Web – Characteristics of Web – Search Engines – Browsing Tools – Meta Searches- Digital Libraries – Architectural Issues – Document Models, Representation and Access – Prototypes Standards	09
IV	**Text Classification and Vector Based Classification** Text Based Classification Problem – Naïve Bayes Text Classification – The Bernoulli Model –Properties of Naïve Bayes – Feature Selection – Vector Space Classification: Rocchio Classification –k nearest neighbor – Linear vs Non-linear Classifiers	09
V	**Web crawling and Link analysis** Overview – Crawling - Distributing indexes - Connectivity servers – Link analysis: The Web as a graph Vs Page Rank - Markov chains - The Page Rank computation - Topic-specific Page Rank - Hubs and Authorities - Choosing the subset of the Web	09
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze the fundamental concepts, design and implement classical and advanced IR models, and evaluate their effectiveness in retrieving relevant information from large datasets.
CO2:	Design, implement, and evaluate effective query languages and retrieval techniques to enhance information retrieval performance.
CO3:	Design, implement, and evaluate efficient indexing and retrieval techniques for text-based and web-based information, including inverted indexes, Boolean queries, and parallel/distributed search algorithms.
CO4:	Apply Naive Bayes and vector-based classification techniques to classify text documents effectively, and evaluate the performance of these techniques using appropriate metrics.
CO5	Understand and apply web crawling, indexing, and link analysis techniques to extract and rank relevant information from the web.

TEXT BOOKS:

T1 Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Modern Information Retrieval: TheConcepts and Technology behind Search, Second Edition, ACM Press Books,2011.

T2 C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press,2009.

REFERENCE BOOKS:

T1 Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2016.

T2 David A Grossman and Ophir Frieder, Information Retrieval: Algorithms and Heuristics, 2nd Edition, Springer, 2004.

T3 Bruce Croft, Donald Metzler and Trevor Strohman, —Search Engines: Information Retrieval in Practice, Addison Wesley, (1st Edition) 2009.

T4 Mark Levene, —An Introduction to Search Engines and Web Navigation, Wiley Publications, 2nd edition, 2010

CO-PO MAPPING

PO & PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO1	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO2	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO3	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO4	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
CO5	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3
AVG	3	3	3	3	2	-	-	1	-	-	1	2	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8307	Block Chain Technology	3	0	0	3

Course Objective

The student should be made to

1. Understand Blockchain's Fundamental Components, and Examine Decentralization Using Blockchain
2. Explain how Cryptocurrency works, from when a Transaction is created to when it is considered part of the Blockchain.
3. Explain the Components of Ethereum and Programming Languages for Ethereum.
4. Study the basics of Hyperledger and Web3.
5. Know about alternative Blockchains and Blockchain Projects in Different Domains.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BLOCKCHAIN** History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization	9
II	**INTRODUCTION TO CRYPTOCURRENCY** Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin limitations – Name Coin – Prime Coin – Zcash – Smart Contracts - Ricardian Contracts.	9
III	**ETHEREUM** The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.	9
IV	**WEB3 AND HYPERLEDGER** Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda.	9
V	**ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS** Kadena – Ripple – Rootstock – Quorum – Tendermint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous Tools.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Understand the Technology Components of Blockchain and how it works
CO2: Understand Bitcoin and itsLimitations by Comparing with other Alternative Coins.
CO3: Devise Solution using the Ethereum Model.
CO4: Understand and use Hyperledger and its Development Framework.
CO5: Track alternative Blockchains and Emerging Trends in Blockchain

TEXT BOOKS:

T1: Imran Bashir, Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained,(Second Edition), Packt Publishing, 2018.

T2: S.Shukla, M.Dhawan, S.Sharma, S.Venkatesan, Blockchain Technology: Cryptocurrency and Applications, Oxford University Press, 2019.

REFERENCE BOOKS:

R1: Arshdeep Bahga, Vijay Madisetti, Blockchain Applications: A Hands-on Approach, VPT, 2017.

R2: Alex Leverington, Ethereum Programming‖ Packt Publishing, 2017.

R3: Roger Wattenhofer, The Science of the Blockchain‖ CreateSpace Independent Publishing, 2016.

R4 : A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	2	3	-	3	2	3
CO2	3	3	3	3	2	-	-	2	-	2	3	-	3	3	3
CO3	3	3	3	3	3	-	-	2	-	3	3	2	3	3	3
CO4	3	3	3	3	3	-	-	2	-	3	3	2	3	3	3
CO5	3	3	3	3	3	-	-	2	-	3	3	2	3	3	3
AVG	3	3	3	2.8	2.6	-	-	2	-	2.6	3	2	3	2.8	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8308	Professional Ethics	3	0	0	3

Course Objective

The student should be made to

1. Provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
2. Provide basic familiarity about Engineers as responsible Experimenters, Codes of Ethics.
3. Provide basic knowledge on Industrial Standards, Exposure to Safety, Risk Benefit Analysis.
4. Idea about the Collegiality and Loyalty, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights.
5. Adequate knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.

Unit	Description	Instructional Hours
I	**HUMAN VALUES** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time –Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality –Introduction to Yoga and meditation for professional excellence and stress management	9
II	**ENGINEERING ETHICS** Senses of Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest –Customs and Religion – Uses of Ethical Theories	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –A Balanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis Course Outcome and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights(IPR) – Discrimination	9
V	**GLOBAL ISSUES** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.

CO2: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO3: Aware of responsibilities of an engineer for safety and risk benefit analysis.

CO4: Aware of professional rights and responsibilities of an engineer.

CO5: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

TEXT BOOKS:

T1: Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGrawHill,New Delhi, 2004.

T2: Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

R1: Charles B. Fleddermann, Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.

R2: Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, Engineering Ethics –Concepts and Cases‖, Cengage Learning, 2009.

R3: John R Boatright, Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003

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CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	3	-	-	2	1	3	2	-	-	2	1	2	-
CO2	-	3	1	-	-	2	1	3	2	-	-	2	2	2	-
CO3	3	3	2	2	3	2	1	3	2	-	2	-	2	2	2
CO4	3	3	2	2	-	2	1	3	2	3	2	2	1	3	2
CO5	-	3	3	3	-	2	1	2	2	3	-	2	1	3	2
AVG	3	3	2.2	2.3	3	2	1	2.8	2	3	2	2	1.4	2.4	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21IT8309	DEEP LEARNING TECHNIQUES	3	0	0	3

Course Objective

The student should be made to

1. To learn the basics about Neural Networks and Neuron.
2. To understand the basics of Deep Learning and enable the students to know Deep Learning Techniques to support Real-Time Applications.
3. To Analyze ANN learning and Memory Based Learning.
4. To Understand Deep Learning and Deep Network Architectures.
5. To Learn Neural Networks in Tensor Flow for Solving Problems

Unit	Description	Instructional Hours
I	**NEURAL NETWORKS** Building Intelligent Machines-The Limits of Traditional Computer Programs. The Mechanics of Machine Learning- The Neuron-Expressing Linear Perceptions as Neurons- Feed-Forward Neural Networks -Linear Neurons and Their Limitations-Sigmoid, Tanh, and ReLU Neurons-SoftMax Output Layers.	9
II	**BASICS OF DEEP LEARNING** Convolutional Neural Networks : Neurons in Human Vision-The Shortcomings of Feature Selection-Vanilla Deep Neural Networks Don't Scale-Filters and Feature Maps-Full Description of the Convolutional Layer-Max Pooling-Full Architectural Description of Convolution Networks-Closing the Loop on MNIST with Convolutional Networks-Image Preprocessing Pipelines Enable More Robust Models-Accelerating Training with Batch Normalization- Building a Convolutional Network for CIFAR-10-Visualizing Learning in Convolutional Networks-Leveraging Convolutional Filters to Replicate Artistic Styles.	9
III	**MEMORY AUGMENTED NEURAL NETWORKS** Neural Turing Machines-Attention-Based Memory Access- NTM Memory Addressing Mechanisms- Differentiable Neural Computers- Interference-Free Writing in DNCs-DNC Memory Reuse-Temporal Linking of DNC Writes-Understanding the DNC Read Head-The DNC Controller Network Visualizing the DNC in Action- Implementing the DNC in Tensor Flow-Teaching a DNC to Read and Comprehend.	9
IV	**DEEP REINFORCEMENT LEARNING** Deep Reinforcement Learning Masters Atari Games -What Is Reinforcement Learning? - Markov Decision Processes (MDP)-Explore Versus Exploit- Policy versus Value Learning-Pole-Cart with Policy Gradients-Q-Learning and Deep Q-Networks- Improving and Moving Beyond DQN.	9
V	**TENSOR FLOW** Implementing Neural Networks in Tensor Flow : What Is Tensor Flow?-How Does Tensor Flow Compare to Alternatives?- Installing Tensor Flow-Creating and Manipulating Tensor Flow Variables-Tensor Flow Operations-Placeholder Tensors-Sessions in Tensor Flow-Navigating Variable Scopes and Sharing Variables- Managing Models over the CPU and GPU-Specifying the Logistic Regression Model in Tensor Flow-Logging and Training the Logistic Regression Model-Leveraging Tensor Board to Visualize Computation Graphs and Learning-Building a Multilayer Model for MNIST in Tensor Flow.	9
Total Instructional Hours		**45**

Course Outcome

At the end of the course, students would be able to:

CO1 Model Neuron and Neural Network.

CO2: CO2 Develop Algorithms Simulating Human Brain.

CO3: Chairman, Board of Studies 21 Dean–Academics

CO4: Explore the Essentials of Deep Learning and Deep Network Architectures.

CO5 Implement various Deep Learning Models.

TEXT BOOKS:

T1: Nikhil Buduma, Nicholas Locascio, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.

T2:Simon Haykins, —Neural Network- A Comprehensive Foundation‖, Pearson Prentice Hall (2nd Edition), 2001

REFERENCE BOOKS:

R1: Ian Goodfellow, YoshuaBengio, Aaron Courville,Deep Learning :Adaptive Computation and Machine Learning series, MIT Press, 2017.
R2: Jeff Heaton, Artificial Intelligence for Humans: Deep Learning and Neural Network, Lightning Source Inc, 2015.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	-	-	-	3	-	3	-	1	-	-
CO2	3	1	2	2	2	3	-	1	2	-	3	2	1	-	-
CO3	3	2	2	2	2	3	-	1	2	-	2	2	1	-	-
CO4	3	1	2	2	-	3	-	1	-	-	2	2	1	-	-
CO5	3	1	2	1	2	-	-	-	-	-	2	3	1	-	-
AVG	3	1.2	2.2	2	1.6	1.8	-	0.6	1.4	-	2.4	1.8	1	-	-

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	21IT8310	Management Information System	3	0	0	3

Course Objective

The student should be made to

1. Understand the Role and Importance of MIS
2. Identify the Process of MIS to support in the Management Activities
3. Extend the concept of Decision Making in MIS to identify the Quality Product
4. Design and analyze the system for determining the requirements
5. Infer the concept of Deterministic System and Enterprise Resource Planning in various applications

Unit	Description	Instructional Hours
I	**INTRODUCTION** Technology of Information Systems, concepts, definition; role and impact of MIS; role and importance of management; approaches to management; functions of the manager; management as a control system; concepts of data models; database design; client-server architecture.	9
II	**PROCESS OF MANAGEMENT** Planning, organization, staffing, coordination and controlling; management by exception; MIS as a support to management; organization structure and theory; basic model and organization structure; organizational behavior.	9
III	**DECSION MAKING AND INFORMATION** Decision making concepts, methods, tools and procedures; behavioral concepts in decision making; organizational decision making; information concepts as a quality product; classification of the information; methods of data and information collection; value of the information; organization and information system concepts, control types; handling system complexity; post implementation problems in systems.	9
IV	**SYSTEM ANALYSIS AND DESIGN** Need for system analysis; system analysis of existing system; new requirement; system development model; structured system analysis and design; computer system design; development of MIS; development of long range plans of the MIS; ascertaining the class of the information; determining the information requirement; development and implementation of the MIS; management of quality; MIS factors of success and failure.	9
V	**DECISION SUPPORT SYSTEMS:** Deterministic systems; artificial intelligence; knowledge-based systems; MIS and the role of DSS; enterprise management systems; enterprise resource planning (ERP); ERP features and benefits; implementation factors of ERP; Internet and Web based information system; Electronic Commerce.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Identify the Role and Importance of MIS.

CO2: Ability to understand the Process of MIS to support in the Management Activities.

CO3: Apply the concept of Decision Making in MIS to identify the Quality Product.

CO4: Design and Analyze the system for determining the requirements.

CO5: Utilize Deterministic System and Enterprise Resource Planning in various Applications.

TEXT BOOKS:

T1: Waman S Jawadekar, Management Information Systems: A Global Digital Enterprise Perspective‖, McGraw-Hill (2nd ed.) 2013.

T2: Gordon B. Davis, Margrethe H Olson, Management information systems: conceptual foundations, structure, and development‖ McGraw-Hill (2nd ed.) 1984.

REFERENCE BOOKS:

R1: Kenneth C. Laudon, Jane P. Laudon, Management Information Systems: Managing the Digital Firm‖, Pearson Publication, (16th edition), 2019.

R2: Ramesh Behl, James A. O'Brien, George Marakas, Management Information Systems, McGraw-Hill (11th Ed.), 2019.

R3: Goyal D.P, Management Information Systems: Managerial Perspectives, Vikas Publication, (4th Edition), 2014.

R4: Gerald V. Post, David L. Anderson, Management Information Systems: Solving Business Problems with Information Technology Mcgraw-Hill, 2003..

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	2	3	3	3	2	3	2	3
CO2	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3
CO3	3	3	2	3	3	3	2	2	3	3	2	2	3	2	2
CO4	3	3	3	3	2	3	3	3	2	2	3	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	2	3	3	3	3	3
AVG	3	2.8	2.4	2.8	2.8	2.6	2.6	2.6	2.8	2.6	2.4	2.4	3	2.6	2.8

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NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2019 WITH AMENDMENT

ACADEMIC YEAR 2024-2025 EVEN SEMESTER

S. No	Regulation	Course Code with Name	Credits
1.	2019	21IT8201 – Generative Artificial Intelligence (Hons)	3

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SEMESTER VI
MINOR COURSES

MINOR SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.TECH	22IT6471	FUNDAMENTALS OF DATA SCIENCE	3	0	0	3

Course Objective

The student should be made to

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

Unit	Description	Instructional Hours
I	**INTRODUCTION** Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing	9
II	**DESCRIBING DATA** Types of Data - Types of Variables -Describing Data with Tables and Graphs – Describing Data with Averages - Describing Variability	9
III	**DESCRIBING RELATIONSHIPS** Correlation –Scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression –regression line – least squares regression line – Standard error of estimate – interpretation of r2	9
IV	**PYTHON LIBRARIES FOR DATA WRANGLING** Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping	9
V	**DATA VISUALIZATION** Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Define the data science process.

CO2: Understand different types of data description for data science process.

CO3: Gain knowledge on relationships between data.

CO4: Use the Python Libraries for Data Wrangling.

CO5 Apply visualization Libraries in Python to interpret and explore data.

TEXT BOOKS:

T1: David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)

T2: Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)

T3: Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCE BOOKS:

R1: Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
CO3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	3
CO4	3	2	2	1	2	-	-	-	1	1	2	2	3	3	2
CO5	2	2	1	2	2	-	-	-	1	1	1	2	1	2	2
AVG	2.2	1.8	1.25	1.6	1.8	1	1	-	1.2	1.2	1.2	2.2	2	2.4	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE/B.TECH	22IT6472	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	3	0	0	3

Course Objective

The student should be made to

1. Have an overview of various AI applications
2. Learn about various heuristic and game search algorithms
3. Obtain a thorough knowledge of various knowledge representation schemes
4. Know about various Expert System tools and applications
5. Understand about basic concepts of NLP.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO AI:** Definitions of AI - Problem solving by searching- Uninformed Search Strategies: Breadth First search, Depth first search, Depth limited search – Informed Search strategies: A * search, Greedy Best First Search - Local Search Optimization: Simulated Annealing- Genetic Algorithm.	9
II	**ADVERSARIAL SEARCH:** Games - Optimal decisions in games - Minimax algorithm - Alpha-beta pruning - Constraint Satisfaction problems -Map coloring and Crypt Arithmetic problem.	9
III	**KNOWLEDGE REPRESENTATION:** Knowledge base agent - knowledge representation techniques - Probabilistic reasoning - Bayes theorem in AI.	9
IV	**EXPERT SYSTEM:** Characteristics of Expert System- Components of an Expert System-Expert System Development- Knowledge Engineering-Applications of Expert System-Case Studies: Simple Medical Expert System-Successful Expert Systems.	9
V	**NATURAL LANGUAGE PROCESSING** Language Models-Text classification – Information Retrieval – Information Extraction.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1: Identify problems that are amenable to solution by AI methods.
CO2: Identify appropriate AI methods to solve gaming Problems.
CO3: Apply the concept of Knowledge Representation for solving problems.
CO4: Design Expert systems.
CO5 Outline the fundamentals of NLP.

TEXT BOOKS:

T1: Stuart Russell, Peter Norvig,'Artificial Intelligence: A Modern Approach', Pearson, 2nd Edition, 2016 (Unit 1, 2 , 3 and 5)

T2: Vinod Chandra S.S and Anand Hareendran S, 'Artificial Intelligence :Principles and Applications', PHI Learning Private Limited, 2014. (Unit 4).

REFERENCE BOOKS:

R1: Elaine Rich, Kevin Knight, Shivashankar B Nair, 'Artificial Intelligence and Machine Learning', Tata Mc Graw-Hill, Third edition, 2013

R2: W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2003.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	1	-	2	3	2	2	1	1	3
CO2	3	3	3	3	3	2	1	-	2	3	2	2	1	2	2
CO3	3	2	2	3	3	2	1	-	2	3	1	1	1	2	3
CO4	3	3	3	3	3	2	1	-	2	3	2	2	2	1	2
CO5	3	3	3	3	3	2	1	-	2	3	2	2	2	1	2
AVG	**3**	**2.8**	**2.8**	**3**	**3**	**2**	**1**	**-**	**2**	**3**	**1.8**	**1.8**	**1.4**	**1.4**	**2.4**

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SEMESTER VIII
MINOR COURSE

MINOR SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21IT8601	CYBER SECURITY	3	0	0	3

Course Objective

The student should be made to

1. Know the importance of Information System Security.
2. Explore various Crypto graphic Techniques.
3. Learn the basics of Cybercrime and Cyber Offences.
4. Familiarize various Cyber Threats, Attacks, Vulnerabilities, Defensive Mechanisms.
5. Understand the Organizational Implications on Cyber Security

Unit	Description	Instructional Hours
I	**INFORMATION SYSTEMS AND SECURITY** Information System Components, Information System Categories, Individuals in Information System, Information Security, Threats to Information systems, Cyber Security and Risk analysis, Database Security.	9
II	**OVERVIEW OF SECURITY TECHNIQUES** Computer security concepts, OSI security architecture, Security attacks, Security services, Security mechanisms, Model for Network security, Symmetric cipher model, cryptography, Cryptanalysis and Brute-Force Attack.	9
III	**CYBERCRIME AND CYBER OFFENCES** Introduction to Cybercrime, Classifications of Cybercrimes planning of attacks, social engineering: Human based, Computer based: Cyberstalking.	9
IV	**CYBER THREATS, ATTACKS AND PREVENTION** Phishing, Password cracking, Keyloggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID): Types of identity theft.	9
V	**CYBER SECURITY IMPLICATIONS** Lessons for Organizations, Web Threats for Organizations, Security and Privacy Implications, Risks in social media marketing, People's Privacy in the organization, Best Practices for organizations.	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, students would be able to:

CO1: Identify components and categories of information systems.

CO2: Analyze threats to information systems.

CO3: Evaluate cryptographic techniques including symmetric and asymmetric cryptography.

CO4: Develop strategies for preventing cyber threats such as phishing, DoS attacks, and identity theft.

CO5: Assess the implications of cyber security on organizational policies.

TEXT BOOKS:

T1: William Stallings, "Cryptography and Network Security: Principles and Practice", Seventh Edition, Pearson Education,2017.
T2: Nina Godbole, Sunit Belapure, "Cyber security: Understanding Cybercrime, Computer Forensics and Legal perspectives", Wiley India Pvt. Ltd, 2013.

REFERENCE BOOKS:

R1: Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Cengage Learning India Pvt Ltd (1st Edition), 2018.
R2: William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Pearson Education (3rd Edition), 2014.
R3: Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security: Principles, Theory and Practices", BPB Publications(1st Edition), 2017.

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	2	2	-	2	3	2	2
CO2	3	3	-	2	2	-	-	-	3	2	-	2	3	3	3
CO3	3	3	2	2	2	2	-	2	2	2	-	2	2	2	2
CO4	-	2	3	3	3	2	-	2	3	2	-	3	3	3	3
CO5	3	3	3	3	2	3	-	3	3	3	3	3	3	3	3
AVG	**3.0**	**2.8**	**2.5**	**2.4**	**2.2**	**2.3**	**-**	**2.3**	**2.6**	**2.2**	**3.0**	**2.4**	**2.8**	**2.6**	**2.6**

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SEMESTER VI
HONOR COURSES

HONOR SYLLABUS

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT6371	ETHICS AND ARTIFICIAL INTELLIGENCE	3	0	0	3

Course Objective

1. Study the morality and ethics in AI
2. Learn ae Ethical initiatives in the field of artificial intelligence
3. Study about AI standards and Regulations
4. Study about social and ethical issues of Robot Ethics
5. Study about AI and Ethics- challenges and opportunities

Unit	Description	Instructional Hours
I	**INTRODUCTION** Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust	9
II	**ETHICAL INITIATIVES IN AI** International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization.	9
III	**AI STANDARDS AND REGULATION** Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems.	9
IV	**ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS** Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.	9
V	**AI AND ETHICS- CHALLENGES AND OPPORTUNITIES** Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.	9
	Total hours	**45**

Course Outcome

At the end of the course, students would be able to:

CO1	Analyze and evaluate the implications of morality and ethics in AI, encompassing societal, psychological, legal, environmental, and trust-related dimensions.
CO2	Understand international ethical guidelines for AI and recognize potential issues in various applications.
CO3	Apply ethical principles to design processes for autonomous systems, addressing issues of transparency, data privacy, bias mitigation, and the development of ethical standards for robotics and automation.
CO4	Understand the key concepts of robotics, ethics, and morality, and how they relate to technology and professional practice.
CO5	Analyze the potential benefits and drawbacks of AI, considering its impact on society, particularly in healthcare and industry, and evaluate existing policies for managing AI development.

TEXT BOOK:

T1 Y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020

T2 Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES:

R1 Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017

R2 Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020

R3 Web link: https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65

R4 https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	2	3	-	-	-	2	-	-	2
CO2	-	-	-	-	2	3	-	3	-	-	-	3	-	-	1
CO3	2	3	3	2	2	3	-	3	-	-	-	2	-	-	2
CO4	2	-	-	-	2	3	-	3	-	-	-	2	-	-	3
CO5	2	3	2	2	2	3	-	3	2	2	-	3	-	-	2
Avg	2	3	2.5	2	2	3	2	3	2	2	-	2.4	-	-	2

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT6372	KNOWLEDGE ENGINEERING	2	0	2	3

Course Objective

The student should be made to:

1. Understand the basics of Knowledge Engineering.
2. Discuss methodologies and modeling for Agent Design and Development
3. Design and develop ontologies
4. Apply reasoning with ontologies and rules
5. Understand learning and rule learning

Unit	Description	Instructional Hours
I	**REASONING UNDER UNCERTAINTY** Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering	6 + 6
II	**METHODOLOGY AND MODELING** Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.	6 + 6
III	**ONTOLOGIES – DESIGN AND DEVELOPMENT** Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.	6 + 6
IV	**REASONIING WITH ONTOLOGIES AND RULES** Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.	6 + 6
V	**LEARNING AND RULE LEARNING** Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.	6 + 6
	Total Hours	**60**

S. No	List of Experiments
1	Perform operations with Evidence Based Reasoning.
2	Perform Evidence based Analysis.
3	Perform operations on Probability Based Reasoning.
4	Perform Believability Analysis
5	Implement Rule Learning and refinement.
6	Perform analysis based on learned patterns
7	Construction of Ontology for a given domain.

Course Outcome

Upon completion of this course, the students will be able to:

CO1 : Outline the fundamentals of knowledge engineering using probability concepts
CO2: Apply methodologies and modeling for Agent Design and Development.
CO3: Design and develop ontologies.
CO4: Apply reasoning with ontologies and rules.
CO5: Apply rule learning for problem solving.

TEXT BOOK:

T1 Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum,' Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning', Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9)

REFERENCES:

R1 Ronald J. Brachman, Hector J. Levesque, 'Knowledge Representation and Reasoning', Morgan Kaufmann, 2004

R2 Ela Kumar, 'Knowledge Engineering', I K International Publisher House, 2018

R3 John F. Sowa, 'Knowledge Representation: Logical, Philosophical, and Computational Foundations', Brooks Cole Thomson Learning, 2000.

R4 King , 'Knowledge Management and Organizational Learning' , Springer, 2009.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	1	2	1	2	3	2	1
CO2	3	2	3	2	2	-	-	-	2	1	2	1	3	2	1
CO3	2	2	3	2	2	-	-	-	3	2	2	2	3	2	1
CO4	2	2	3	1	1	-	-	-	2	2	2	2	3	2	1
CO5	2	2	2	1	1	-	-	-	2	1	1	1	3	2	1
AVG	2.4	1.8	2.4	1.4	1.4	-	-	-	2.0	1.6	1.6	1.6	3	2	1

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SEMESTER VIII
HONOR COURSE

HONOR SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21IT8201	GENERATIVE ARTIFICIAL INTELLIGENCE	2	0	2	3

Course Objective

The student should be made to

1. Understand the foundational concepts, history, and evolution of Generative AI, along with its capabilities, applications, and economic potential.
2. Develop the skills to design effective text prompts using various techniques, such as zero-shot and few-shot prompting, and explore advanced engineering approaches to enhance the coherence and relevance of AI outputs
3. Gain a comprehensive understanding of generative models, including RNNs, LSTMs, GANs, VAEs, Transformers, and Diffusion models, and their applications in generating text, images, audio, and video
4. Explore the features, capabilities, and challenges of various platforms and pre-trained models for generative AI, focusing on applications like text-to-text, text-to-image, and text-to-code generation.
5. Analyze the ethical issues, limitations, and societal implications of Generative AI, and learn strategies for responsible development and use to address economic and social challenges.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO GENERATIVE AI** Capabilities - History and Evolution -Benefits- Challenges - Applications of Generative AI – Tools for Text, Image Code, Audio and Video generation– Economic Potential of Generative AI - Use cases.	5
II	**PROMPT ENGINEERING TECHNIQUES AND APPROACHES** Prompt Creation -Writing effective prompts -Techniques for using text prompts: Zero shot and few-shot prompt techniques – Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought - Benefits of using text prompts - Challenges in generating meaningful and coherent prompts.	6
III	**MODELS FOR GENERATIVE AI** Basics of Sequential data processing – Building blocks of Generative AI - Discriminative modelling – Generative modelling –Recurrent Neural Networks – Long Short-Term Memory (LSTM) Networks - Generative Adversarial Networks (GANs) - Variational Autoencoders (VAEs) – Transformer–based Models - Diffusion models- Applications.	7
IV	**PLATFORMS FOR GENERATIVE AI** Introduction to Platforms – Features of platforms – Capabilities -Applications - Pre-trained Models - Challenges – Generation of Text to Text – Generation of Text to Image – Text to Code Generation – Explainable AI – Benefits – Use cases.	7
V	**ETHICAL ISSUES AND LIMITATIONS OF GENERATIVE AI** Limitations of Generative AI – Issues and concerns – Considerations for Responsible Generative AI – Economic Implications – Social Implications – Future and professional Growth of Generative AI.	5
	Total Instructional Hours	30

LAB COMPONENT:

List of Experiments:

1. Generate text using Generative AI
2. Text Generation using ChatGPT and Bard
3. Image Generation using GPT and Stable Diffusion
4. Code Generation
5. Experimenting with Prompts
6. Approaches in Prompt Engineering
   - Chain-of-Thought Approach
   - Interview Pattern Approach
   - Tree-of-Thought Approach
7. Effective Text Prompts for Image Generation
8. Develop AI Applications with the Foundation Models
9. Develop AI Applications for Code Generation

Total: 30 Hours

Course Outcome

At the end of the course, students would be able to:

CO1	Build insights into the key technological trends driving generative AI models.
CO2	Develop the ability to apply effective prompt engineering techniques to enhance theperformance and control the behavior of generative AI models.
CO3	Build, train and apply generative models and develop familiarity with platforms.
CO4	Identify ethical issues and limitations of generative AI models.
CO5	Understand the economic impact, including disruption to labor markets, opportunities for innovation, and cost-benefit trade-offs.

TEXT BOOKS:

T1: Deep Learning: Teaching Machines to Paint, Write, Compose and Play, David Foster,2023. 2nd edition. O'Reilly Media, Inc.

T2: Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016.

REFERENCE BOOKS:

R1: Hands-on Generative Adversarial Networks with Keras, Rafael Valle. Packt Publisher, 2019 .

ONLINE LEARNING MATERIALS:

https://www.coursera.org/learn/generative-ai-introduction-and- applications?specialization=generative-ai-for-everyone

https://www.coursera.org/learn/generative-ai-prompt-engineering-for-everyone?specialization= generative-ai-for-everyone

https://www.coursera.org/learn/generative-ai-foundation-models-and- platforms?specialization=generative-ai-for-everyone

https://www.coursera.org/learn/generative-ai-ethical-considerations-and- implications?specialization= generative-ai-for-everyone

CO-PO MAPPING

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	2	-	-	2	-	-	2
CO2	-	3	3	2	3	2	3	3	2	2	3	2	2	-	2
CO3	-	-	3	2	3	2	3	3	2	2	3	2	2	-	2
CO4	-	-	-	2	-	2	3	3	2	-	-	2	2	-	2
AVG	2	2.5	3	2	3	2	3	3	2	2	3	2	2	-	2

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VALUE ADDED COURSES

Programme	Name of the course	L	T	P	C
B.Tech IT 23VACH02	JOY OF COMPUTING USING PYTHON	2	0	1	2

Course Objective		
	The students should be able	
	1	To understand C programming Concepts.
	2	To learn how to use indexing and slicing to access data in Python programs.
	3	To develop Python programs with conditionals and loops and to define Python functions and call them.
	4	To develop the program using Control statements.
	5	To use Python data structures — lists, tuples, dictionaries
	6	To learn how to use exception handling in Python applications for error handling.
	7	To understand the Arrays, Sorting and Searching techniques in c programming.
	8	To develop Python programs using String operations.
	9	To understand the concept of methods and inheritance in python.

Module	Description	Instructional Hours
1	**INTRODUCTION** Introduction to C: Features of C, Compilation of C, Simple Programs, Variables and Keywords, Data types in C, Specifiers, Operators & its types.	02
2	**CONDITIONAL STATEMENTS AND CONTROL FLOW STATEMENTS** Decision making: If statement, IF-Else statement and IF-Else-IF ladder , Looping statement: For loop, While Loop, Do While Loop, For Each loop, Repetition Statement: Continue and Break Statement.	04
3	**ARRAYS , SORTING, SEARCHING AND FUNCTIONS IN C** Introduction to Arrays, Array Manipulation, types of Arrays, Linear search, Binary search, Insertion sort, Bubble sort, Selection sort, and Quick sort, String and it's operations, Introduction to Functions, Call by value and Call by reference, Recursion, Flood Fill and Robot path problem.	05
4	**DATA STRUCTURE** Linear Data Structure: List, Doubly linked list, circular list and its manipulation, Non Linear Data Structure: Stack and operations, Queue and operations, Binary Tree , BST, Graph, Traversal, Minimum Spanning Tree, Shortest Path problems.	06
5	**INTRODUCTION TO PYTHON** Introduction to Python basics, Variables, Data types, Operators, Arithmetic with Numbers and Running .py files.	02
6	**STRINGS AND LISTS**	04

	Python Strings, String Operations, Programs using Strings, List: List Operations, list Methods, aliasing, cloning lists, advanced list processing, list comprehension.	
7	**TUPLES AND DICTIONARIES** Tuple: tuple assignment, tuple as return value, tuple operations, tuple methods, Dictionaries: operations and methods.	04
8	**LOOPS, CONTROL FLOW STATEMENTS AND FUNCTIONS** Loops: For loop, while loop, do while loop, looping programs, Control Flow statements: If , elif and else statement, control flow statement programs, Functions in python, Recursive functions.	04
9	**PYTHON-OOP AND ERRORS and EXCEPTION HANDLING** Introduction to Object Oriented Programming, Class and Attributes, Methods and Inheritance, errors and exception handling.	05
	Total Instructional Hours	36

Course Outcome	CO1	Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables
	CO2	Read ,write and execute by hand simple Python programs.
	CO3	Decompose a Python program into functions.
	CO4	Represent compound data using Python lists, tuples and dictionaries.
	CO5	Interpret the concepts of object oriented programming using Python.
	CO6	Read and write data from/to files in Python Programs.
	CO7	Structure simple Python programs for solving problems and Decompose a Python program into functions
	CO8	Write the Python program using string functions.
	CO9	Interpret the concepts of Methods, Inheritance and Error and Exception handling.

TEXT BOOK:

T1	Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
T2	Introduction to Java programming, By Y.DanielLiang,Pearson Publication.

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Programme	Name of the course	L	T	P	C
B.Tech IT 22VACH04	WEB RUNNER LANGUAGE-JAVA	2	0	1	2

Course Objective	The student should be able	
	1	To understand object-oriented programming principles
	2	To write, compile and execute Java programs.
	3	To understand the concept of Strings and Arrays
	4	To understand and use the exception handling mechanism of Java.
	5	To understand how to design applications with threads in Java.
	6	To understand and use GUI components.
	7	To apply Methods and Packages in Java Programming
	8	To understand the Data Structure concepts and Mysql.
	9	To do the Miniproject using JDBC Connections.

Module	Description	Instructional Hours
1	**INTRODUCTION TO JAVA** Setting up the environment, Basic Syntax, JVM Architecture, JDK, JRE and JVM, Identifiers, Variables and comments. Operators, Types of Operators.	02
2	**CONTROL STATEMENTS AND SERIES AND PATTERNS** Decision making: If statement, IF-Else statement and IF-Else-IF ladder , Looping statement: For loop, While Loop, Do While Loop, For Each loop, Repetition Statement: Continue and Break Statement, Series and Patterns.	02
3	**STRINGS AND ARRAYS** Introduction to Strings, String Operations, StringBuffer class, StringBuilder Class, StringJoiner, String Tokenizer, Introduction to Arrays, Array Class in Java, Types Of Array.	03
4	**BASICS OF OOPS AND CLASSES** OOPS Concept, Namingconvention , Methods , Access Modifiers, Constructors in Java, Introduction to classes and objects, Understanding classes and objects in java, class vs interface, object class in java, Inner class in java.	05
5	**INHERITANCE ,ABSTRACTION AND ENCAPSULATION** Introduction to Inheritance , Inheritance and Constructors, Multiple Inheritance, Introduction to Abstraction, Abstract classes in java, Encapsulation, Polymorphism.	06
6	**METHODS AND PACKEGES** Different Method call in Java, Abstract Methods, Method Overriding , Methods Overloading, Java Interfaces, Java Packages, How to create a package in Java, Java.util package, Java.lang package, Java.io Package.	05

7	**MULTITHREADING AND COLLECTIONS** Lifecycle and stages of a thread, Thread priority in Java, Thread Class, Runnable interface, start() method in thread, Collections class in Java, List Interface in Java, Queue Interface in Java, Iterator in Java, Comparator in Java.	05
8	**DATA STRUCTUREs and MYSQL** Arrays, Linked lists, Stacks, Queues, Tree, Graph, Introduction to Mysql, Database, Tables, Queries, Indexes, Clauses, Conditions, Joins.	04
9	**JDBC AND MINIPROJECT AND JAVA 8** Connectivity with JDBC, Driver Manager, Statement, JDBC Exceptions, Inventory Management - using JDBC and MYSQL, Stream API, Lambda Expression.	04
	Total Instructional Hours	36

Course Outcome	CO1	Use the syntax and semantics of java programming language and basic concepts of OOP.
	CO2	Read and make elementary modifications to Java programs that solve real-world problems.
	CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
	CO4	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
	CO5	Use multithreading concepts to develop inter process communication.
	CO6 & CO7	Develop and run the Java Programs using classes and Objects. Apply the syntax of control statements and to develop the programs.
	CO8 & CO9	Apply Data Structure concepts and Mysql in java programs and to develop the miniproject using the JDBC connectivity.

TEXT BOOK:

T1	Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
T2	Introduction to Java programming, By Y.DanielLiang,Pearson Publication.

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