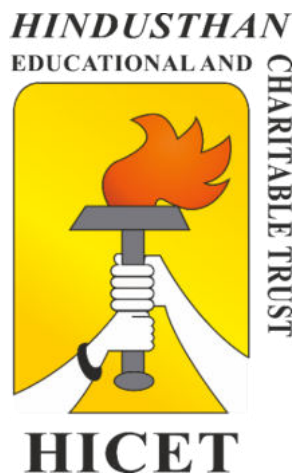*HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY*

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade)

Coimbatore - 641 032.

B.TECH. INFORMATION TECHNOLOGY

Curriculum & Syllabus

Academic year 2022-23

VISION AND MISSION OF THE INSTITUTION

VISION

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

MISSION

IM1: To provide academic excellence in technical education through novel teaching methods.

IM2: To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.

VISION AND MISSION OF THE DEPARTMENT

VISION

To develop IT Professionals of the best caliber with entrepreneurship zeal

MISSION

To achieve the vision of the department with sustained efforts to,

DM1: To establish a best learning environment that helps the students to face the challenges of information technology field.

DM2: To enable students develop skills to solve technical problems and also endorse collaborative and multidisciplinary activities through curricular, co-curricular and extra-curricular activities.

DM3: To increase the visibility of academic programs at all level and fascinate talent to meet entrepreneurship skills.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/Development Of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct Investigations Of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The Engineer And Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment And Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.

PO9: **Individual And Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project Management And Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-Long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO 1: Able to Design and develop software solutions by employing appropriate problem solving strategies, including Logically thinking, Create a user interface, Write code to connect a front end user interface with a backend database using a contemporary object-oriented language.

PSO 2: Ability to design and develop mobile applications and Web based Applications with testing skills, which consequently leads to employability and entrepreneurship skills.

PSO 3: To increase the visibility of academic programs at all level and fascinate talent to meet entrepreneurship skills.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Graduates of the program will be proficient in identifying, formulating and solving complex problems by applying their knowledge of mathematics, science and Information Technology principles.

PEO 2 Graduates of the program will be capable of analyzing, designing, implementing and managing software projects through continuous learning and use modern tools to meet real-world constraints.

PEO 3 Graduates of the program exhibits professionalism with ethical attitude, communication, team work and will contribute to society needs.

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IT - HiCET

Chairman

Dean (Academics)
HiCET

CURRICULUM

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.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2019

For the students admitted during the academic year 2019-2020 and onwards

SEMESTER VII

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	19IT7201	Distributed and Cloud Computing	PC	3	0	0	3	25	75	100
2.	19IT7202	Data Science and Analytics	PC	3	0	0	3	25	75	100
3.	19IT7203	Software Testing and Quality Assurance	PC	3	0	0	3	25	75	100
4.	19IT73XX	**Professional Elective III**	PE	3	0	0	3	25	75	100
5.	19XX74XX	**Open Elective II**	OE	3	0	0	3	25	75	100
PRACTICALS										
6.	19IT7001	Distributed and Cloud Computing Laboratory	PC	0	0	3	1.5	50	50	100
7.	19IT7002	Data Analytics Laboratory	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8.	19IT7901	Project Work - Phase I	EEC	0	0	4	2	50	50	100
			TOTAL	15	0	10	20	275	525	800

PROFESSIONAL ELECTIVE III										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	19IT7301	Social Network analysis	PE	3	0	0	3	25	75	100
2.	19IT7302	Cyber Forensics	PE	3	0	0	3	25	75	100
3.	19IT7303	Software Documentation	PE	3	0	0	3	25	75	100
4.	19IT7304	Principles of Management	PE	3	0	0	3	25	75	100
5.	19IT7305	Software Architecture	PE	3	0	0	3	25	75	100

6.	19IT7306	Green Computing	PE	3	0	0	3	25	75	100
7.	19IT7003	Professional Readiness For Innovation, Employability and Entrepreneurship	PE	3	0	0	3	50	50	100

OPEN ELECTIVE II - INFORMATION TECHNOLOGY										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	19IT7401	Cyber Security	OE	3	0	0	3	25	75	100

SEMESTER VIII

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
			THEORY							
1.	19FT83XX	**Professional Elective –IV**	PE	3	0	0	3	25	75	100
2.	19FT83XX	**Professional Elective- V**	PE	3	0	0	3	25	75	100
			PRACTICAL							
3.	19IT8901	Project Work – Phase II	EEC	0	0	24	8	50	50	100
			Total	6	0	24	14	100	200	300

PROFESSIONAL ELECTIVE IV										
1.	19IT8301	Graphics and Multimedia	PE	3	0	0	3	25	75	100
2.	19IT8302	Software Process	PE	3	0	0	3	25	75	100
3.	19IT8303	Service Oriented Architecture	PE	3	0	0	3	25	75	100
4.	19IT8304	Human Computer Interaction	PE	3	0	0	3	25	75	100
5.	19IT8305	Mobile Edge Systems	PE	3	0	0	3	25	75	100
6.	19IT8311	Robotics and its Applications	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	19IT8306	Information Retrieval Technologies	PE	3	0	0	3	25	75	100
2.	19IT8307	Block Chain Technology	PE	3	0	0	3	25	75	100
3.	19IT8308	Professional Ethics	PE	3	0	0	3	25	75	100
4.	19IT8309	Deep Learning Techniques.	PE	3	0	0	3	25	75	100
5.	19IT8310	Management Information System	PE	3	0	0	3	25	75	100
6.	19IT8312	Quantum Computing	PE	3	0	0	3	25	75	100

SEMESTER V

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	19IT5201	Mobile Computing	PC	3	0	0	3	25	75	100
2.	19IT5202	Computer Networks	PC	3	0	0	3	25	75	100
3.	19IT5203	Microcontrollers and Embedded Systems	PC	3	0	0	3	25	75	100
4.	19IT5204	Artificial Intelligence and Machine Learning	PC	3	0	0	3	25	75	100
5.	19IT5205	Data Warehousing and Data Mining	PC	3	0	0	3	25	75	100
6.	19IT53XX	**Professional Elective-I**	PE	2	0	2	3	50	50	100
PRACTICALS										
7.	19IT5001	Machine Learning Laboratory	PC	0	0	3	1.5	50	50	100
8.	19IT5002	Mobile Application Development Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	19HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10.	19HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	19	0	8	23	475	525	1000

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1.	19IT5351R	Internet and Web Technology	PE	2	0	2	3	50	50	100
2.	19IT5352	Advanced Java Programming	PE	2	0	2	3	50	50	100
3.	19IT5353	C# and .Net Programming	PE	2	0	2	3	50	50	100
4.	19IT5354	Advanced Data Structure	PE	2	0	2	3	50	50	100
5.	19IT5355	Advanced Database Technology	PE	2	0	2	3	50	50	100
6.	19IT5356	Ethical Hacking	PE	2	0	2	3	50	50	100

SEMESTER VI

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	19IT6181	Software Project Management	HS	3	0	0	3	25	75	100

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
2.	19IT6201	Internet of Things	PC	3	0	0	3	25	75	100
3.	19IT6202R	Principles of Compiler Design	PC	3	0	0	3	25	75	100
4.	19IT63XX	**Professional Elective II**	PE	3	0	0	3	25	75	100
5.	19XX64XX	**Open Elective I**	OE	3	0	0	3	25	75	100
THEORY AND LAB COMPONENT										
6.	19IT6251	Cryptography and Network Security	PC	3	0	2	4	50	50	100
PRACTICALS										
7.	19IT6001	Internet of Things Laboratory	PC	0	0	3	1.5	50	50	100
8.	19IT6003	Project based Learning	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	19IT6701	Internship/Industrial Training	EEC	0	0	0	1	100	0	100
10.	19HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
11.	19HE6072	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.	19IT6301	Business Intelligence and Analysis	PE	3	0	0	3	25	75	100
2.	19IT6302	Information Security	PE	3	0	0	3	25	75	100
3.	19IT6303	Software Design	PE	3	0	0	3	25	75	100
4.	19IT6304	Natural Language Processing	PE	3	0	0	3	25	75	100
5.	19IT6305	Soft Computing	PE	3	0	0	3	25	75	100
6.	19IT6307	Virtual Reality and Augmented Reality	PE	3	0	0	3	25	75	100
7.	19IT6308	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.	19IT6402	Machine Learning for Engineers	OE	3	0	0	3	25	75	100

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

SEMESTER III

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.	21HE3071	**Career Guidance Level – III** Personality, Aptitude and CareerDevelopment	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

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.	21AC4191	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

REGULATION-2022

<mark>**For the students admitted during the academic year 2022-2023 and onwards**</mark>

SEMESTER I

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.	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	UHV	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

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

CREDIT DISTRIBUTION R2019

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

CREDIT DISTRIBUTION R2022

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

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Hindusthan College of Engineering & Technology
COIMBATORE - 641 032

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7201	**Distributed and Cloud Computing**	**3**	**0**	**0**	**3**

Course Objective

The student should be made to:
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 Application Platform and Thread Programming
5. To gain insight on Cloud Resource Management and Security.

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–Coordination in Group Communication–Ordered Multicast	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	**Introduction:** 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 – Virtualization of CPU – Memory – I/O Devices	9
IV	**Cloud Application 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, Applications: Amazon Web Applications – Google App Engine – Microsoft Azure.	9
V	**Resource Management and Security in Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	9

TOTAL INSTRUCTIONAL HOURS   45

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Course Outcome	Upon completion of this course, the students will be able to
	CO1: Understand Distributed Communication
	CO2: Design Distributed Resource Management
	CO3: Familiar with basics of Cloud Computing and Virtualization
	CO4: Learn about Cloud Application Platform and Thread Programming
	CO5: Gain knowledge about Resource Management and Security in Cloud

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, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publication, First Edition, 2013.

REFERENCE BOOKS:

R1- Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―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, Tata McGraw Hill Publication, 2009.

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

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7202	**Data Science and Analytics**	3	0	0	3

Course Objective

The student should be made to:
1. To know the Fundamental Concepts of Data Science and Analytics.
2. To know about Hadoop tools such as Hive and Map Reduce procedure.
3. To gain knowledge on NoSql Databases such as MongoDB and Cassandra.
4. To Learn Data Analysis Methods and Machine Learning Algorithms
5. To learn Various Techniques for Mining Data Streams.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA SCIENCE AND BIG DATA** Classification of Digital Data - Introduction to Big Data- Big Data Analytics: Classification ofAnalytics – Challenges – Importance of Big Data Analytics - Data Science - Data Scientist -Terminologies used in Big Data Environments - Soft State Eventual Consistency	9
II	**HADOOP FRAMEWORK AND HIVE** Distributed File Systems - HDFS concepts – Map Reduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN-Hive QueryLanguage Statements –Partitions –Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having - RCFile Implementation -Hive User Defined Function - Serialization and Deserialization - Hive Analytic Functions	9
III	**NOSQL DATABASE MODELS-MONGODB, CASSANDRA** Introduction to NoSQL – MongoDB: - Data Types - MongoDB Query Language - Cassandra:Features - CQL Data Types – CQLSH – Key spaces - CRUD Operations – Collections - Using a Counter - Time to Live - Alter Commands - Import and Export - Querying System Tables	9
IV	**INTRODUCTION TO PIG AND HBASE** Introduction to PIG – Data Types – Execution Modes – Relational OperatorsEval functions – Complex Data Types – User Defined Functions – Parameter Substitution –Diagnostics operator – WordCount Example - HBase: Data Model and Implementations –Logical and Physical view – HBase Architecture - CRUD operations - HBase Clients – Examples.	9

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DATA ANALYSIS AND MACHINE LEARNING ALGORITHMS

V	Statistical Methods:Regression Modeling, Multivariate Analysis – Introduction to Clustering Techniques - Hierarchical Clustering - K-means Algorithms- The CURE Algorithm -Clustering in Non- Euclidean Spaces - Clustering for Streams and Parallelism. The Machine-Learning Model –Perceptron- Support-Vector Machines - Learning from Nearest Neighbors- Decision Trees - Comparison of Learning Methods	9

TOTAL INSTRUCTIONAL HOURS   45

Course Outcome

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

CO1 - Understand the fundamental concepts of Data Science and Analytics.
CO2 - Practice Big Data Using Hadoop Framework.
CO3 - Work with Big Data Platform and Store Data in HBase, MongoDB.
CO4 - Perform Analysis Using Machine Learning Algorithms.
CO5 - Realize Algorithms for Mining the Data from Large Volumes.

TEXT BOOKS:

T1 - Seema Acharya, Subhashini Chellappan, Big Data and Analytics, Wiley Publications, (Second Edition),2019.

T2 - Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press (Third Edition), 2020.

REFERENCE BOOKS:

R1 - Tom White, Hadoop The Definitive Guide, O'Reilly Publications, Fourth Edition, 2015.

R2 -Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley Publishers, 2014.

R3- Jiawei Han, Micheline Kamber, Jian Pei, Data Mining Concepts and Techniques, Morgan Kaufman Publications, (Third Edition), 2012.

R4 - Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7203	**Software Testing and Quality Assurance**	3	0	0	3

<table>
<tr><td rowspan="2">Course Objective</td><td colspan="2">The student should be made to:</td></tr>
<tr><td colspan="2">
1. To understand the Basic principles and categories of Defects in Software Testing.
2. To familiar with the types and levels of Software Testing.
3. To study the concepts related to Controlling and Monitoring Software Testing
4. To familiar with the concepts related to Quality and Customer Satisfaction, Benchmark.
5. To Learn the process of Certification and Standard Assessment
</td></tr>
</table>

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 of testing-Unit Testing- Integration Testing- System Testing - 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

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	STANDARDS, CERTIFICATION AND ASSESSMENT	
V	Need for standards, SQA Standards – ISO: 9001 Certification, Bootstrap methodology, V SPICE Project and ProcessAssessment, Management and its Role in Quality Assurance -SQA Unit & other actors in SQA systems	9

TOTAL INSTRUCTIONAL HOURS   45

Course Outcome

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

CO1: understand the basic Principles of Software Testing and types of Defects in Software Testing.

CO2: apply the appropriate Testing methods for real time applications.

CO3: understand How to Control, Monitor and review the Software Projects.

CO4: understand basics of Quality Assurance and to develop quality plans.

CO5: understand the process of Certification and Standard Assessment.

TEXT BOOKS:

T1. Daniel Galin, ―Software Quality Assurance: From Theory to Implementation, Pearson Addison-Wesley, Second Edition, 2012.

T2. Ilene Burnstein, ―Practical Software Testing, Springer International Edition 2003.

REFERENCE BOOKS:

R1. M G Limaye, ―Software Testing – Principles, Techniques and Tools‖, McGraw Hill,2017.

R2.MilindLimaye, ―Software Quality Assurance, McGraw Hill, 2011.

R3. Glenford J. Myers, Corey Sandler, Tom Badgett,The Art of Software Testing, 3rd Edition, John Wiley & Sons, Inc. 2011

R4. Ron Patton, Software Testing, second edition. Pearson Education.2009.

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Programme	Course Code	Name of the Course	L	T
B.TECH	19IT7001	**DISTRIBUTED AND CLOUD COMPUTING LABORATORY**	0	0

The student should be made:

<table>
<tr><td rowspan="5">Course Objective</td><td>1.</td><td>To understand Basics, Techniques and Tools for Cloud Computing</td></tr>
<tr><td>2.</td><td>To know about usage of Virtualization Concept</td></tr>
<tr><td>3.</td><td>To use GAE as PaaS</td></tr>
<tr><td>4.</td><td>To understand the working of AWS Elastic Beanstalk</td></tr>
<tr><td>5.</td><td>To gain knowledge about CloudSim Environment</td></tr>
</table>

Expt. No.	Description of the Experiments
1	Install VirtualBox 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 following experiments a. Fibonacci Series b. File Operations
4	Install Google App Engine. Create hello World app and other simple web applications using Python/Java.
5	Use GAE launcher to launch the Web Applications.
6	Use AWS EC2 Instance to launch the Web Applications using Linux\Windows Web Application
7	Deploy a Web Application using AWS Elastic Beanstalk
8	Simulate a cloud scenario using CloudSim and run a Scheduling Algorithm not present in CloudSim

Total Practical Hours

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

CO1: Understand Techniques and Tools used in cloud environment

CO2: Design and implement Virtualization Concept in the Cloud Infrastructure

Course Outcome   CO3: Use GAE as PaaS in Cloud Environment

CO4: Deploy an application in AWS Elastic Beanstalk

CO5: Gain knowledge about usage of CloudSim Simulation Environment

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH	19IT7002	**DATA ANALYTICS LABORATORY**	0	0	3	1.5

The student should be made:

Course Objective

1. To Implement Map Reduce Programs For Processing Big Data
2. To Realize Storage Of Big Data Using H Base, Mongo Db
3. To analyse Big Data Using Linear Models
4. To analyse Big Data Using Machine Learning Techniques Such As Svm / Decision Tree Classification And Clustering

Expt. 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 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 logistics regression
9	Perform test on Normalization using R.
10	Visualize data Using any Plotting Framework

Total Practical Hours   45

Course Outcome

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

CO1: Process Big Data using Hadoop Framework .

CO2: Understand Installation of Hadoop and HIVE Setup. CO3: Use MongoDB and Cassandra to Store Data.

CO4: Build and apply Linear And Logistic Regression Models and Perform Data Analysis With Machine Learning Methods .

CO5: Perform Graphical Data Analysis.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7301	Social Network analysis	3	0	0	3

Course Objective

The student should be made:

CO1: understand the concept of semantic web and related applications.

CO2: understand about web data and knowledge representation using ontology.

CO3: learn how to perform Modelling and aggregating social network data.

CO4: understand human behaviour in social web and related communities.

CO5: 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**

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	Upon completion of this course, the students will be able to
	CO1: Develop Semantic Web related applications.
Course	CO2: Represent knowledge using ontology.
Outcome	CO3: Perform Modeling and Aggregating social network data
	CO4: Extract human behavior in social web and related communities.
	CO5: Visualize social networks and understand real time applications.

TEXT BOOKS:

T1 - BorkoFurht, ―Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

T2 - Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.

REFERENCE BOOKS:

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 Modelling‖, 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.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7302	Cyber Forensics	3	0	0	3

Course Objective	The student should be made: CO1: Learn the Forensics and Investigation. CO2: Be Exposed to Forensics Technology and Systems. CO3: Learn About Evidence Collection and Forensic Tools. CO4: Learn to Analyse and Validate Forensics Data. CO5: Learn Ethical Hacking and System Hacking	

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CYBER FORENSICS:** The Goal of the Forensic Investigation: WhyInvestigate, Internet Exceeds Norm, How to Begin a Non−Liturgical Forensic Examination: Isolation ofEquipment, 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:** Processing Crime and Incident Scenes –Working with DOS and Windows Systems - Current Computer Forensics Tools: Software/ HardwareTools.	9
IV	**ANALYSIS AND VALIDATION:** Validating Forensics Data – Data Hiding Techniques – PerformingRemote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile DevicesForensics.	9
V	**ETHICAL HACKING:** Introduction to Ethical Hacking – Footprinting and Reconnaissance – ScanningNetworks – Enumeration – System Hacking – Malware Threats – Sniffing – Social Engineering.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome	Upon completion of this course, the students will be able to CO1: Understand the forensics and investigation. CO2: Gain knowledge about forensics technology and systems used. CO3: To analyze digital evidence and use forensics tools. CO4: Explain the principle of Network Forensics. CO5: Understand the concept ethical hacking and system hacking	

TEXT BOOKS:

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, Guide to Computer Forensics and Investigations, Cengage Learning, Published: Fourth Edition, 2010

REFERENCE BOOKS:

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.

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PROGRAMME B.E/B.Tech	COURSE CODE 19IT7303	NAME OF THE COURSE Software Documentation	L	T	P	C
			3	0	0	3

Course Objective

The student should be made:

1. To Learn about the various Processes Involved in Software Documentation.
2. To 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 clarify the Goals of the various Software Development Teams.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Need for Software Documentation - Understanding Task Orientation - Analyzing Users – Writinguser scenarios - User Informational Needs - Document Goals - User Work Motivations – UserAnalysis 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	**DOCUMENTATION TESTING** Usability Tests - Advantages of Field Testing - Editing and Fine Tuning - Problems - Designing forTask Orientation - Page Showing Elements of Document Design - Screen Showing Elements forOnline Help Design - Solutions to the Design Problem for Printed and Online Documentation.	9
IV	**DOCUMENTATION LAYOUTS** Laying Out Pages and Screens - Elements of Page and Screen Design - Designing Type – EffectiveWriting Style - Using Graphical that Support Decision Making - Functions of Graphics - Type andElements of Graphics.	9
V	**DOCUMENTATION GUIDELINES** Writing to Guide - Procedures - Guidelines - Writing to Support - Reference - Structural – ReferenceEntry - Checklist - Designing Index - User Oriented Index - Case Studies.	9

TOTAL INSTRUCTIONAL HOURS   45

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| | Upon completion of this course, the students will be able to |
| **Course Outcome** | CO1: Understand and Analyse Software Documentation.
CO2: Develop a Documentation Style and Review Plan.
CO3: Construct and Realize Commonly used Software Artifacts for Software Testing.
CO4: Design a Software Documents and Layouts.
CO5: Manage the Documentation Guidelines and Checklists |

TEXT BOOKS:

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 Lightweight Documents for Software Projects, John Wiley & Sons, 2005

REFERENCE BOOKS:

R1 - CyrilleMartraire, Living Documentation: Continuous Knowledge Sharing by Design, First Edition‖, Addison- Wesley Professional, 2019

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

R3 - Edmond H.Weiss, How To Write Usable User Documentation, Second Edition , Oryx Press, 1991.

R4 - Patricia A. Williams, Pamela S. Beason,Writing Effective Software Documentation, LONGMAN,1990.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7304	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 andTheories 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 – Useof 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

Upon completion of this course, the students will be able to
CO1: Identify the concept of Management and Administration
CO2: Apply the concept of Planning, Forecasting and Decision Making
CO3: Select the Organizational Structures and Apply Staffing Concepts
CO4: Analyze the Motivational and Leadership Theories
CO5: Use Communication and Controlling Processes

TEXT BOOKS:
T1: Stephen P. Robbins & Mary Coulter, ―Management‖, Prentice Hall (India) Pvt. Ltd., (14thEdition), 2017.
T2: JAF Stoner, Freeman R.E and Daniel R Gilbert ―Management‖, Pearson Education, (6th Edition), 2011.

REFERENCE BOOKS:

R1: Tripathy PC & Reddy PN, ―Principles of Management, Tata McGraw Hill, (6th Edition),2017.

R2: Harold Koontz & Heinz Weihrich ―Essentials of management Tata McGraw Hill, (10thEdition), 2015.

R3: Harold Koontz, Heinz Weihrich, ―Essential of Management, Tata Mcgraw Hill, (10th Edition),2015.

R4: Robert Kreitner& Mamata Mohapatra, ―Management, Biztantra, (12th Edition), 2011.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT7305	Software Architecture	3	0	0	3

Course Objective	The student should be made: 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, Siemens 4 Views, SEI'sPerspectives and Views –Case Studies	9
IV	**ARCHITECTURAL STYLES** Introduction – Data Flow Styles – Call-Return Styles – SharedInformation Styles – EventStyles – Case Studies for Each Style	9
V	**DOCUMENTING THE ARCHITECTURE** Good practices – Documenting the Views using UML – Merits andDemerits of using Visual Languages– Need for Formal Languages - Architectural Description Languages – ACME – 9Case Studies.	9

TOTAL INSTRUCTIONAL HOURS   45

Course Outcome	Upon completion of this course, the students will be able to CO1: Acquire the importance and role of Software Architecture in Large-ScaleSoftware Systems. CO2: Assess the Quality Attributes of a System at the Architectural Level.CO3: Use Appropriate Views to Specify Architecture CO4: Recognize the major Software Architectural Styles CO5: Design Document for a given Architecture.

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TEXT BOOKS:

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, Auerbach Publications, 2010.

REFERENCE BOOKS:

R1: Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, PauloMerson, Robert Nord, and Judith Stafford, —Documenting Software Architectures. Views andBeyond, 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, ArifChughtai, Timo Kehrer,—Software Architectures: A Comprehensive Framework and Guide for Practitioner, Springer 2011.

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

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT7306	GREEN COMPUTING	3	0	0	3

Course Objective

The student should be able
1 To learn the fundamentals of Green Computing.
2 To understand various green assets 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 andteleporting – 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 Roadmap – GreenCompliance: 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 to a Home, Hospital, Packaging Industry and Telecom Sector	9
	Total Instructional Hours	**45**

Course Outcome

CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on theenvironment
CO2	Enhance the skill in energy saving practices in their use of hardware.
CO3	Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders
CO4	Understand the ways to minimize equipment disposal requirements
CO5	Experience various case studies and applications of Green computing

TEXT BOOK:

T1 Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2014.

T2 Bud E. Smith, "Green Computing Tools and Techniques for Saving Energy, Money and Resources", CRC Press, 2018, ISBN 9781138374669

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.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT7401R	CYBER SECURITY	3	0	0	3

Course Objective

The student should be able
1 To know the importance of Information System Security.
2 To explore various Cryptographic 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

CO1 Understand the Information Systems and Security Fundamentals.
CO2 Gain knowledge on various Security Techniques.
CO3 CExpress fundamentals of cybercrimes and the cyber offenses.
CO4 Recognize the cyber threats, attacks, vulnerabilities and its defensive mechanism.
CO5 Learn the Organizational Implications on Cyber security.

TEXT BOOK:

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

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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.

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SYLLABUS

PROFESSIONAL ELECTIVES - IV

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8301	GRAPHICS AND MULTIMEDIA	3	0	0	3

Course Objective		
	The student should be able	
	1	To Learn the basics of Computer Graphics System and Line DrawingAlgorithms,
	2	To Understand Two Dimensional Transformations and Clipping Algorithms.
	3	Students familiar with Three-Dimensional Graphics and Three-Dimensional Transformations.
	4	To Implement activities involving in Design, Development and Testing
	5	To 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, ScanI Conversion Techniques, Line Drawing: Simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms. Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood- Fill Algorithms.	9
II	**2DTransformation:** 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, Bezierand 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:** An 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		
	CO1	Understand about Computer Graphics System, and Line Drawing AlgorithmsTwo Dimensional Transformations.
	CO2	Familiar with Techniques of Clipping, Two-Dimensional TransformationGraphics
	CO3	The Computer Graphics Course Prepares Students for Activities involving inDesign, Development and Testing of Modelling, Rendering, Shading and Animation.

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| CO4 | To Understand about various latest interactive Multimedia Devices, the basicconcepts about Images and Image Format. |
| CO5 | To Understand about Data, Image and Video Compression Techniques and Animation. |

TEXT BOOK:

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.

REFERENCES:

R1   James D. Folay,Andries van Dam,StevenK.Feiner, John F.Hughes,Computer GraphicsPrinciple & 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

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8302	SOFTWARE PROCESS	3	0	0	3

Course Objective

The student should be able

1. To acquire knowledge about the different activities involved in SoftwareProcess.
2. To Identify and describe the key phases of Project Management.
3. To Plan and manage projects at each stage of the Software Development LifeCycle (SDLC)
4. To Apply the concepts of Project Implementation & Testing
5. To develop the skills for particular role in a Software Process and to Practicethe Role of Professional Ethics in successful Software Development.

Unit	Description	Instructional Hours
I	**Introduction** Software Engineering – Time Management – Tracking Time – Period and Product Planning –Product Planning – Product Size – Managing yourTime - 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 SoftwareProcess – Launching a Team Project - The Development Strategy – The Development Plan – Defining the Requirement	9
IV	**PRODUCT IMPLEMENTATION** Designing with Teams – Product Implementation – Integration & SystemTesting – 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

CO1 To apply the process to be followed in the Software Development Life-CycleModels.
CO2 To design and to formalize a project based upon the deliverables.
CO3 To organize a Team Work through that address Real-World Challenges
CO4 To develop a Complete Project with the Latest Technologies.
CO5 To inculcate the Professional Ethics in a particular Role of the Environment.

TEXT BOOK:

T1 Watt S Humphrey, Introduction to Personal Software Process, Addison Wesley, 2002

T2 Watt S Humphery, Introduction to Team Software Process, Addison Wesley, 2002.

REFERENCES:

R1 William A.Florac and Anita D. Carleton, Measuring the Software Process: Statistical ProcessControl for Software Process Improvement, Addison-Wesley Professional, I Edition, 2000

R2 Gopalaswamy Ramesh, Managing Global Software Projects: How to Lead GeographicallyDistributed 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 Software‖, Auerbach Publications, I Edition,2003

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8303	SERVICE ORIENTED ARCHITECTURE	3	0	0	3

Course Objective	**The student should be able**
	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		
	CO1	Understand XML Technologies.
	CO2	Build application based on XML.
	CO3	Know the basics of SOA
	CO4	Develop web services using technology elements.
	CO5	Construct SOA-based applications for intra-enterprise and inter-enterprise applications

TEXT BOOK:

T1 Ron Schmelzer et al. XML and Web Services‖, Pearson Education, 2014.

T2 Thomas Erl, Service Oriented Architecture: Concepts, Technology, and Design, PearsonEducation, 2016.

REFERENCES:

R1 James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, Java Web ServicesArchitecture, Elsevier, 2013.

R2 Frank P.Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2002 .

R3 Sandeep Chatterjee and james Webber, Developing Enterprise Web Services:An Architect'sGuide‖, Prentice Hall,2004

R4 James McGovern, Sameer Tyagi,Michael E Stevens, Sunil Mathew, Java Web Services Architecture,Elsevier,2003.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8304	HUMAN COMPUTER INTERACTION	3	0	0	3

Course Objective

The student should be able
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; The Computer: Devices – Memory – Processing andNetworks.	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 andStakeholder 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

CO1 Design effective dialog for HCI
CO2 Model effective HCI for individuals and persons with disabilities.
CO3 Assess the importance of user feedback.
CO4 HCI implications for designing multimedia/ ecommerce/ e-learning Web sites
CO5 Mobile Human computer Interaction

TEXT BOOK:

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-CRCPress,2017.
T3 Handbook of Human-Computer Interaction,

REFERENCES:

R1 James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, Java Web ServicesArchitecture, Elsevier, 2013.
R2 Frank P.Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2002 .
R3 Sandeep Chatterjee and james Webber, Developing Enterprise Web Services:An Architect'sGuide‖, Prentice Hall,2004
R4 James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, Java Web ServicesArchitecture, Elsevier,2003.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8305	MOBILE EDGE SYSTEMS	3	0	0	3

Course Objective	**The student should be able** 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 ofEdge 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	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 realtime. CO4 Learn the concepts of Edge computing in Internet of Things. CO5 Learn various standards and role of open source and IIoT

TEXT BOOK:

T1 Ajit Singh, Edge Computing: Simple in Depth, Shroff Publishers and Distributors PrivateLimited,

1st Edition, 2019.

T2   Jie Cao, Quan Zhang, Weisong Shi, Edge Computing: A Primer, Springer, 1st Edition, 2018.

REFERENCES:

R1   Rajkumar Buyya, Satish Narayana Srirama, Fog and Edge Computing, Principles and Paradigms, Wiley Series on Parallel and Distributed Computing, 1st Edition, 2019.

R2   ArshdeepBahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 1st Edition, 2015.

R3   David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1st Edition, 2017.

R4   Amir M.Rahmani, Fog Computing in the Internet of Things: Intelligence at the Edge, Lifestyle, 1st Edition, 2019

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT8311**	**ROBOTICS AND ITS APPLICATIONS**	**3**	**0**	**0**	**3**

Course Objective	**The student should be able** 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 planningpotential field path planning-obstacle avoidance-case studies.	9
IV	**VISION SYSTEM** Robotic vision systems-image representation-object recognition and categorization-depthmeasurement- 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	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 BOOK:

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.

REFERENCES:

R1   Nicholas G Odrey, Mikell P Groover, Mitchell Weiss, Roger N Nagel, "Industrial Robotic Technology-Programmingand Application", Mc Graw-Hill 2017.

R2   S. R. Deb, Sankha Deb, "Robotics Technology and Flexible Automation", McGraw Hill Education, 2nd Edition, 2017.

R3   R M Murray, Z. Li and SS Sastry, "A Mathematical Introduction to Robotic Manipulation", RC Press, 1994

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8306	INFORMATION RETRIEVAL TECHNOLOGIES	3	0	0	3

Course Objective	**The student should be able**	
	1	To understand the basics of Information Retrieval.
	2	To acquire knowledge in Query Languages in Information Retrieval.
	3	To analyze various Search Engine System Operations.
	4	To use different information retrieval techniques in various application areas.
	5	To apply IR principles to locate relevant information large collections ofdata.

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.	9
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	9
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	9
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	9
V	**Web crawling and Link analysis** Overview – Crawling - Distributing indexes - Connectivity servers - Linkanalysis: The Web as a graphV PageRank - Markov chains - The PageRank computation- Topic-specific PageRank - Hubs and Authorities - Choosing the subset of the Web	9
	Total Instructional Hours	45

Course Outcome	CO1	Apply different Information Retrieval Techniques in various ApplicationAreas
	CO2	Design Effective Query for Information Retrieval
	CO3	Design an Efficient Search Engine and analyse the Web Content Structure
	CO4	Analyse various Machine Learning Techniques for Text Classification andMining.
	CO5	Apply IR principles to locate Relevant Information Large Collections of data

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| 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. |

REFERENCES:

| R1 | Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval:Implementing and Evaluating Search Engines, The MIT Press, 2016. |

| R2 | David A Grossman and Ophir Frieder, Information Retrieval: Algorithms and Heuristics, 2ndEdition, Springer, 2004. |

| R3 | Bruce Croft, Donald Metzler and Trevor Strohman, ―Search Engines: Information Retrieval inPractice, Addison Wesley, (1st Edition) 2009. |

| R4 | Mark Levene, ―An Introduction to Search Engines and Web Navigation, Wiley Publications, 2nd edition, 2010 |

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8307	BLOCK CHAIN TECHNOLOGY	3	0	0	3

<table>
<tr><td rowspan="6">Course Objective</td><td colspan="2">The student should be able</td></tr>
<tr><td>1</td><td>To Understand Blockchain's Fundamental Components, and Examine Decentralization Using Blockchain</td></tr>
<tr><td>2</td><td>To Explain how Cryptocurrency works, from when a Transaction is created to when it is considered part of the Blockchain.</td></tr>
<tr><td>3</td><td>To Explain the Components of Ethereum and Programming Languages for Ethereum.</td></tr>
<tr><td>4</td><td>To Study the basics of Hyperledger and Web3.</td></tr>
<tr><td>5</td><td>To Know about alternative Blockchains and Blockchain Projects in Different Domains.</td></tr>
</table>

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**

<table>
<tr><td rowspan="3">Course Outcome</td><td>CO1</td><td>Understand the Technology Components of Blockchain and how it works.</td></tr>
<tr><td>CO2</td><td>Understand Bitcoin and its Limitations by Comparing with other Alternative Coins.</td></tr>
<tr><td>CO3</td><td>Devise Solution using the Ethereum Model.</td></tr>
</table>

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CO4	Understand and use Hyperledger and its Development Framework. CO4 -Track alternative Blockchains and Emerging Trends in Blockchain

TEXT BOOK:

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	ArshdeepBahga, 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.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT8308**	**PROFESSIONAL ETHICS**	**3**	**0**	**0**	**3**

The student should be able

Course Objective	1	To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
	2	To provide basic familiarity about Engineers as responsible Experimenters, Codes of Ethics.
	3	To provide basic knowledge on Industrial Standards, Exposure to Safety, Risk Benefit Analysis.
	4	To have an idea about the Collegiality and Loyalty, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights.
	5	To have an 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 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	9

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of Conduct – Corporate Social Responsibility

Total Instructional Hours   45

	CO1	The students will understand the basic perception of profession, professionalethics, various moral issues & uses of ethical theories.
	CO2	The students will understand various social issues, industrial standards, codeof ethics and role of professional ethics in engineering field.
Course Outcome	CO3	The students will be aware of responsibilities of an engineer for safety andrisk benefit analysis.
	CO4	The students will be aware of professional rights and responsibilities of anengineer.
	CO5	The students will acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations thatarise in their professional lives

TEXT BOOK:

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.

REFERENCES:

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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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8309	DEEP LEARNING TECHNIQUES	3	0	0	3

	The student should be able
Course Objective	1 To learn the basics about Neural Networks and Neuron.
	2 To understand the basics of Deep Learning and enable the students to knowDeep 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-TemporalLinking of DNC Writes-Understanding the DNC Read Head-The DNCController 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	9

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Regression Model-Leveraging Tensor Board to Visualize Computation Graphs and Learning-Building a Multilayer Model for MNIST in Tensor Flow.

Total Instructional Hours   45

Course Outcome		
	CO1	Model Neuron and Neural Network.
	CO2	Develop Algorithms Simulating Human Brain.
	CO3	Analyze ANN learning and Memory Based Learning.
	CO4	Explore the Essentials of Deep Learning and Deep Network Architectures.
	CO5	Implement various Deep Learning Models.

TEXT BOOK:

T1 Nikhil Buduma, Nicholas Locascio, Fundamentals of Deep Learning: DesigningNext-Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.

T2 Simon Haykins, ―Neural Network- A Comprehensive Foundation‖, Pearson Prentice Hall (2ndEdition), 2001

REFERENCES:

R1 Ian Goodfellow, YoshuaBengio, Aaron Courville,Deep Learning :Adaptive Computation andMachine Learning series, MIT Press, 2017.

R2 Jeff Heaton, Artificial Intelligence for Humans: Deep Learning and Neural Network, LightningSource Inc, 2015.

R3 M T Hagan, H B Demoth, M Beale, ―Neural Networks Design, Thomson Learning, 2002.

R4 Zurada and Jacek M, Introduction to Artificial Neural Systems, West Publishing Company,1992.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT8310**	**MANAGEMENT INFORMATION SYSTEM**	**3**	**0**	**0**	**3**

<table>
<tr><td rowspan="6">Course Objective</td><td colspan="2">The student should be able</td></tr>
<tr><td>1</td><td>To understand the Role and Importance of MIS</td></tr>
<tr><td>2</td><td>To identify the Process of MIS to support in the Management Activities</td></tr>
<tr><td>3</td><td>To extend the concept of Decision Making in MIS to identify the QualityProduct</td></tr>
<tr><td>4</td><td>To design and analyze the system for determining the requirements</td></tr>
<tr><td>5</td><td>To infer the concept of Deterministic System and Enterprise ResourcePlanning in various applications</td></tr>
</table>

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**

<table>
<tr><td rowspan="5">Course Outcome</td><td>CO1</td><td>Identify the Role and Importance of MIS</td></tr>
<tr><td>CO2</td><td>Ability to understand the Process of MIS to support in the Management activities</td></tr>
<tr><td>CO3</td><td>Apply the concept of Decision Making in MIS to identify the Quality Product</td></tr>
<tr><td>CO4</td><td>Design and Analyze the system for determining the requirements</td></tr>
</table>

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| CO5 | Utilize Deterministic System and Enterprise Resource Planning in various applications |

TEXT BOOK:

T1   Waman S Jawadekar, Management Information Systems: A Global Digital EnterprisePerspective‖, McGraw-Hill (2nd ed.) 2013.

T2   Gordon B. Davis, Margrethe H Olson, Management information systems: conceptual

REFERENCES:

R1   Kenneth C. Laudon, Jane P. Laudon, Management Information Systems: Managing the DigitalFirm‖, 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, (4thEdition), 2014.

R4   Gerald V. Post, David L. Anderson, Management Information Systems: Solving Business

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT8312	QUANTUM COMPUTING	3	0	0	3

The student should be able

Course Objective	1	To Provide the Essentials of Quantum Computing.
	2	To Learn basic quantum mechanics and correlations
	3	To understand the concepts of quantum information and cryptography
	4	To impart the knowledge of Quantum algorithms.
	5	To understand quantum computational complexity and Error corrections.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO QUANTUM COMPUTATION** Overview of traditional computing – Church-Turing thesis – Quantum bits, Bloch sphere representation of a qubit, multiple qubits– Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decompositiontheorem	9
II	**BACKGROUND MATHEMATICS AND PHYSICS** Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.	9
III	**QUANTUM INFORMATION AND CRYPTOGRAPHY** Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem	9
IV	**QUANTUM ALGORITHMS** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search	9
V	**QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION** Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods –Classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine- qubit quantum codes – fault-tolerant quantum computation	9
	Total Instructional Hours	**45**

Course Outcome	CO1	Provide the Essentials of Quantum Computing
	CO2	Learn basic quantum mechanics and correlations
	CO3	Understand the concepts of quantum information and cryptography
	CO4	cquire the knowledge of Quantum algorithms.

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CO5   Understand quantum computational complexity and Error corrections

TEXT BOOK:

T1   P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 2007

T2   Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press. 2011

REFERENCES:

R1   V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.

R2   Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific. 2005.

R3   Pittenger A. O., An Introduction to Quantum Computing Algorithms,Hamilton Printing, NY,2006

R4   John Gribbin, "Computing with Quantum Cats: From Colossus to Qubits", Prometheus Books, March 2014

R5   Riley Tipton Perry, "Quantum Computing From The Ground Up", World Scientific Publishing Co Pte Ltd, Sep 2012

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SYLLABUS

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5201	Mobile Computing	3	0	0	3

	The student should be made to:
Course Objective	1. Learn the basic concepts of Mobile Computing.
	2. Understand the Architecture and Components of Mobile Operating Systems.
	3. Identify the various schemes in MAC protocols.
	4. Study the functionalities of Mobile IP protocols.
	5. Gain knowledge on Routing and Security issues in Ad hoc and Sensor networks.

Unit	Description	Instructional Hours
I	**CELLULAR TECHNOLOGY** Mobile Computing – Mobile Computing Vs Wireless Networking- Mobile Computing Applications – Characteristics of Mobile Computing – Structure of Cellular Mobile Communication –GSM – Services – Architecture – GPRS – Services – Architecture Services – UMTS, Satellite Systems-GEO, LEO, MEO.	12
II	**MOBILE APPLICATION DEVELOPMENT AND OPERATING SYSTEMS** Responsibilities of OS in Mobile device – Mobile O/S-Windows Mobile-Palm OS-Symbian OS Android and Blackberry OS, Protocols and Platforms for Mobile Computing -Mobile Devices as Web clients-WAP- Bluetooth, XML, J2ME, Java Card, Linux for Mobile Devices, Android Software Development Kit-M-Commerce-B2C and B2B applications-Security Issues	12
III	**MAC PROTOCOLS** Properties – Wireless MAC – Taxonomy – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes – Wireless LAN Standards – IEEE 802 Protocol Architecture, IEEE 802.11 System Architecture, Protocol Architecture & Services, MAC protocols for Ad Hoc networks, Cognitive Radio ad-Hoc networks	12
IV	**MOBILE INTERNET PROTOCOL AND MOBILE DATABASE** Mobile IP – Terminologies of Mobile IP – Packet Delivery – Features of Mobile IP – Key Mechanism– Route optimization -DHCP – Significance of DHCP , Transaction Processing in mobile Environment, Mobile Transaction models.	12
V	**MOBILE ADHOC NETWORKS &WIRELESS SENSOR NETWORKS** MANET : Characteristics – Routing Protocols- VANET –Security issues in MANET – Attacks on Adhoc Networks – Sensor Networks: Characteristics - Routing Protocols.	12

TOTAL INSTRUCTIONAL HOURS   **60**

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	Upon completion of this course, the students will be able to
	CO1: learn the basic concepts of mobile computing and its applications.
Course	CO2: Execute and Analyse the components of Mobile Operating Systems
Outcome	CO3 Understand the various schemes in MAC protocols.
	CO4: Understand and demonstrate the functionalities of Mobile IP protocols
	CO5: Understand the routing and security issues in Ad hoc and Sensor networks

TEXT BOOKS:

T1- Prasant Kumar Pattnaik, Rajib Mall, Fundamentals of Mobile Computing, PHI Learning Pvt. Ltd,Second Edition, New Delhi ,2015.

T2 - Jochen H. Schller, ―Mobile Communications, Pearson Education, Second Edition, New Delhi, 2008

REFERENCE BOOKS:

R1-AsokeKTalukder,HasanAhmedandRoopaRYavagal,―MobileComputing–Technology,Applications andService Creation, Tata McGraw Hill, New Delhi, 2010.

R2 -Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, Wiley Publishers, 2015

R3-RajKamal,―MobileComputing,OxfordUniversityPress,NewDelhi,2012

PROGRAMME B.Tech	COURSE CODE 19IT5202	NAME OF THE COURSE Computer Networks	L 3	T 0	P 0	C 3

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 LayeredArchitecture.
	3. To analyze the concepts of Routing Methods and Sub-netting.
	4. To learn the functions of Network Layer and the various Routing Protocols.
	5. To familiarize the functions and Protocols of the Transport Layer.

Unit	Description	Instructional Hours
I	**OVERVIEW & PHYSICAL LAYER** Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission Media – Switching – Circuit-switched Networks – Packet Switching	9
II	**DATA LINK LAYER** Introduction – Link-Layer Addressing – DLC Services – 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 –Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.	9
IV	**TRANSPORT LAYER** Process to process delivery, User datagram protocol (UDP), Transmission control protocol (TCP), Data traffic, Congestion, Congestion control, Quality of service, Techniques to improve QOS, Integrated services, Differentiated services, QOS in switched networks.	9
V	**APPLICATION LAYER** Client server model, Socket interface, Name space, Domain name space, Distribution of name space, DNS in the internet, Resolution, DNS messages, DDNS, Encapsulation, Electronic mail, File transfer, HTTP, World wide web (WWW), Digitizing audio and video, Audio and video compression, streaming stored audio/video, Streaming live audio/video, Real time interactive audio/video, Voice over IP.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome	Upon completion of this course, the students will be able to
	CO1:Learn about the Protocol Layering and Physical Level Communication
	CO2:Understand the Data Communication System and the purpose of Layered Architecture.
	CO3: Analyze the concepts of Routing Methods and Subnetting.
	CO4: Design protocols for various functions in the Network.
	CO5: Understand the functions and Protocols of the Transport Layer

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TEXT BOOKS:

T1: Larry Peterson, Bruce Davie, Computer Networks: A Systems Approach, Elsevier, Online Edition,2019.

T2: Paul Goransson, Chuck Black and Timothy Culver, Software Defined Networks - A Comprehensive Approach, Elsevier, Second Edition, 2017.

REFERENCE BOOKS:

R1: James F. Kurose, Keith W. Ross, Computer Networking – A Top-Down Approach Featuring theInternet, Pearson Education, Seventh Edition, 2017.

R2: Nader. F. Mir, Computer and Communication Networks‖, Pearson Prentice Hall Publishers, SecondEdition, 2015.

R3: Behrouz A. Forouzan, ―Data communication and Networking‖, Tata McGraw – Hill, Fifth Edition,2013.

R4: Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, Computer Networks: An Open Source Approach McGraw Hill Publishers, 2011.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5203	Microcontrollers and Embedded Systems	3	0	0	3

Course Objective

The student should be made to:

1. To conceptualize the basics of Organizational and Architectural issues of a Microcontroller.
2. To Learn Programming Techniques used in Microcontroller.
3. To Understand the basic concepts of ARM Processor.
4. To Gain Knowledge about the Fundamentals of Embedded Computing andMemory Mechanisms.
5. To Study the Software Development Tools.

Unit	Description	Instructional Hours
I	**THE MICROCONTROLLER ARCHITECTURE** Introductionto8051Microcontroller- PinConfiguration-Architecture- Input /Output Ports-Addressing Modes.	9
II	**INTERFACING MICROCONTROLLER** Timers- Serial Port -Interrupts External- Memory Interface - LCD &Keyboard Interfacing-ADC,DAC - Stepper Motor	9
III	**ADVANCED RISC MACHINES** ARM Embedded Systems- ARM Processor: Architecture, Registers, CPSR, Processor Operating Modes- BriefintroductiontoExceptions, InterruptsandVectorTable-Instruction set: Data processing, Load-Store - Addressing Modes.	9
IV	**EMBEDDED COMPUTING AND MEMORY MANAGEMENT** Characteristics of Embedded Computing- Challenges of Embedded Systems-Embedded system design process-Memory System Mechanisms: Caches, Memory System Performance, MMU and Address Translation.	9
V	**EMBEDDED SYSTEM DEVELOPMENT** Embedded Software Development Tools-Emulators and Debuggers-Design Methodologies-Case Studies- Digital Camera, Smart Card, Mobile PhoneSoftware.	9

	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome

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

CO1: Learn the basic Structure of Microcontroller.

CO2: Analysis and Design to Interface Program Microcontroller.

CO3: Describe the Function of ARM Processor Architecture.

CO4: Understand Memory System Mechanisms

CO5: Design Conceptual Embedded System.

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TEXT BOOKS:

T1-Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, The 8051Microcontroller andEmbedded Systems: Using Assembly and C, Pearson Education, 2nd Edition 2011.

T2-Marilyn Wolf, Computers as Components - Principles of Embedded Computing System Design, Morgan Kaufmann Publisher , 4th Edition, 2016.

REFERENCE BOOKS:

R1- Andrew N, Dominic symes, Chriswright, ARM System Developer's Guide: Designing and Optimizing System Software, Elsevier,2010.

R2- Rajkamal,Embedded Systems Architecture, Programming and Design, McGraw Hill Education,Third Edition,2015.

R3-Daniel W Lewis, ―Fundamentals of Embedded Software‖, Pearson Education, 2011.

R4- Steve Furber, ARM System-on-Chip Architecture, Pearson Education, 2nd Edition 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5204	Artificial Intelligence and Machine Learning	3	0	0	3

Course Objective	The student should be made to: 1. Study the concepts of Artificial Intelligence. 2. Learn the methods of solving problems using Artificial Intelligence. 3. Understand the need for machine learning for various problem solving. 4. Understand the latest trends in machine learning. 5. Introduce the concepts of Expert Systems

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	9
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	9
III	**INTRODUCTION TO MACHINE LEARNING** Machine Learning- Applications of Machine Learning-Types of Learning-Supervised, Unsupervised, reinforcement, Classification Learning-Important elements in Machine Learning: Data formats – Learnability- Statistical Learning Approaches- Elements of Information theory.	9
IV	**SUPERVISED AND UNSUPERVISED LEARNING** Classification: Introduction – Fundamentals of Classification-k-nearest neighbor Classifier-Classification with Support Vector Machines- Clustering: Introduction- K means Algorithm – Mean Shift Algorithm	9
V	**EXPERT SYSTEMS** Characteristics of Expert System- Components of an Expert System-ExpertSystem Development- Knowledge Engineering-Applications of Expert System- Case Studies: A Simple Medical Expert System-Successful Expert Systems.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

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	Upon completion of this course, the students will be able to
	CO1: Identify problems that are amenable to solution by AI methods.
	CO2: Identify appropriate AI methods to solve a given problem.
Course	CO3: Differentiate between supervised, unsupervised, semi-supervised machine learningapproaches.
Outcome	CO4: Analyse and suggest appropriate machine learning approaches for various types ofproblems
	CO5: Design and carry out case studies of Expert Systems.

TEXT BOOKS:

T1- Elaine Rich, Kevin Knight, Shivashankar B Nair-―Artificial Intelligence-, Tata Mc Graw-Hill,(Third edition)-2013.

T2- Tom M. Mitchell, -―Machine Learning, McGraw-Hill Education, 2013.

REFERENCE BOOKS:

R1- Vinod Chandra S.S and Anand Hareendran S, Artificial Intelligence and Machine Learning-PHILearning Private Limited-2014.

R2- Zsolt Nagy, Artificial Intelligence and Machine Learning Fundamentals-Packt Publishing-(1stEdition) 2018.

R3- Giuseppe Bonaccorso, Machine Learning Algorithms, Packt Publishing,2017.

R4- Stuart Russell, Peter Norvig, -Artificial Intelligence: A Modern Approach,Pearson, 2016.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5205	Data Warehousing and Data Mining	3	0	0	3

Course Objective	The student should be made to: 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 Discovery in 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 Server Architecture	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	8
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 Classification – Rule Based Classification	10
V	**CLUSTERING** Cluster Analysis – Partitioning Methods: K-Means, K-Medioids- Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering , BIRCH, Chameleon and Other clustering Methods	9
	TOTAL INSTRUCTIONAL HOURS	**45**

	Upon completion of this course, the students will be able to
Course Outcome	CO1:Identify the Concept of Data Warehousing And OLAP.
	CO2:Implement Data Pre-processing For Mining Applications.
	CO3:Use Data Mining in Business Applications.
	CO4:Apply the Association Rules and Classification for Mining the Data.
	CO5:Deploy Appropriate Clustering Techniques.

TEXT BOOKS:

T1: Jiawei Han and MichelineKamber, Data Mining Concepts and Techniques, Third Edition, Elsevier,2012.
T2: Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining and OLAP, Tata McGraw – HillEdition,21st Reprint 2011.

REFERENCE BOOKS:
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, EasternEconomy Edition, Prentice Hall of India, 2006.
R3: G. K. Gupta, Introduction to Data Mining with Case Studies‖, Eastern Economy Edition, PrenticeHall of India, 2014.
R4: Ian Witten, EibeFrank,Data mining: Practical Machine Learning Tools and Techniques,MorganKaufmann,Third edition,2011.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	**19IT5001**	**Machine Learning Laboratory**	**0**	**0**	**3**	**1.5**

Course Objective	This course will enable students to 1. Provide a broad survey of approaches and techniques in Machine Learning. 2. Make use of Data sets in implementing the Machine Learning Algorithms. 3. Implement ML concepts and Algorithms in any suitable Language of choice. 4. Develop the basic skills necessary to pursue Research in Machine Learning. 5. Develop a deeper understanding of several major topics in Machine Learning

Exp. No	Description of the Experiments
1	Write a program to plot data points in a two-dimensional plane and execute the k-means algorithm on them to perform Clustering.
2	Write a program to illustrate Mean shift in 2D to perform Clustering.
3	Write a program to demonstrate the working of the Decision tree based ID3 Algorithm. Usean appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4	Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
5	Write a program to implement the Naïve Bayesian Classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the Naïve Bayesian Classifiermodel to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct a Bayesian Network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM Algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means Algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbor Algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for thisproblem.
10	Implement the non-parametric Locally Weighted Regression Algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Total Practical Hours   45

Course Outcome	Upon completion of this course, the students will be able to CO1: Understand the implementation procedures for the Machine Learning Algorithms.CO2: Design Java/Python programs for various Learning Algorithms. CO3: Apply appropriate data sets to the Machine Learning Algorithms. CO4: Identify and apply Machine Learning Algorithms to solve real world problems.CO5: Understand how to perform evaluation of Learning Algorithms and model selection

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5002	**Mobile Application Development Laboratory**	0	0	3	1.5

Course Objective	This course will enable students to 1. Know the Components and Structure of Mobile Application DevelopmentFrameworks for Android and Windows OS based Mobiles. 2. Understand how to work with various Mobile Application Development Frameworks. 3. Learn the basic and important Design concepts and issues of Development ofMobile Applications. 4. Study the Capabilities and Limitations of Mobile Devices.

Exp. No	Description of the Experiments
1	Develop an application that uses GUI component, Font andColors.
2	Develop an application that uses Layout Managers and EventListeners.
3	Develop a Native CalculatorApplication.
4	Write an application that draws basic Graphical Primitives on theScreen.
5	Develop an application that makes use of Database.
6	Develop an application that makes use of RSSFeed.
7	Implement an application that implements Multi-threading.
8	Develop a Native Application that uses GPS LocationInformation.
9	Implement an Application that writes Data to the SD card.
10	Implement an Application that creates an Alert upon receiving aMessage.
11	Write a Mobile Application that creates AlarmClock

Total Practical Hours   **45**

Course Outcome	Upon completion of this course, the students will be able to CO1: Design and Implement various Mobile Applications using Emulators.CO2: Deploy Applications to Hand-Held Devices.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19HE5071	Soft Skill-I	1	0	0	1

Course Objective

The student should be made to:
1. To employ soft skills to enhance employability and ensure workplace and careersuccess.
2. To enrich students' numerical ability of an individual and is available in technicalflavor.
3. 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-Reflectivethinking and writing- p2p Interaction	3
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 nonverbalCommunication - Importance of feelings in communication - dealing with feelings in communication.	4
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 – Workingwith Groups – Dealing with People- Group Decision Making.	3
IV	**Quantitative Aptitude:** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based onboats and streams	3
V	**Logical Reasoning:** Clocks - Calendars - Direction Sense - Data Interpretation: Tables,Pie Chart, Bar Graph - Data Sufficiency	2
	TOTAL INSTRUCTIONAL HOURS	**15**

Course Outcome

Upon completion of this course, the students will be able to
CO1:Students will have clarity on their career exploration process and to match theirskillsand interests with a chosen career path.
CO2: Students will develop knowledge, skills, and judgment around humancommunication thatfacilitate their ability to work collaboratively with others
CO3: Students will understand how teamwork can support leadership skills
CO4: Students will be able to make sense of problems, develop strategies to findsolutions, andpersevere in solving them.
CO5: Students will demonstrate an enhanced ability to draw logical conclusions and implicationsto solve logical problems.

REFERENCE BOOKS:
R1: Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. WentzR2: 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: A New Approach to Reasoning Verbal & Non-Verbal By B.S. Sijwali
R5: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19HE5072	Design Thinking	1	0	0	1

<table>
<tbody>
<tr><td rowspan="3">Course Objective</td><td colspan="2">The student should be made to:</td></tr>
</tbody>
</table>

Course Objective

The student should be made to:
1. To expose students to the designprocess
2. To develop and test innovative ideas through a rapid iterationcycle.
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 – Watchingwhat Designers Do – Thinking about what Designers Do – The Natural Intelligence ofDesign Sources	4
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning FromFailures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Rolesand Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development ofExpertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	3
	TOTAL INSTRUCTIONAL HOURS	15

Course Outcome

Upon completion of this course, the students 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

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH	19IT5351R	**INTERNET AND WEB TECHNOLOGY**	3	0	0	3

Course Objective

The student should be made:

1. To understand about client-server communication and protocols used during communication.
2. To design interactive web pages using Java Script
3. To learn about Nodejs frame work to develop web application
4. To have a knowledge in REACT framework
5. To understand the Even handling in REACT framework.

Unit	Description	Instructional Hours
I	**HTML AND CSS** Web Essentials: Clients, Servers, and Communication- Mark-up Languages: XHTML basics formatting and fonts, color, hyperlink, lists, tables, images, forms, frames. Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout. Beyond the Normal Flow. Illustrative programs: Create a web page with all types of cascading style sheets	9
II	**JAVASCRIPT** Introduction to JavaScript -Data Types, Variables, Operators, Type Conversions, Conditional Statement & Iteration & Switch Case Functions –Arrow functions-map-reduce -Objects: Object Properties: Prototypes, inheritance Class Error handling: Call-back & Promises, Async/Await-Modules. Illustrative programs: Create Registration form with validation	9
III	NODE JS Node Js - API - Rest API - Node Js Express Framework - Routes - Sessions & Cookies - Middleware - DB Connection Setup & Usage - Callback & Promises & Async & Await - File Handling & Stream - Error Handling Illustratable programs: Create a web application with sessions and CURD operations	9
IV	REACT JS React - React Life Cycle - DOM - Virtual DOM - JSX Expression - Rendering Elements - Components - Class Components - Functional Components - Props - State - Constructor. Illustratable programs: Design a simple web application using components in React	9
V	REACT JS Life cycle of component-React Hooks - Router - Events Handling - Passing Data from Parent to Child components & vice versa - React Context - API handling. Illustratable programs: Design a simple web application using React to handle the events	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to
CO1: Design simple web pages using mark-up languages like HTML and CSS.
CO2: Develop a web page with user interaction using Java Script.
CO3: Creation of simple web application using node.js Framework
CO4: Design a simple web application using React framework
CO5: Create a web application that performs Event handling in React framework

TEXT BOOKS:

T1   Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

T2   Mike Cantelon Marc Harter.T.J. Holowaychuk Nathan Rajlich, "Node.js in Action", Manning Publications, 2014.

T3   Mehul Mohan, "Advanced web development with React", BPB Publications, India,2020

REFERENCE BOOKS:

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.

R3   David Gutman, Fullstack Node.js The Complete Guide to Building Production Apps with Node.js , Fullstack.io2019.

R4   Cory Gackenheimer," Introduction to React", après 2015.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT5352	Advanced Java Programming	2	0	2	3

Course Objective	The student should be made to: 1. Understand the basic concepts of Inheritances, packages and interfaces inJAVA Programming. 2. Identify the need for advanced Java concepts like Enumerations andCollections. 3. Adapt Servlets to build Server-Side Programs. 4. Gain knowledge on Spring Core Framework. 5. Construct Database Queries and Understand the Mechanism of JDBC.

Unit	Description	Instructional Hours
I	**OVERVIEW OF JAVA PROGRAMMING:** Introduction to Java Programming-Features of Java Language, JVM, Inheritance, Interfaces and Packages, Exception Handling, Multithreaded Programming. **Programs to demonstrate use of implementing Interfaces andPackages**	9
II	Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values () and valueOf() Methods, Java enumerations are class types, enumerations Inherits Enum,example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean andcharacter values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations,Annotation basics, specifying retention policy, Obtaining Annotations at run time by use ofreflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations. **Program to implement Wrapper Classes and their Methods.**	9
III	**SERVLETS:** Introduction to Servlets: The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.httppackage;Handling HTTPRequests andResponses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects. **Programs to Demonstrate the use of Servlet Program.**	9
IV	**JAVA SPRING FRAMEWORK**: Spring Introduction: What is Spring and Its Features, How Spring Fits in to Enterprise Edition? Spring Beans: What is Spring Bean-Bean Scope- Bean Lifecycle, IOC Containers: Core Container- J2EE Container-Web Container, Dependency Injection -Setter DI and Constructor DI, Auto wiring: ByType-ByName. **Create a Program using Bean Development Kit and JAR files.**	9

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| V | **JAVA DATABASE CONNECTIVITY**: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database,Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. **Programs to Illustrate the use of JDBC Connection.** | 9 |

| | **TOTAL INSTRUCTIONAL HOURS** | **45** |

| **Course Outcome** | CO1: Design program using user defined Packages and Interfaces. CO2: Interpret the need for advanced Java concepts like Enumerations and Collections in developing. CO3: Execute programs on basic concepts of JSP and Build Applications usingJSP and deploy the Project using Tomcat Server. CO4: Work on concepts of Spring. CO5: Illustrate Database access and details for managing information using theJDBC API. |

TEXT BOOKS:

T1 - Herbert Schildt: JAVA the Complete Reference, Eleventh Edition, Tata McGraw Hill, 2018. T2 - Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2015.

REFERENCE BOOKS:

R1 - Cay S. Horstmann: Core Java, Volume II—Advanced Features, 11th Edition, Prentice Hall,2019. R2 - Y. Daniel Liang: Introduction to JAVA Programming, Eleventh Edition, Pearson Education, 2017.

R3- Markus Eisele: Modern Java EE Design Patterns: Building Scalable Architecture for Sustainable Enterprise Development, O'Reilly Media, Online Edition, 2016.

R4-Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT5353	C# and .Net Programming	2	0	2	3

Course Objective

The student should be made:
1. To learn Basics of C# Language.
2. To interpret the Advanced Features of C#.
3. To utilize the .Net Framework to develop Distributed Applications.
4. To gain Basic Knowledge on Database Programming.
5. To know the terminologies of ASP.Net in Web Applications Development.

Unit	Description	Instructional Hours
I	**C# LANGUAGE BASICS** Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations. **Programs using Arrays and strings**	7+2(P)
II	**C# ADVANCED FEATURES** Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Console I/O Operations, Errors and Exceptions, Multithread. **Programs using Interfaces and Exception Handling**	7+2(P)
III	**.NET FRAMEWORK** Common language Runtime (CLR), Common Type System (CTS), Common language Specification (CLS), Compilation Process, Assemblies, Versioning, Reflection, Namespaces, Command line compiler, Marshaling, Remoting. **Client Server Programming**	7+2(P)
IV	**DATABASE PROGRAMMING** Data Access with ADO.NET, Architecture, Data Reader, Data Adapter, Command, Connection, Data set, Data Table, Data Row, Data Column, Data binding, Data Grid Control, XML based Data sets. **Database Applications using ADO.Net**	5+4(P)
V	**WEB APPLICATIONS** Web Development and ASP.NET, Architecture Web Forms, Web Form Controls, Life time Management, Application, Session, ASP with ADO.NET Validation Controls, Website Security. **Web Applications using ASP.Net**	5+4(P)
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

Upon completion of this course, the students will be able to CO1: Understand the Basic Terminologies of C# Languages.CO2: Express the advanced features of C#.
CO3: Enhance the skills on Developing Client Server Applications.CO4: Discover the ideas on Database Applications Development.
CO5: Exhibit Web Applications using ASP.Net.

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TEXT BOOKS:

T1 E. Balagurusamy, Programming in C#: A Primer, Tata McGraw-Hill (4th Edition), 2015.

T2 Andrew Troelsen, Philip Japikse, C# 6.0 and the .NET 4.6 Framework, A Press publication (7th Edition), 2015.

REFERENCE BOOKS:

R1-Andrew Troelsen and Philip Japikse, ―Pro C# 7: With .NET and .NET Core, A Presspublication, (8th Edition) 2017.

R2- Adrew Stellman and Jennifer Greene, ―Head First C#, O'Reilly (3rd Edition), 2013.

R3-Ian Griffiths, Matthew Adams, and Jesse Liberty, ―Programming C# 4.0, O'Reilly (6thEdition), 2010.

R4- Herbert Schildt, ―C# 4.0: The Complete Reference, Tata McGraw-Hill, 2010.

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PROGRAMME B.E/B.Tech	COURSE CODE 19IT5354	NAME OF THE COURSE Advanced Data Structure	L 2	T 0	P 2	C 3

<table>
<tr><td rowspan="2">Course
Objective</td><td colspan="6">The student should be made:</td></tr>
<tr><td colspan="6">
1. To understand basic Data Structures such as Stacks and Queues.
2. To introduce a variety of Data Structures such as Hash Tables, Search Trees,Tries, Heaps, Graphs.
3. Exploring the Advanced Data Structure Algorithms such as Red Black,Splay Trees etc.,
4. To apply sorting such as Heap Sort, Merge Sort etc.
5. To learn the various Pattern Matching Algorithm.
</td></tr>
</table>

Unit	Description	Instructional Hours
I	**Introduction to Data Structures,** Abstract data types, Linear list – Singly linked list implementation, Insertion, Deletion and searching operations on linear list, Stacks-Operations, Array and linked Representations of Stacks, Stack Applications, Queues-Operations. **Programs using Singly Linked List, Stacks and Queues.**	5+4(P)
II	**Dictionaries:** Linear list representation, Skip list representation, Operations - Insertion, Deletion and Searching. **Hash TableRepresentation:** Hash functions, Collision resolution- Separate Chaining, Open Addressing-Linear probing, Quadratic probing, Double hashing, Rehashing, Extendible Hashing. **Programs using Hash.**	7+2(P)
III	**Search Trees**: Binary Search Trees, Definition, Implementation, Operations-Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees. **Program using Search Trees.**	5+4(P)
IV	**Graphs:** Graph Implementation Methods. Graph Traversal Methods.Sorting: Heap Sort, External Sorting- Model for external sorting, Merge Sort. **Program using Graph Traversal Methods and Sorting.**	5+4(P)
V	**Pattern Matching and Tries:** Pattern Matching Algorithms-Brute Force,The Boyer –Moore Algorithm, The Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix Tries. **Program using Pattern Matching.**	7+2(P)

	TOTAL INSTRUCTIONAL HOURS	**45**

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Course Outcome	Upon completion of this course, the students will be able to CO1: Ability to select the Data Structures that efficiently model the Information ina problem. CO2: Ability to assess efficiency trade-offs among different Data Structure implementations or combinations. CO3: Implement and know the various Graph Traversal Methods. CO4: Implement and know the application of algorithms for Sorting and PatternMatching. CO5: Design programs using a variety of data structures, including Hash tables, Binary and general Tree Structures, Search Trees, Tries, Heaps, Graphs, and AVL-trees.

TEXT BOOKS:

T1: E. Horowitz, S. Sahni and Susan Anderson Freed "Fundamentals of Data Structures in C,Universities Press (2nd Edition), 2008.

T2: A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, "Data Structures using C, PHI/Pearson Education, 2008.

REFERENCE BOOKS:

R1- R. F. Gilberg and B.A.Forouzan, Cengage,A Pseudocode Approach with C, (2nd Edition),2014. R2- Seymour Lipschutz, ―Data Structures Schaum's Outlines,McGraw Hill(Revised 1st Edition), 2014.

R3- Jean-Paul Tremblay & Paul G. Sorenson,An Introduction to Data Structures with Applications, McGraw Hill, (2nd Edition), 2013.

R4- ReemaThareja, ―Data Structures using C, Oxford press (3rd Edition), 2012.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	19IT5355	Advanced Database Technology	2	0	2	3

Course Objective	The student should be made: 1. To understand the basics of Distributed and Parallel Databases Architectures. 2. To familiar with Object Oriented Relational Databases. 3. To learn how to create XML documents with DTD and XML schema. 4. To understand the concepts of Data Mining and Data warehousing. 5. To study the applications of Intelligent Database Technologies

Unit	Description	Instructional Hours
I	**PARALLEL AND DISTRIBUTED DATABASES** Database SystemArchitectures:CentralizedandClient-Server Architectures–Parallel Systems-Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database: Homogeneousand Heterogeneous DatabasesDistributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control. **Implementation of client server application and 2 phase locking algorithms**	9
II	**OBJECT AND OBJECT RELATIONAL DATABASES** Concepts for Object Databases: Object Identity – Objects versus Literals– Complex Type Structuresfor Objects and Literals– Encapsulation of Operations –Persistence of Objects -Type Hierarchiesand Inheritance -ODMG Model – ODL – Object Database Conceptual Design- OQL-ObjectRelational features in SQL / Oracle **Creating Object Oriented Database using PL/SQL oracle**	9
III	**XML DATABASES AND MOBILE DATABASES** XML Databases: XML Hierarchical Data Model– XML Documents,DTD – XML Schema – XML Querying–MobileDatabases:System Architecture - Location and Handoff Management **Design XML document with DTD and XML Schema using Eclipse.**	9
IV	**QUERY PROCESSING AND OPTIMIZATION** Query Processing - SQL Query Translation - Pipelining - Query Optimization - Query Trees and Heuristics-Overview of Query Optimization in Oracle - Semantic Query Optimization	9
V	**INTELLIGENT DATABASE TECHNOLOGIES** Intelligent Databases: Active databases and Triggers – Temporal Database- Spatial Database- Multimedia Database- Deductive Databases- Information Retrieval concepts. **Implementation ofTriggers using PL/SQL.**	9

TOTAL INSTRUCTIONAL HOURS	**45**

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

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

CO1: To understand the Design Fundamentals and Methodologies of the Software.CO2: To provide basic concepts of Software Design Principles.

CO3: To understand the Architecture Design and Quality Attributes of theSoftware. CO4: To learn the tools of Architectural Design for the current trends.

CO5: To Gain practical experience in the Architectural Design Process for learning-oriented software

TEXT BOOKS:

T1 -Henry F Korth, Abraham Silberschatz and S. Sudharshan, Database System Concepts, SeventhEdition, McGraw Hill, 2019.

T2 - R. Elmasri, S.B. Navathe, Fundamentals of Database Systems, Seventh edition, Pearson; 2016.

REFERENCE BOOKS:

R1 - Subramaniam, Multimedia Databases, Morgan Kauffman Publishers, 2019.

R2 - Thomas Cannolly and Carolyn Begg, Database Systems, A Practical Approach to Design, Implementation and Management Pearson; 7th edition (2015)

R3- Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining and OLAP, Tata McGrawHill,2008.

R4- Vijay Kumar,Mobile Database systems A John Wiley & Sons, Inc., Publication 2006.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	19IT5356	Ethical Hacking	3	0	0	3

Course Objective	The student should be made to: 1. To understand various hacking techniques and attacks 2. To be exposed to Foot Printing 3. To get familiarized with Data Security 4. To learn about the Network Protection System 5. To learn about the different Ethical Hacking Laws and Tests.

Unit	Description	Instructional Hours
I	**ETHICAL HACKING** Types of Data Stolen From the Organizations, Elements of Information Security, Authenticity and Nonrepudiation, Security Challenges, Effects of Hacking, Hacker – Types of Hacker, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors Illustrative programs: To study about Hacking tools and skills, Create a simple key logger using python	9
II	**FOOT PRINTING AND SOCIAL ENGINEERING** Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking. Illustrative programs: To study about sniffing and its tools, Create a social networking website login using phishing techniques	9
III	**DATA SECURITY** Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures, Cryptography – Methods and Types of Attacks, Wireless Hacking, Windows Hacking, Linux Hacking. Illustrative programs: Hide data using Snow Steganography, Perform SQL Injection	9
IV	**NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS** Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking. Illustrative programs: Capture and Analyze Network traffic using Wireshark sniffer, Hacking Web Server	9
V	**ETHICAL HACKING LAWS AND TESTS** An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Data base, Password Cracking. Illustrative programs: Study of Techniques for Web based Password Capturing, Perform Session Hijacking	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Upon completion of this course, the students will be able to
CO1: Understand the basic of Ethical Hacking

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Course Outcome   CO2: Gain the knowledge about Foot Printing
CO3: Express fundamentals of Data Security
CO4: Understand about the Network Protection System
CO5:Know about Ethical Hacking Laws and Tests

TEXT BOOKS:
TEXT BOOKS:
T1: Michael T. Simpson, Kent Backman and James E. Corley, Hands-On Ethical Hacking and Network Defense, Cengage Learning, 2017.
T2: Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, Syngress publication, 2013.

REFERENCE BOOKS:
R1: DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Learning, 2009-11-01.
R2: SPatrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series – Elsevier, 2011.
R3: Andrew Whitaker, Daniel P. Newman, "Penetration Testing and Network Defense" , Cisco Press, 2006.

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SYLLABUS

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6181	SOFTWARE PROJECT MANAGEMENT	3	0	0	3

Course Objective	**The student should be able** 1 To Outline the Need for Software Project Management 2 To Learn the Concepts on Project Management and Evaluation. 3 To Plan and Monitor Projects for the Risk Management. 4 To Explore the Process of Monitoring and Controlling 5 To Manage People and Organization of Teams

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT** Project Definition - Importance of Software Project Management - Activities Methodologies-Categorization of Software Projects - Setting Objectives - Management Control – Management Control – Stepwise: An Overview of Project Planning.	9
II	**PROGRAM MANAGEMENT AND PROJECT EVALUATION** Introduction - Project Portfolio Management - Evaluation of Individual Projects - Cost Benefit Evaluation Techniques - Managing the Allocation of Resources within Programmes – Strategic Programme Management - Creating a Programme Aids to Programme Management - Benefits Management.	9
III	**ACTIVITY PLANNING AND RISK MANAGEMENT** Objective(s) – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models– Forward Pass Backward Pass – Critical Path –Activity Float – Shortening Project Duration – Activity on Arrow Networks - Risk Identification, Assessment, Planning, Management -Evaluating Risks to the Schedule.	9
IV	**MONITORING AND CONTROL** Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned ValueAnalysis– Prioritizing Monitoring – Getting Project Back to Target – Change Control – ManagingContracts Introduction – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.	9
V	**MANAGING PEOPLE AND ORGANIZING TEAMS**	9

Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting theRight Person for The Job – Instruction in The Best Methods – Motivation–The Oldman – Hackman Job Characteristics Model –Stress - Working in Groups – Becoming a Team –Decision Making – Leadership – Organizational Structures

	Total Instructional Hours	**45**

Course Outcome	CO1	Construct and Realize Software Design or Software Deployment.
	CO2	Develop a Budget, Schedule or Work Plan.
	CO3	Apply Cost Monitoring and Control Strategies for Software Projects
	CO4	Understand the Interdependencies between the Processes of the System.
	CO5	Manage the Organizational Behaviour of People Working in Teams

TEXT BOOK:

T1 Bob Hughes, Mikecotterell, Software Project Management, Tata McGraw Hill,Sixth edition, 2017

T2 Adolfo Villafiorita, Introduction to Software Project Management, CRC Press,2014.

REFERENCES:

R1 Murali k. chemuturi, Thomas M. cagly, ―Mastering Software Project Management - Best Practices Tools and Techniques, 2010.

R2 Richard E. Fairly, ―Managing and Leading Software Projects, Weilly and Sons, 2009.

R3 Jalote, ―Software Project Management in Practice, Pearson Education, 2014.

R4 Walker Royce, Software Project Management: A Unified Framework, Addison-WesleyProfessional, 2002

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6201**	**INTERNET OF THINGS**	**3**	**0**	**0**	**3**

Course Objective

The student should be able
1. To infer the Design Methodologies of IoT.
2. To summarize various Packages, Frameworks and Cloud Services.
3. To listen to some of the application areas where Internet of Things can be applied.
4. To infer the Design Methodologies of IoT.
5. To summarize various Packages, Frameworks and Cloud Services.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction -Definition and Characteristics of IoT - Physical design of IoT- Logical design of IoT -IoT enabling technologies- IoT levels and Deployment	9
II	**PROTOCOLS & THINGS IN IOTs** Smart Objects: The ―Things‖ in IoT -Sensors, Actuators, Smart Objects, Sensor Networks Protocols: M2M and WSN Protocols – SCADA and RFID Protocols – IEEE 802.15.4 – BACNet Protocol–Modbus – KNX – Zigbee – MQTT.	9
III	**DEVELOPING IOTs** IoT design methodology - Motivation for using Python- Logical Design using Python — ControlFlow — Packages — File Handling — Classes — Packages used for connectivity-Python Packagesof Interest for IoT –Case Study on IoT System for Weather Monitoring	9
IV	**IOT PHYSICAL DEVICES AND PHYSICAL SERVER** IoT Device — Raspberry Pi — Raspberry Interfaces — Programming Raspberry Pi with Python —Other IoT Devices —Cloud Storage Models and Communication APIs - WAMP — Xively Cloudfor IoT— Django — Amazon Web Services for IoT — SkyNet IoT Messaging Platform -Case Study	9
V	**DOMAIN SPECIFIC IOTs** IoT Application- Home Automation- Smart and connected Cities - Publicsafety- Agriculture -Environment – Industry -Health and Lifestyle.	9
	Total Instructional Hours	**45**

Course Outcome

CO1	Explain the Characteristics and Enabling Technologies of IoT
CO2	Analyse the various Application Protocols related to IoT
CO3	Design IoT based simple applications using Python
CO4	Describe the different Packages, Frameworks and Cloud Services.
CO5	Implement small IoT based Real Time applications

TEXT BOOK:

T1 Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015.

T2 David Hanes, CCIE No. 3491, Gonzalo Salgueiro, CCIE No. 4541, Patrick Grossetete, Robert Barton, CCIE No. 6660, CCDE No. 2013:6, Jerome Henry, CCIE No. 24750, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things Cisco Press, Jun 13, 2017.

REFERENCES:

R1 Gaston C.Hillar, ―Internet of things with python,Packt Publishing Limited, 2016.

R2 Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 1st edition, 2013

R3 Andrian McEwen, Hakim Cassimally, ―Designing the Internet of Things", John Wiley & Sons Ltd,1st edition, 2014.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6202R	PRINCIPLES OF COMPILER DESIGN	3	0	0	3

The student should be able

Course Objective		
	1	To study the various phases of compiler and lexical analyzer.
	2	To learn the various parsing techniques
	3	To understand intermediate code generation
	4	Gain knowledge about run time environment and storage allocations.
	5	Learn how to optimize and effectively generate machine codes

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMPILERS** The structure of a compiler - Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata – Minimizing DFA.	9
II	**SYNTAX ANALYSIS** Role of the Parser-Context Free Grammars -Writing a Grammar-Top Down Parsing -Recursive-Descent parsing-Non recursive Descent Parsing-Bottom up parsing-ShiftReduce Parser-LR Parser - LR (0) Item Construction of SLR Parsing Table - Introduction toLALR Parser - Error Handling and Recovery in Syntax Analyzer	9
III	**INTERMEDIATE CODE GENERATION** Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types andDeclarations, Translation of Expressions, Type Checking.	9
IV	**RUN–TIME ENVIRONMENT:** Storage Organization- Static Versus Dynamic Storage Allocation- Access to non-local Data on the Stack-Stack Allocation of Space- Heap Management-Introduction to Garbage collection- Introduction to Trace based collection.	9
V	**CODE OPTIMIZATION AND GENERATION** **Code optimization:** Introduction, The principle sources of optimization Loop optimization and Peephole optimization, DAG- optimization of basic blocks. **Code generation:** Issues in Code Generation –Target Language –Address in the Target Code- Design of a simple Code Generator.	9
	Total Instructional Hours	45

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	CO1	Understand the different phases and lexical Analysis of compiler.
Course Outcome	CO2	Apply different parsing algorithms to develop the parsers for a given grammar.
	CO3	Understand syntax-directed translation in Intermediate code generation.
	CO4	Gain knowledge on Run-time environment.
	CO5	Apply code optimization techniques and understand code generation.

TEXT BOOK:

T1 Aho, Ravi Sethi, JD Ullman, Compilers Principles, Techniques and Tools, PearsonEducation/Prentice Hall of India, (2nd Edition), 2014

T2 Terence Halsey, Compiler Design: Principles, Techniques and Tools, 1st Edition, Larsen & Keller education, 2018

REFERENCES:

R1 V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers,5th Edition,2017.

R2 Douglas Thain, Introduction to Compilers and Language Design, LULU Press, 1st Edition, 2019.

R3 Des Watson, A Practical Approach to Compiler Construction, Springer International Publishing AG,1st Edition, 2017.

R4 Sebastian Hack, Reinhard Wilhelm, Helmut Seidl,Compiler Design: Code Generation and Machine-Level Optimization, Springer Berlin Heidelberg, 1st Edition, 2016.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6251**	**CRYPTOGRAPHY AND NETWORK SECURITY**	**3**	**0**	**2**	**4**

Course Objective		**The student should be able**	
	1	To understand the basic concept of OSI Security Architecture and ClassicalEncryption Techniques.	
	2	To identify the concept of Symmetric and Asymmetric Ciphers.	
	3	To learn how to understand the Hash Functions and Digital Signature.	
	4	To provide Symmetric and Asymmetric Algorithms related to Cryptography.	
	5	To understand the Security Applications in the field of Internet Security Protocols	

Unit	Description	Instructional Hours
I	**INTRODUCTION AND SYMMETRIC CIPHERS** Computer Security Concepts - The OSI Security Architecture - Security attacks, services and mechanisms – A Model for Network Security– ClassicalEncryption Techniques (Substitution Techniques, Transposition Techniques, Steganography). **Program for Encryption and Decryption using the following Substitution Techniques(i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher**	9+3
II	**SYMMETRIC AND ASYMMETRIC CIPHERS** Fermat's and Euler's Theorems - The Chinese Remainder Theorem - Discrete Logarithms – DES – AES - Block Cipher Modes - Public Key Cryptography and RSA - Other Public-Key Cryptosystems. **Program for DES and RSA algorithm for practical applications.**	10+3
III	**AUTHENTICATION AND HASH FUNCTION** Cryptographic Hash Functions - Applications of Cryptographic Hash Functions - Hash Functions Based on Cipher Block Chaining - Secure Hash Algorithm (SHA)- Message Authentication Codes - Message Authentication Requirements -Message Authentication Functions - MACs Based on Hash Functions: HMAC - Digital Signatures. **To Calculate the message digest of a text using the SHA-1 algorithm**	9+3
IV	**MUTUAL TRUST** Key Management and Distribution: Symmetric Key Distribution UsingSymmetric Encryption, Asymmetric Encryption - Distribution of Public Keys - X.509 Certificates – Public Key Infrastructure User Authentication Protocols: Remote User **Demonstrate intrusion detection system (ids) using any tool e.g. Snort or any other s/w.**	9+3
V	**NETWORK AND INTERNET SECURITY PROTOCOLS** Basic Concepts, Secure Sockets Layer (SSL), - Transport Layer Security (TLS) - HTTPS - Secure Shell (SSH) –Electronic mail Security: Pretty Good Privacy (PGP)- S/MIME-IP SECURITY **Defeating Malware Function: i) Building Trojans ii) Rootkit Hunter**	8+3
	Total Instructional Hours	60

Course Outcome	CO1	To Classify the Symmetric Encryption Techniques
	CO2	To be able Understand Symmetric and Asymmetric Ciphers key algorithm.
	CO3	To Evaluate security mechanisms, hash functions and digital signature.
	CO4	Summarize the intrusion detection and its solutions to overcome the attacks.

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CO5   The student will able to apply Network and Internet security protocols

TEXT BOOK:

T1   William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Publication, (7th Edition), 2017.

T2   Behrouz Forouzan, Debdeep Mukhopadhyay, Cryptography and Network Security, Tata McGraw Hill Publication, (3rd Edition), 2015.

REFERENCES:

R1   Atul Kahate, ―Cryptography and Networ Security, Tata McGraw Hill Publication, 2019.

R2   Charles P Pfleeger, Shari Lawrence Pfleeger Jonathan Margulies Security in computing,Pearson Publication, 2018.

R3   Roberta Bragg, Mark Rhodes Ousley, Keith Strassberg, ―Network Security: The CompleteReference, McGraw Hill Publication, 2017.

R4   Kaufman, Perlman and Speciner, Network Security: Private Communication in a public world, Pearson Publication, 2016.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6001**	**INTERNET OF THINGS LABORATORY**	**0**	**0**	**3**	**1.5**

Course Objective	**The student should be able** 1 To physically recognize and understand the use cases of different sensors 2 To setup a Raspberry PI board 3 Understand the architecture of IoT solutions 4 Learn about various technologies helping IoT grow 5 Implement an IoT solution practically

Exp. No	Description of the Experiments
1	Case Study
1 a)	Run some python programs on Pi like:
1 b)	Read two numbers and print their sum, difference, product and division.
1 c)	Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name 'n' times, where name and n are read from standard input, using for and while loops.
1 d)	Handle Divided by Zero Exception.
1 e)	Print current time for 10 times with an interval of 10 seconds.
1 f)	Read a file line by line and print the word count of eachline.
2	Light an LED through Python program
3	Read the analog Data through sensors from physical environment (Use MCP3008)
4	Access an Image through a Pi webcam
5	Control a Light source using webpage
6	Machine to Machine Connectivity using MQTT Protocol
7	Create a Web Server using RESTFUL API
8	Network File Transfer using TCP (Wi-Fi)
9	Get the status of a bulb at a remote place (on the LAN) through web.
10	Study: Amazon Web Services
11	Implement an intruder system that sends an alert to the given mail using Node-Red.

Total Instructional Hours   **45**

Course Outcome	CO1 Understand constraints and opportunities of wireless and mobile networks forInternet of Things. CO2 Analyse real time data stored in a cloud server using data analytics tool. CO3 Develop skills to integrate IoT devices CO4 Design and implement solutions to IoT based problems. CO5 Create an IoT based application

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6003	**PROJECT BASED LEARNING** **(Common to IT, CSE, ECE & AIML)**	0	0	3	1.5

		The student should be able				
Course **Objective**	1	To help the students look into the functioning of simple to complex devices andsystems
	2	To enable the students to design and build simple systems on their own
	3	To help experiment with innovative ideas in design and team work
	4	To create an engaging and challenging environment in the engineering lab

COURSE ASSESSMENT METHODS:

DIRECT

1. Project reviews 50%

2. Work book report 10%

3. Demonstration & Viva – voce 40%

IN-DIRECT

1. Course-end survey

CONTENT:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines. In the fifth semester, students will focus primarily on Design and developing a prototype.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the Engineering Clinics Expoat the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

		Total Instructional Hours	**45**
S.No	**Project Title**	**Technology**	**Domain**
1.	A Gesture-based Tool for Sterile Browsing of Radiology Images	Artificial Intelligence	Health Care
2.	A new hint to transportation - Analysis of the NYC	Data Analytics	Transport

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bike share system

3.	A Novel Method for Handwritten Digit Recognition System	Artificial Intelligence	Education
4.	AI based discourse for Banking Industry	Artificial Intelligence	Banking & Finance
5.	AI-based localization and classification of skin disease with erythema	Artificial Intelligence	Health Care
6.	AI-powered Nutrition Analyzer for Fitness Enthusiasts	Artificial Intelligence	Health Care
7.	Airlines Data Analytics for Avaition Industry	Data Analytics	Logistic &Transport
8.	Analytics for Hospitals Health-Care Data	Data Analytics	Health Care
9.	Car Resale value Prediction	Applied Data Science	Retails & E-Commerce
10.	Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation	Artificial Intelligence	Health Care
11.	Containment Zone Alerting Application	Cloud Application Development	Logistic &Transport
12.	Corportate Employee Attrition Analytics	Data Analytics	Banking & Finance
13.	Crude Oil Price Prediction	Artificial Intelligence	Retails & E-Commerce
14.	Customer Care Registry	Cloud Application Development	Retails & E-Commerce
15.	Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy	Artificial Intelligence	Health Care
16.	Detecting Parkinsons Disease using Machine Learning	Applied Data Science	Health Care
17.	Developing a Flight Delay Prediction Model using Machine Learning	Applied Data Science	Logistic &Transport
18.	Early Detection of Chronic Kidney Disease using Machine Learning	Applied Data Science	Health Care
19.	Efficient Water Quality Analysis and Prediction using Machine Learning	Applied Data Science	Water
20.	Emerging Methods for Early Detection of Forest Fires	Artificial Intelligence	Climate Change
21.	Exploratory Analysis of Rain Fall Data in India for Agriculture	Applied Data Science	Rural & Agriculture Development
22.	Fertilizers Recommendation System For Disease Prediction	Artificial Intelligence	Banking & Finance
23.	Gas Leakage Monitoring And Alerting System	Internet Of Things (IoT)	Safety
24.	Hazardous Area Monitoring For Industrial Plant Powered By IoT	Internet Of Things (IoT)	Safety
25.	Industry-Specific Intelligent Fire Management System	Internet Of Things (IoT)	Safety
26.	Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies	Artificial Intelligence	Banking & Finance
27.	Inventory Managment System for Retailers	Cloud Application Development	Retails & E-Commerce

No.	Project Title	Domain	Category
28.	IoT Based Safety Gadget For Child Safety Monitoring And Notification	Internet Of Things (IoT)	Safety
29.	IoT Based Smart Crop Protection System For Agriculture	Internet Of Things (IoT)	Rural & Agriculture Development
30.	Machine Learning based Vehicle Performance Analyzer	Applied Data Science	Logistic &Transport
31.	Natural Disasters Intensity Analysis and Classification using Artificial Intelligence	Artificial Intelligence	Climate Change
32.	News Tracker Application	Cloud Application Development	Education
33.	Nutrition Assistant Application	Cloud Application Development	Health Care
34.	Personal Assistance For Seniors Who Are Self-Reliant	Internet Of Things (IoT)	Accessibility & Assistance
35.	Personal Expense Tracker Application	Cloud Application Development	Banking & Finance
36.	Plasma Donor Application	Cloud Application Development	Education
37.	Real-Time Communication System Powered by AI for Specially Abled	Artificial Intelligence	Health Care
38.	Real-Time River Water Quality Monitoring And Control System	Internet Of Things (IoT)	Water
39.	Retail Store Stock Inventory Analytics	Data Analytics	Logistics
40.	Signs With Smart Connectivity For Better Road Safety	Internet Of Things (IoT)	Safety
41.	Skill and Job Recommender	Cloud Application Development	Education
42.	Smart Fashion Recommender Application	Cloud Application Development	Retails & E-Commerce
43.	Smart Lender - Applicant Credibility Prediction for Loan Approval	Applied Data Science	Banking & Finance
44.	Smart Solutions For Railways	Internet Of Things (IoT)	Logistic &Transport
45.	Smart Waste Management System For Metropolitan Cities	Internet Of Things (IoT)	Climate Change
46.	SmartFarmer - IoT Enabled Smart Farming Application	Internet Of Things (IoT)	Smart Farming
47.	Trip Based Modeling of Fuel Consumption in Modern Fleet Vehicles Using Machine Learning	Applied Data Science	Climate Change
48.	University Admit Eligibility Predictor	Applied Data Science	Education
49.	VirtualEye - Life Guard for Swimming Pools to Detect Active Drowning	Artificial Intelligence	Safety
50.	Visualizing and Predicting Heart Diseases with an Interactive Dash Board	Data Analytics	Health Care
51.	Web Phishing Detection	Applied Data Science	Cyber Security

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19HE6071**	**SOFT SKILL-II**	**1**	**0**	**0**	**1**

		The student should be able
Course Objective	1	To make the students aware of the importance, the role and the content of softskills 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– Mock Presentations & Feedback	4
II	**Interview Skills and Personality Skills:** Interview handling Skills –Self preparation check list–Grooming tips: do's & don'ts– Mock interview & feed back- Interpersonal skills-creative thinking- problemsolving- analytical skills	3
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	3
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	3
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams –Cubes -Coded inequalities - Conditions and Grouping	2

	Total Instructional Hours	**15**

Course Outcome	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 behaviour and suggest standards for appearance, actions and attitude in a Business environment
	CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
	CO5	Students will excel in complex reasoning

REFERENCES:

R1	Bridging The Soft Skills Gap: How To Teach The Missing Basics To Today's Young Talent- Bruce Tulgan
R2	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R3	How to crack test of Reasoning - Jaikishan and Premkishan
R4	The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19HE6072**	**INTELLECTUAL PROPERTY RIGHTS (IPR)**	**1**	**0**	**0**	**1**

<table>
<tr><td rowspan="7">Course Objective</td><td colspan="2">The student should be able</td></tr>
<tr><td>1</td><td>To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.</td></tr>
<tr><td>2</td><td>To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.</td></tr>
<tr><td>3</td><td>To disseminate knowledge on copyrights and its related rights and registration aspects.</td></tr>
<tr><td>4</td><td>To disseminate knowledge on trademarks and registration aspects.</td></tr>
<tr><td>5</td><td>To disseminate knowledge on Design, Geographical Indication (GI) and theirregistration aspects.</td></tr>
</table>

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of IntellectualProperty Rights	**3**
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non -Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	**3**
III	**COPYRIGHTS** Purpose and Function of Trade Marks, Acquisition of Trade Mark Rights, Protectable Matter, Selecting and Evaluating Trade Mark, Trade Mark Registration Processes.	**3**
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks -Registration of Trademarks.	**3**
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks -Procedure for registration.	**3**

	Total Instructional Hours	**15**

<table>
<tr><td rowspan="5">Course Outcome</td><td>CO1</td><td>Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract valuefrom IP.</td></tr>
<tr><td>CO2</td><td>Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.</td></tr>
<tr><td>CO3</td><td>Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new productsand product marketing.</td></tr>
<tr><td>CO4</td><td>Identify different types of trademarks and procedure for registration</td></tr>
<tr><td>CO5</td><td>Recognize the concept of design, geographical indication and procedure for registration</td></tr>
</table>

TEXT BOOK:

T1 Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learningPrivate Limited.

T2 V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt. Ltd, 2012.

REFERENCES:

R1 Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.

R2 Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property,Edward Elgar Publishing Ltd., 2013.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6301**	**BUSINESS INTELLIGENCE AND ANALYSIS**	**3**	**0**	**0**	**3**

Course Objective	**The student should be able**	
	1	To Understand of Decision-Making, Practices of Business Intelligence.
	2	To Design and Build Bi Applications Based on Users Needs
	3	To Demonstrate the Limitations and Possibilities of Bi Technology
	4	To Understand the Concept of Business Intelligent Models.
	5	To Analyze the Business Environment with Related Tools.

Unit	Description	Instructional Hours
I	**Business Intelligence an Introduction:** Introduction, Definition, History and Evolution, Business Intelligence Segments, Difference between Information and Intelligence, Defining Business Intelligence Value Chain, Factors of Business Intelligence System, Real time Business Intelligence, Business Intelligence Applications, Types of Business Intelligence, Business Intelligence Platform, Dynamic roles in Business Intelligence, Roles of Business Intelligence in Modern Business- Challenges of BI.	9
II	**Architecting the Data:** Introduction, Enterprise Data and Subject Area Model, Enterprise Conceptual Model, Total Data Quality Management (TDQM). Definition of Data Mining, Data mining parameters, Statistical Perspective on Data Mining, Statistics-need, Similarity Measures, Decision Tree-Illustrations, Neural Network, Neural Network versus Conventional Computers, Data Warehouse, Data Mart, Aspects of Data Mart, Online Analytical Processing, Characteristics of OLAP, OLAP Tools, Data Modeling using Star Schema and Snowflake Schema.	9
III	**Types of Business Models:** B2B Business Intelligence Model, Electronic Data Interchange & E- Commerce Models, Systems for Improving B2B E-Commerce, B2C Business Intelligence Model, Need of B2C model in Data warehousing, Different types of B2B intelligence Models Knowledge Management: Characteristics of Knowledge Management, Knowledge assets, Generic Knowledge Management Process, Essentials of Knowledge Management Process.	9
IV	**Data Extraction:** Introduction, Data Extraction, Role of ETL process, Importance of source identification, Various data extraction techniques, Change data capture Business Intelligence Life Cycle: Introduction, Business Intelligence Lifecycle, Enterprise Performance Life Cycle (EPLC) Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Development Stages and Steps, Parallel Development Tracks, BI Framework.	9
V	**Business Intelligence User Model:** Business Intelligence Opportunity Analysis Overview, Content Management System, End User Segmentation, Basic Reporting and Querying, Online Analytical Processing, OLAP Techniques, Benefits of using OLAP, Dashboard, Advanced/Emerging BI Technologies, Organization Culture, Managing Total Cost of Ownership for Business	9

Intelligence, Total Cost of Ownership and Business Intelligence, Managing the TCO of the

Business Intelligence, Factors that Affect Total Cost of Ownership.

Total Instructional Hours   45

Course Outcome	CO1	Demonstrate knowledge about and understanding of organizational and individual decision- making and future trends of BI.
	CO2	Implement the concept of big data and analytics, data visualization techniques.
	CO3	Demonstrate the ability to use BI systems and technology to design and build BI applications based on users_ needs
	CO4	Apply relevant theories, concepts and techniques to solve real-world BI problems
	CO5	Critically evaluate the limitations and possibilities of BI technology

TEXT BOOK:

T1   Jena R K, IT & Business Intelligence 1st Edition, Excel Books-2015.

T2   Mike Davis, Patrick LeBlanc, Knight's Microsoft Business Intelligence 24-Hour Trainer john Wiley & Sons, 2011.

REFERENCES:

R1   Ramesh Sharda, DursunDelen,Business Intelligence: A Managerial Perspective on Analytics,3rdEdition, Pearson, 2010

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6302	INFORMATION SECURITY	3	0	0	3

Course Objective	The student should be able	
	1	To provide the basic concepts of Information Security and its life cycle.
	2	To understand about Legal, Ethical and Professional issues in InformationSecurity
	3	To learn various Risk Identification, Assessment and Managementtechniques.
	4	To understand the various Security Standards in Information SecurityManagement.
	5	To develop various Security Tools and its Technologies

Unit	Description	Instructional Hours
I	**INTRODUCTION** Critical Characteristic of Information-CNSS Security Model- Components of an -Securing the Components- Balancing Security and Access-The SDLC-The Security SDLC , Security Professional and the Organization, Communities of Interest**.**	9
II	**SECURITY INVESTIGATION** Need for Security-Business Needs-Threats-Attacks-Legal-Ethical and Professional Issues-Law and Ethics in Information Security-Relevant US. Laws-International Laws and Legal Bodies-Ethics and Information Security-Codes of Ethics and Professional Organizations	9
III	**RISK MANAGEMENT** Risk Management: An Overview of Risk Management, RiskIdentification, Risk Assessment, Risk Control strategies, Selecting a Risk Control Strategy, Quantitative verses Qualitative Risk, Risk Management Discussion Points	9
IV	**SECURITY STANDARDS AND PRACTICES** Database Security -Introduction, Problems in Databases Security, Controls -OWASP Secure Coding Standards -VISA International SecurityModel-Design of Security Architecture-Planning for Continuity	9
V	**SECURITY TECHNOLOGY** Security Technology: Access Control, Firewalls, Security Technology: Intrusion Detection and Prevention Systems and other Security Tools: Honeypots, Honey nets, and Padded cell Systems, IDPS, Scanning and Analysis Tools, Cryptography-Techniques, Algorithms and Tools, Physical Security, and Security and Personnel.	9

Total Instructional Hours   **45**

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	CO1	Understand the principal concepts, major issues, technologies and basicapproaches in Information Security.
Course Outcome	CO2	Familiar with the Legal, Ethical and Professional issues in InformationSecurity.
	CO3	Learn the process of Identifying, Assessing and treating Risks.
	CO4	Understand various Security Standards in this area and focus on VISASecurity Model.
	CO5	Understand the Technological aspects of Information Security.

TEXT BOOK:

T1   Michal E Whitman ,Herbert J

T2   Izzat Alsmadi, Robert Burdwell, Practical Information Security, Springer International

REFERENCES:

R1   Richard E.Smith,Elementary Information Security, Jones & Bartlett Learning,(3rd Edition),2019

R2   Richard O'Hanley-James S.Tiller,Information Security Management Handbook, CRC Press, (6th Edition), 2014.

R3   Mayank Bhushan, Rajkumar Singh Rathore,Aatif Jamshed, Fundamental of Cyber Security‖, BPB Publications, (1ˢᵗEdition),2017.

R4   Hassan A. Afyouni , Database Security and Auditing: Protecting Data Integrity and

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6303**	**SOFTWARE DESIGN**	**3**	**0**	**0**	**3**

Course Objective	**The student should be able**
	1 To provide basic understanding on design and its fundamentals
	2 To understand the software design principles
	3 To learn various design methodologies
	4 To understand the various software architectural design
	5 To develop design using different styles.

Unit	Description	Instructional Hours
I	**DESIGN FUNDAMENTALS:** The Basic Concepts of Design – Characteristics of Design Activities – Essential Elements of Design – The Factors that Affect the Design -Design Principles: Basic Rules of Software Design – Design Processes.	9
II	**SOFTWARE DESIGN PRINCIPLES:** The Nature of the Design Process - The Software Design Process -Design in the Software Development Process - Design Qualities**.**	9
III	**DESIGN METHODOLOGIES:** Design Practices – Stepwise Refinement – Incremental Design – Structured System Analysis and Design – Jackson Structured Programming – Jackson System Development – Designing with Objects – Component-Based Design.	9
IV	**SOFTWARE ARCHITECTURE DESIGN:** Notion of Architecture – Notion of Software Architecture - Architectural Styles – Description of Software Architecture –Visual Notation – Examples.	9
V	**ARCHITECTURAL DESIGN:** Typical Architectural Design – Data Flow – Independent Components – Call and Return – Using Styles in Design – Choices of Style – Combination of Styles – Architectural Design Space – Theory of Design Spaces – Design Space of Architectural Elements – Design Space of Architectural Styles.	9
	Total Instructional Hours	**45**

Course Outcome		
	CO1	Design the Software using Designs Fundamentals and Methodologies.
	CO2	To create a Good Software by using the Styles, Architectural Design space.
	CO3	To reconstruct the Software Architecture that can be used for an Applicationof your choice.
	CO4	Analyse Specifications and Identify appropriate Design Strategies.
	CO5	Develop an appropriate Design for a given set of Requirements.

TEXT BOOK:

T1 David Budgen, "Software Design", Pearson Publication, Second Edition, 2011. (Unit II, UnitIII).

T2 Hong Zhu, ―Software Design Methodology from Principles to Architectural Styles, Elsevier,

REFERENCES:

R1 Eric J. Braude, Software Design: From Programming to Architecture, Wiley, 2017.
R2 Carlos Otero, "Software Engineering Design: Theory and Practice", CRC Press, 2012.
R3 Hassan Gomaa, "Software Modeling and Design", Cambridge University Press, 2011.
R4 John Robinson, Software Design for Engineers and Scientists, Newnes, 2004.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6304	NATURAL LANGUAGE PROCESSING	3	0	0	3

Course Objective	The student should be able
	1 To understand the basics of NLP.
	2 To provide knowledge of various levels of analysis involved in NLP
	3 To study about Semantic Analysis and Discourse Processing.
	4 To gain knowledge in automated Natural Language Generation and MachineTranslation
	5 To learn the concepts of Retrieving Information and Resources

Unit	Description	Instructional Hours
I	**OVERVIEW AND LANGUAGE MODELING** Origins and challenges of NLP-Language and Grammar-Processing Indian Languages-NLP Applications-Information Retrieval- Language Modeling Introduction-Various Grammar-based Language Models- Statistical Language Model	9
II	**WORD LEVEL AND SYNTACTIC ANALYSIS** Introduction-Regular Expressions-Finite-State Automata orphological Parsing-Spelling Error Detection and Correction-Words and Word classes Part-of Speech Tagging. Syntactic Analysis Introduction-Context-free Grammar-Constituency-Parsing-Probabilistic Parsing	9
III	**SEMANTIC ANALYSIS AND DISCOURSE PROCESSING** Introduction- Meaning Representation-Lexical Semantics-Ambiguity- Word Sense Disambiguation- Discourse Processing Introduction – Cohesion – Reference – Resolution - Discourse Coherence and Structure	9
IV	**NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION** Introduction-Architecture of NLG Systems-Generation Tasks and Representations-Application of NLG-Machine Translation Introduction-Problems in Machine Translation-Characteristics of Indian Languages-Machine Translation Approaches-Translation involving Indian Languages	9
V	**INFORMATION RETRIEVAL AND LEXICAL RESOURCES** Introduction-Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – Evaluation - Lexical Resources Introduction-WordNet-Frame Net- Stemmers-POS Tagger-Research Corpora	9

	Total Instructional Hours	**45**

CO1   Able to understand the basics of NLP

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	CO2	Analyse the Natural Language Text.
	CO3	Understand Semantic Analysis and Discourse Processing
Course Outcome	CO4	Generate the Natural Language and do Machine Translation.CO5: Apply Information Retrieval Techniques
	CO5	Apply Information Retrieval Techniques

TEXT BOOK:

T1   Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press (Third Edition),2008.

T2   Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python‖,

REFERENCES:

R1   Daniel Jurafsky and James H Martin, Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition‖, Prentice Hall (3rd Edition), 2019.

R2   Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher,2015.

R3   Richard M Reese, Natural Language Processing with Java‖, OReilly Media, 2015.

R4   Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Chapmanand Hall/CRC Press (Second Edition,), 2010.

R5   James Allen, Bejamin-Cummings, ―Natural Language Understanding, Pearson Education(2ndEdition), 2007

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6305	SOFT COMPUTING	3	0	0	3

Course Objective

The student should be able

1. Learn the various Soft Computing Frameworks
2. Be familiar with design of various Neural Networks
3. Be exposed to Fuzzy Logic
4. Gain knowledge about Genetic Programming.CO5: Be exposed to Hybrid Systems
5. Be exposed to Hybrid Systems

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFT COMPUTING** Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network- Madaline Network.	9
II	**ARTIFICIAL NEURAL NETWORKS** Back propagation Neural Networks - Kohonen Neural Network - Learning Vector Quantization -Hamming Neural Network – Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks-Support Vector Machines - Spike Neuron Models.	9
III	**FUZZY SYSTEMS** Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations-Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.	9
IV	**GENETIC ALGORITHMS** Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction – Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm.	9
V	**HYBRID SYSTEMS** Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy Art Map: A Brief Introduction - Soft Computing Tools	9
	Total Instructional Hours	45

Course Outcome

CO1	Apply various Soft Computing Frameworks.
CO2	Design of various Neural Networks.
CO3	Use Fuzzy Logic for Real Time Applications..
CO4	Discuss Genetic Programming
CO5	Assess Hybrid Soft Computing techniques

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TEXT BOOK:

T1 S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, Thirdedition 2018.

T2 S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm,

REFERENCES:

R1 James M. Keller, Derong Liu, David B. Fogel, ―Fundamentals of Computational Intelligence:Neural Networks, Fuzzy Systems, and Evolutionary Computation‖, Wiley-IEEE Press, 2016.

R2 J.S.R.Jang, C.T. Sun and E.Mizutani, ―Neuro-Fuzzy and Soft Computing, PHI / Pearson Education 2015.

R3 N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford UniversityPress, 2015.

R4 Melanie Mitchell, ―Introduction to Genetic AlgorithmsPHI Learning, 2002

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	19IT6307	VIRTUAL REALITY AND AUGMENTED REALITY	3	0	0	3

The student should be able

Course Objective

1	To introduce the concept of basic input output devices used in VR technology.
2	To give an insight on the various modelling techniques used for VR development process.
3	To explore the methodology and terminologies used for content creation in VR.
4	To understand the possible applications of virtual reality and augmented reality in engineering applications.
5	To know the basic building blocks of the VR on mobile and web.

Unit	Description	Instructional Hours
I	**INPUT/ OUTPUT DEVICES** The three I's of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices: Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces-Output Devices: Graphics displays-sound displays & haptic feedback.	9
II	**VR DEVELOPMENT PROCESS** Geometric modeling - kinematics modeling- physical modeling -behavior modeling - model Management.	9
III	**CONTENT CREATION CONSIDERATIONS FOR VR** Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -sideeffects of exposures to virtual reality environment	9
IV	**VR ON THE WEB & VR ON THE MOBILE** JS-pros and cons-building blocks (WebVR, WebGL, Three.js, deviceorientation events)- frameworks (A-frame, React VR)-Google VR for Android-Scripts, mobile device configuration, building to android- cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics	9
V	**APPLICATIONS** Medical applications-military applications-robotics applications-Advanced Real time Tracking other applications- games, movies, simulations, therapy	9

	Total Instructional Hours	**45**

Course Outcome

CO1	Select the appropriate input output device for an application.
CO2	Apply the suitable modelling for the given problem statement
CO3	Design appropriate VR content for an application.

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CO4   Construct the building blocks for VR in mobile and web.

CO5   Analyse & Design VR systems for various applications

TEXT BOOK:

T1   C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, JohnWiley & Sons, Inc.,2008.

T2   Jason Jerald. 2015. The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.

REFERENCES:

R1   Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg & Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN: 9780321883575

R2   Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factorsfor AR and VR (Usability),Steve Aukstakalnis, Addison-Wesley Professional; 1 edition, 2016.

R3   Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, Tony Parisi, O'Reilly Media; 1 edition, 2015

R4   Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages, Tony Parisi, O'Reilly Media; 1 edition, 2014.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6308**	**WEB DEVELOPMENT – I**	**0**	**0**	**3**	**3**

Course Objective	**The student should be able**	
	1	To build web applications using the Express.js framework
	2	Focus on industry-practices like functional programming
	3	To get practice with object-oriented design and object-oriented design
	4	To Learn about the PostgreSQL with Sequelize models
	5	To practice EJS Templating, security, and version control.

Unit   **Description of the Experiments**

1   **Introduction to Node.js**

In this module students are introduced to Node.js - they learn how to install it and write programs on it and use Node.js REPL. Students also start using GitHub and learn how to collaborate on code with others using the git tool.

2   **Working with NPM**

This module is an introduction to Node.js package manager for students where they start writing custom NPM modules. They also explore and use built-in modules of Node.js

3   **Node.js deep dive**

In this module students start building their first application and learn how to use closure to emulate private methods.

4   **Testing**

In this module students are introduced to testing. They start writing tests for their application, learn how to use Jest to run the tests and pre-commit hooks to run the tests automatically before each commit

5   **Databases and Sequelize**

In this module students get to learn about databases and set up a PostgreSQL database. They learn how to connect to a database from a Node.js application and then work on the database by creating Sequelize models to manipulate data.

6   **Backend Web development with Express.js**

In this module, students develop their first application and connect it to the PostgreSQL database on their machine, and begin learning the basics of the CRUD pattern by building some additional features to the application that they're working on.

7   **Add User Interface for To-do Application**

This module teaches students how to create interfaces for their application. They also practice converting a given visual design into working HTML and CSS.

8   **EJS Templating**

This module teaches touches upon the basics of the MVC pattern, instructing student how to render dynamic data inside their HTML pages using EJS templates. This module also lets the student practice how to deploy their work to a remote server.

9   **HTML forms to save and accept user inputs**

This module teaches students how to accept user input on their application via form element in HTML. Students also explore more of the CRUD pattern, moving onto creation of resources using forms, deletion of existing resources, and learn about Cross Site Request Forgery (CSRF) and how authenticity tokens can be used to prevent such attacks. Students are also introduced to APIs.

10   **User Authentication and final wrap-up**

In this module students dig deeper into Sequelize association, migration and validation. They build a functional user sign-up page, learn about password storage and play around with browser cookies, sessions, user authentication, and related best practices. They also learn to display one-off flash messages.

Total Instructional Hours   45

Course Outcome		
	CO1	Build web applications using Express.js.
	CO2	Manipulate data using both imperative and functional programming techniques
	CO3	Model real-world systems using object-oriented design.
	CO4	Write HTML & CSS to create elegant web pages.
	CO5	Build database applications using Sequelize.

TEXT BOOK:

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REFERENCES:

R1   Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007

R2   Mike Cantelon, Marc Hartert, T.J. Holowaychuk, Nathan Rajlich" Node.js in Action",Manning Publications, 2014.

R3   David Gutman, Fullstack Node.js The Complete Guide to Building Production Apps with Node.js , Fullstack.io 2019.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT6402**	**MACHINE LEARNING FOR ENGINEERS**	**3**	**0**	**0**	**3**

	The student should be able
	1 To understand the basic concepts of machine learning and probability theory.
	2 To appreciate supervised learning and their applications.
Course Objective	**3** To understand unsupervised learning like clustering and EM algorithms.
	4 To understand the theoretical and practical aspects of probabilistic graphical models.
	5 To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – TestingMachine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Tradeoff.	9
II	**SUPERVISED LEARNING** Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification - Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Logistic Regression-K-Nearest Neighbors.	9
III	**UNSUPERVISED LEARNING** Introduction to clustering -Mixture Models and EM – K-Means Clustering – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis (PCA)	9
IV	**GRAPHICAL MODELS** Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.	9
V	**ADVANCED LEARNING** Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning	9
	Total Instructional Hours	**45**

	CO1	Choose and implement classification or regression algorithms for an application using an open source tool.
	CO2	Implement Supervised Learning algorithms for an application and analyze the results.
Course Outcome	CO3	Use a tool to implement typical clustering algorithms for different types of applications.
	CO4	Design and implement an HMM for a sequence model type of application.
	CO5	Identify applications suitable for different types of machine learning with suitable justification.

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TEXT BOOK:

T1   Machine Learning for Absolute Beginners, Third Edition, Oliver Theobald, 2021

T2   Machine Learning Refined: Foundations, Algorithms, and Applications, Second Edition, Jeremy Watt, Reza Borhani ,Aggelos K. Katsaggelos,2020

T3   Sebastian Raschka, Vahid Mirjilili, Python Machine Learning and deep learning, 2nd edition, kindle book, 2018

REFERENCES:

R1   Carol Quadros Machine Learning with python, scikit-learn and Tensorflow, Packet Publishing, 2018.
R2   Gavin Hackeling,Machine Learning with scikit-learn, Packet publishing, O'Reily, 2018.
R3   Giuseppe Bonaccorso ―Machine Learning Algorithms, Packt Publishing,2017
R4   IanGoodfellow, Yoshua Bengio, Aaron Courville, DeepLearning, MITPress,2016
R5   Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Prentice Hall of India, Third Edition 2014
R6   Tom M. Mitchell, Machine Learning, McGraw-Hill Education, Indian Edition,2013

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT7307**	**WEB DEVELOPMENT - II**	**0**	**0**	**3**	**3**

Course Objective		
		The student should be able
	1	Understand the basic architecture of front end applications and create web Applications using React TypeScript front-end stack.
	2	Interaction between a client-side application and server-side app via an API.
	3	Industry practices for state management and usage of static types.
	4	Best practices with regard to the development of a modern client-side application.
	5	To build TypeScript projects from scratch to scale.

Unit	Description of the Experiments
1	**React fundamentals** This module introduces students to development using TypeScript by setting up a development env5555ironment, introducing them to the TypeScript 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.
2	**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.
3	**A deeper dive into React Hooks** This module discusses the common pitfalls of state management, introduces in-browser persistent storage, demonstrates additional standard hooks and the creation and use of custom hooks.
4	**Client-side routing** This module covers the concept of client-side routing as a separate behaviour 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	**Types in depth and Variants** This module takes a deeper dive into TypeScript'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 TypeScript's type inference behaviour.
6	**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.
7	**APIs and state modelling** 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 pageable APIs.
8	**Best practices and npm packages** 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
9	**Production React Apps** 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.

Total Instructional Hours   **45**

Course Outcome		
	CO1	Be able to create Single Page Web Applications (SPA) using React, Typescript and Tailwind CSS.
	CO2	Have a solid understanding of static types, and know how to port untyped JavaScript to TypeScript
	CO3	Learn typed state management that is inline with a backend data model.
	CO4	Able to Modelling and managing complex states

CO5 Practice API and state Modelling

TEXT BOOK:

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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

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REFERENCES:

R1   Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, 2008.

R2   Anthony T. Velte, Toby J. Velte, and Robert Elsen peter, Cloud Computing: A Practical Approach, McGraw Hill, 2010.

R3   Borko Furht, Handbook of Cloud Computing, Armando Escalante (Editors), Springer, 2010.

R4   Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India, 2010.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**19IT8314**	**WEB DEVELOPMENT - III**	**0**	**0**	**3**	**3**

<table>
<tr><td rowspan="6">Course Objective</td><td colspan="2">The student should be able</td></tr>
<tr><td>1</td><td>To allow the student to learn more about production-ready deployments.</td></tr>
<tr><td>2</td><td>To know the workflow using pull-requests</td></tr>
<tr><td>3</td><td>To practice JS Bundling of integration of JS into non-JS backend</td></tr>
<tr><td>4</td><td>Different approaches of training.</td></tr>
<tr><td>5</td><td>Knowledge about of the popular Docker</td></tr>
</table>

Unit	Description of the Experiments

1 Workflow using pull-requests

This module acts as an advanced guide to the usage of git in development teams, where the norm is to develop on branches, perform peer-reviews, and to re-work based on reviews before merging. Since this cycle is most often performed using online tooling that uses pull requests to achieve this workflow, students are taught how to open a pull request, make changes, submit work for review and then update code based on review.

2 JS Bundling - integration of JS into non-JS backends

This module covers the history of why "bundling" as a process exists for the JS ecosystem, the most common bundling tools, and the general methodology. This module also covers the new "import maps" feature that allows for similar capability without the use of a bundling tool.

3 Compile to JS languages - options & approaches

This module covers the reason why languages that compile to JS exist, the different purposes that they serve, and demonstrate a few of the most popular options and the differences between each.

4 Testing

This module covers the importance of testing, the different approaches to testing such as unit testing, integration testing, and hybrid testing. It should also cover popular libraries that are used to help with testing, and also common pitfalls in the practice of testing and how to avoid them.

5 CI/CD - Continuous integration & delivery

This module teaches students about modern development processes that enable teams to release changes quickly and often, by leading them through the process of setting up an automated system that detects changes to code to run tests and then linking that to the deployment of code that passes its test suite to a remote server.

6 Application environments

This module teaches students about the different environments in which an application is expected to run. This module explains the differences between the environments that a student has already operated in - development, testing & production, and also introduces the concept of a staging environment which acts as a gateway to the production environment.

7 Containerization

This module covers the field of containerization - where complex applications are packaged to run in isolated spaces called containers. The approach for covering this topic involves the use of the popular Docker (OCI) standard, teaching students how to build a Docker image for their web application, and how to deploy this image to different targets.

8 Internationalisation and localization

This module covers i18n, teaching students the basics of setting up their web applications to support users who prefer or require a language different from the default language of the app, and/or live in a time zone that is different from the default. This module also covers L10n, teaching students how to use the i18n framework to customise their web application for another locale.

9 Error logging & debugging

This module covers the practice of logging and notification of runtime errors that occur on a deployed application. This module also covers the process that is followed to detect the source of a bug, and how testing can be used to ensure a fix and to prevent recurrences.

Total Instructional Hours   45

	CO1	Be able to bundle a codebase with non-trivial JS dependencies and code.
	CO2	Know how to differentiate between popular JS flavours and pick one that is suitable for a task
	CO3	Understand why testing is important, what TDD is, and be able to write both unit and integration tests for Rails applications that use JS in the front-end.
Course Outcome	CO4	Be able to set up a CI/CD pipeline for a server-side application, ensuring the code reaches production automatically after tests pass.
	CO5	Know how to organise & communicate development work using pull requests and be aware of container-based deployments, be able to build a Docker image for their web application and then deploy that image to a web server

TEXT BOOK:

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 © Freshworks Inc. & Pupilfirst 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.

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SYLLABUS

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21MA3151	Statistics and Queuing Theory	3	0	2	4

Course Objective	
	1. Construct a well-defined knowledge of random variables.
	2. Understand the concept of standard distributions which can describe the real-life phenomenon.
	3. Illustrate the relation between two random variables by using correlationconcepts along with R studio
	4. Describe some basic concepts of statistical methods for testing the hypothesistogether with R studio.
	5. Apply the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

Unit	Description	Instructional Hours
I	**PROBABILITY AND RANDOM VARIABLE** Random variable –Discrete and continuous random variables – Probability mass function - Probability density function – Cumulative distribution functions - Moment generating function.	9
	Introduction to R programming **Application of descriptive statistics – Mean, Median, Mode, variance and Box plot.**	3
II	**STANDARD DISTRIBUTIONS** Discrete Distributions - Binomial, Poisson, Continuous Distributions -Uniform, Exponential and Normal distributions.	9
	Application of Normal distribution	3
III	**CORRELATION AND REGRESSION** Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines.	9
	Applications of Correlation and Regression	3
IV	**HYPOTHESIS TESTING** Test for means– t test for single mean and difference of mean - F test for proportion of variance, Chi – Square test – independence of attributes –goodness of fit.	9
	Application of Student t- test for Single mean & difference of means, Application of Chi – square test	6
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).	9
	TOTAL INSTRUCTIONAL HOURS	**60**

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After successful completion of this course, the students should be able to

Course Outcome

CO1: Understand the concepts of random variables.

CO2: Describe various discrete and continuous distribution functions.

CO3: Compute correlation between variables, and predict unknown values using regression along with R studio.

CO4: Understand the concepts of statistical methods for testing the hypothesis together with R studio.

CO5: Identify the queuing models in the given system, find the performance measures and analyze the result.

TEXT BOOKS:

T1 - Gupta S. P, Statistical Methods‖, Sultan Chand & Sons Publishers, 2016.

T2 – Medhi J, "Stochastic Processes "New Age International Publishers, New Delhi,2014.

REFERENCE BOOKS:

R1- Applied statistics and Probability for Engineers by C.Mont Gomery ,6th Edition, Wiley Publications. R2 - A.O. Allen, Probability, Statistics and Queueing Theory with Computer Applications‖, Elsevier, Second Edition, 2012.

R3 - Walpole R. E., Myers S.L. & Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson Education Inc, 9th edition, 2012.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21IT3201	Data Structures and Algorithm Design	3	0	0	3

Course Objective

1. To provide a good understanding of the fundamental Data structures
2. To provide a good understanding of how several fundamental algorithms work, particularly those concerned with sorting, searching and graph manipulation
3. To educate on the space and time efficiency of most algorithms
4. To educate on design of new algorithms or modify existing ones for new applications
5. To introduce graph algorithms

Unit	Description	Instructional Hours
I	**LINEAR STRUCTURES** Abstract Data Types (ADTs) – List ADT – array-based implementation –linked list implementation – singly linked lists - doubly-linked lists – Stack ADT – Operations -QueueADT – Operations - Circular Queue	9
II	**TREES AND GRAPH STRUCTURES** Tree ADT – tree traversals - Binary Tree ADT – expression trees – binarysearch tree ADT– AVL Trees - Graphs - Definition – Representation of Graph – Breadth-first traversal -Depth-first traversal	9
III	**FRAMEWORK OF ANALYSIS** Definition and properties of an algorithm- Analysis of algorithms - Brute Force-Selection Sort – Bubble Sort. Divide and Conquer –Finding maximumand minimum-Analysis of Merge sort- Analysis of Quick sort-	9
IV	**GREEDY AND DYNAMIC PROGRAMMING** Greedy Approach - Minimum Spanning Trees- Single-source shortest paths. Dynamic Programming: Computing a Binomial Coefficient; Floyds Algorithm – Knapsack Problem and Memory functions.	9
V	**COPING WITH THE LIMITATIONS OF ALGORITHM POWER** P, NP NP - Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem. Branch and Bound – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.	9

TOTAL INSTRUCTIONAL HOURS   45

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	CO 1: Implement abstract data types for Linear Data Structures.
Course Outcome	CO 2: Apply the different linear and Non-Linear Data Structures to problemsolutions
	CO 3: Explain the fundamentals of Analysis of Algorithm.
	CO 4: Analyze algorithms and estimate their Best-Case, Worst-Case and Average-case Behavior.
	CO 5: Explain the concepts of NP Complete problems

TEXT BOOKS:

T1: M A Weiss,Data Structures and Algorithm Analysis in C++, Pearson Education, 4th Edition,2014.ISBN-13: 978-0-13-284737-7

T2- AnanyLevitin, Introduction to the Design and Analysis of Algorithms, Pearson Publications, 3rd Edition, 2012. ISBN-13: 978-0132316811

REFERENCE BOOKS:

R1: Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction toAlgorithms, Third Edition, PHI Learning Private Limited, 2012. ISBN-13: 9780070131446

R2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms‖,Pearson Education, Reprint 2006.ISBN-13: 978-0201000238

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	P	C
B.Tech	21IT3202	Object Oriented Programming Using C++	3	0	3

Course Objective	1. Be familiar with the C++ concepts of Abstraction, Encapsulation,Constructor 2. To understand the concepts of Polymorphism, Overloading andInheritance 3. Learn to apply Exception Handling 4. To study the concept of Generic Programming 5. To learn the concept of File Handling And built classes from STL

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OBJECT ORIENTED PROGRAMMING** Object Oriented Programming Concepts – Objects – Classes – Methods and Messages – Abstraction and Encapsulation – Inheritance – Abstract Classes – Polymorphism - Introduction to C++ – Arrays – Structures and Unions- Functions- Storage Class	9
II	**CONSTRUCTORS AND OPERATOR OVERLOADING** Defining A Class – Creating Objects - Access Specifiers – Function and Data Members Default Arguments – Function Overloading – Friend Functions – Const With Class – Static Member of a Class – Nested Classes – Local Classes - Constructors – Destructors– Operator Overloading – Overloading Through Friend Functions – Overloading the Assignment Operator – Type Conversion – Explicit Constructor	9
III	**TEMPLATES AND EXCEPTION HANDLING** Function and Class Templates - Exception Handling – Try-Catch-ThrowParadigm - Exception Specification – Terminate and Unexpected Functions – Uncaught Exception.	9
IV	**INHERITANCE AND POLYMORPHISM** Inheritance – Public, Private, and Protected Derivations – Multiple Inheritance – Virtual Base Class – Abstract Class – Composite Objects -Runtime Polymorphism – Virtual Functions – Pure Virtual Functions	9
V	**FILE HANDLING** File Streams and Formatted I/O – I/O Manipulators - File Handling – File Pointers-Random Access – Standard Template Library – STLComponent	9
	TOTAL INSTRUCTIONAL HOURS	**45**

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Course Outcome	**After successful completion of this course, the students should be able to** CO1: Differentiate between structures of Procedure Oriented Programming andObject-Oriented Programming.

After successful completion of this course, the students should be able to CO1: Differentiate between structures of Procedure Oriented Programming andObject-Oriented Programming.

CO2: Apply the concepts of Data Abstraction, Encapsulation and Inheritance forproblem solutions.

CO3: Understand the concept of Function Overloading, Operator Overloading,Virtual Functions and Polymorphism.

CO4: Classify Inheritance with the understanding of early and late binding,usage of Exception Handling

CO5: Use File handling techniques and apply Generic Programming Techniques

TEXT BOOKS:

T1- Balagurusamy.E, Object Oriented Programming with C++, Tata McGraw Hill Publications, Seventh edition, 2017, ISBN 13: 9789352607990.

T2- Robert Lafore, Object-Oriented Programming in C++‖, Sams Publishing; 4th edition;2002 ISBN 788131722824

REFERENCE BOOKS:

R1-Ira Pohl, ―Object Oriented Programming using C++, Pearson Education, Second EditionReprint 2006.ISBN-13: 978-8131703915

R2- Rohit Khrana, Object Oriented Programming with C++, Vikas Publishing, 2nd edition,2014;ISBN-13: 9789325975644;

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21IT3203	Computer Organization and Architecture	3	0	0	3

Course Objective
1. To understand the Computer instructions, Addressing Modes and Performancemeasurements.
2. To familiarize the implementation of Fixed point and Floating-point arithmeticoperations.
3. To expose the students about Parallelism using the concept of Pipelining.
4. To study about Instruction Level Parallelism and Multithreading
5. To familiarize the students about Hierarchical Memory System and AccessingI/O devices

Unit	Description	Instructional Hours
I	**OVERVIEW & INSTRUCTIONS** Components of a computer system – Performance –Instructions– operations and operands– Representing instructions – Logical operations – Controloperations for Decision-making –MIPS addressing modes	9
II	**ARITHMETIC OPERATIONS** Introduction - Addition and Subtraction – Multiplication – Division: Restoring and Non-Restoring division algorithm – Floating point representation- Floating point representation operations	9
III	**PROCESSOR AND CONTROL UNIT** A Basic MIPS implementation – Building a Data path – Control Implementation Scheme –Overview of Pipelining – Pipelined Data path- Pipelined control – Hazards –Types of Hazards - Handling Data Hazards – Handling Control Hazards, Exception Handling.	10
IV	**PARALLELISM** Parallel processing challenges – Flynn's classification –Vector Architectures, Hardware multithreading – Introduction to Multicore processors.	8
V	**MEMORY AND I/O SYSTEMS** Memory hierarchy – Memory technologies –Cache Memory- mapping functions - measuring and improving cache performance – Accessing I/O Devices – Interrupts –Direct Memory Access – Bus structure – Bus operation – Interface circuits – USB	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

After successful completion of this course, the students should be able to
CO1: Understand the Basic Instructions and Addressing Modes.
CO2: Demonstrate and perform Computer arithmetic Operations on Integer and Realnumbers.
CO3: Learn the Pipelined concepts and Hazards. To know how to overcome the HazardsCO4: Compare the parallel processing architectures.
CO5: Exemplify in a better way the I/O and Memory Organization.

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TEXT BOOKS:

T1 - David A. Patterson and John L. Hennessey, ―Computer organization and design‟, MorganKauffman, Elsevier, Fifth edition, 2014. ISBN: 9780124078864

T2- V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, ―Computer Organization and Embeddedsystems―, VIth edition, Mc Graw-Hill Inc, 2012. ISBN 9781283394772

REFERENCE BOOKS:

R1 - William Stallings ―Computer Organization and Architecture- Designing for performance, TenthEdition, Pearson Education, 2016, ISBN 9780134165981

R2- Vincent P. Heuring, Harry F. Jordan, ―Computer System Architecture, Second Edition, PearsonEducation, 2008. SBN 13: 9780805343304

R3-Govindarajalu, Computer Architecture and Organization, Design Principles and Applications",Second edition, Tata McGraw Hill, New Delhi, 2010. ISBN: 978-0-07-015277-9

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21IT3251	Digital Principles and System Design	3	0	2	4

<table>
<tr><td rowspan="1">Course Objective</td><td colspan="3">
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 asynchronous sequential circuits.
5. To study the fundamentals of HDL.
</td></tr>
</table>

Unit	Description	Instructional Hours
I	**MINIMIZATION TECHNIQUES** Number systems: Decimal, Binary, Octal, Hexadecimal-Number-Base conversion-Complements of Numbers: 1"s and 2"s complements- Boolean algebra and laws-De-Morgan's Theorem-Principle of Duality-Minimization of Boolean expressions – Minterm – Maxterm – Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions (2variable,3variable&4-variable)-Tabulation method.	10
II	**COMBINATIONAL CIRCUITS** Circuits for arithmetic operations: adder: Half adder, Full adder, subtractor: Half subtractor, Full subtractor-BCD adder-Magnitude Comparator-Encoders, Decoders- Multiplexers, Demultiplexers, Code converters: Binary to Gray, Gray to Binary **1. Experimental Design and implementation of Half Adder & HalfSubtractor.** **2. Experimental Design and implementation of Binary to Gray andGray to Binary Conversion.** **3. Experimental Design and implementation of Multiplexers and Demultiplexers**	9+6(P)
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Flip flops:SR, JK, D,T - Design of synchronous sequential circuits: State diagram - State table – State minimization - State assignment. Shift registers: SISO, SIPO,PIPO,PISO – Counters: BCD,Up down counter. **Experimental Design and implementation of Synchronous and Asynchronous Counters**	9+4(P)
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS** Analysis and design of asynchronous sequential circuits-Reduction of state and flow tables– Race-free state assignment–Hazards	9
V	**HARDWARE DESCRIPTION LANGUAGE** Introduction to Hardware Description Language (HDL)- HDLfor combinational circuits-Half adder, Full adder, Multiplexer, De-multiplexer, HDL for Sequential Circuits- Flip flops, Synchronous and Asynchronous Counters, Registers. **1. Coding Combinational/Sequential circuits using HDL**	9+4(P)
	TOTAL INSTRUCTIONAL HOURS	60

<table>
<tr><td rowspan="5">Course Outcome</td><td>CO1: Simplify Boolean functions using different methods.</td></tr>
<tr><td>CO2: Analyze, design and implement combinational logic circuits.</td></tr>
<tr><td>CO3: Analyze, design and implement Synchronous sequential logic circuits.</td></tr>
<tr><td>CO4: Analyze, design and implement Asynchronous sequential logic circuits</td></tr>
<tr><td>CO5: Simulate and implement combinational and sequential circuits using HDL.</td></tr>
</table>

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TEXT BOOKS:

T1 Morris Mano M. and Michael D. Ciletti, ―Digital Design with an Introduction to the Verilog HDL, V Edition, Pearson Education, 2013.ISBN-13: 978-0-13-277420-8

REFERENCE BOOKS:

R1-. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, Fourth Edition, Vikas PublishingHouse Pvt. Ltd, New Delhi, 2012.ISBN: 978-93-259-6041-1

R2-Thomas L. Floyd, ―Digital Fundamentals‖, Pearson Education, Inc, New Delhi, 2013 ISBN: 978-1-292-07598-3.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	21IT3001	Data Structures and Algorithm Laboratory	0	0	3	1.5

Course Objective

1. To understand various advanced abstract data type (ADT) and Data structures and their implementations
2. To learn linear data structures – stack and queue.
3. Be exposed to sorting, searching, hashing algorithms
4. Learn to apply Tree and Graph structures
5. Learn how to analyze and design solution to the problem.

Exp. No	Description of the Experiments
1	After getting her PhD, XXX has become a celebrity at her university, and her facebook profile is full of friend requests. Being the nice girl, she is, XXX has accepted all the requests. Now YYY is jealous of all the attention she is getting from other guys, so he asks her to delete some of the guys from her friend list. To avoid a 'scene', XXX decides to remove some friends from her friend list, since she knows the popularity of each of the friend she has. Implement the above scenario using appropriate data structure.
2	Given an array of n integers nums, a 132 pattern is a subsequence of three integers nums[i], nums[j] and nums[k] such that i< j < k and nums[i] <nums[k] <nums[j]. Return true if there is a 132 pattern in nums, otherwise, return false. Implement using Stack data structure.
3	In a deck of cards, every card has a unique integer. You can order the deck in any order you want. Initially, all the cards start face down (unrevealed) in one deck. Now, you do the following steps repeatedly, until all cards are revealed: • Take the top card of the deck, reveal it, and take it out of the deck. • If there are still cards in the deck, put the next top card of the deck at the bottom of the deck. • If there are still unrevealed cards, go back to step 1. Otherwise, stop. Return an ordering of the deck that would reveal the cards in increasing order. Write a program to implement the above concept.
4	Given the root of a Binary Search Tree and a target number k, return true if there exist two elements in the BST such that their sum is equal to the given target. Implement using BST.
5	Geek hosted a contest and N students participated in it. The score of each student is given by an integer array arr. The task is to print the number of each student (indexes) in the order they appear in the scoreboard. A student with a maximum score appears first. If two people have the same score then higher indexed student appears first.
6	Given an array, sort its element by their frequency and index. i., e if two elements have different frequencies, then the one which has more frequency should come first; otherwise the one which has less index should come first.
7	Watson gives Sherlock an array of integers. His challenge is to find an element of the array such that the sum of all elements to the left is equal to the sum of all elements to the right. You will be given arrays of integers and must determine whether there is an element that meets the criterion. If there is, return YES.

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Otherwise, return NO.

8	Write a C program to Implement Hash Tables with Quadratic Probing.

9 Given a graph which consists of several edges connecting its nodes, find a subgraph
of the given graph with the following properties: The subgraph contains all the nodespresent in the
original graph. The subgraph is of minimum overall weight (sum of all root- to-leaf path such that
adding up all the values along the path equals target Sum. A leaf is a node with no children.

10 A thief enters a house for robbing it. He can carry a maximal weight of 16 kg into his bag. There are 4
items in the house with the following weights and values. What items should thief take if he either takes
the item completely or leaves it completely? (Use knapsack algorithm)

11

Item	Weight (kg)	Value ($)
Mirror	10	100
Silver nugget	7	63
Painting	8	56
Vase	4	12

12 A Cable Company Manager is assigned to connect all houses of an Apartment with his network. Find
the solution to connect all houses by using minimum length of cable. Thenetwork with the length of
cable required to do the connection is given.(Use Prim's Algorithm)
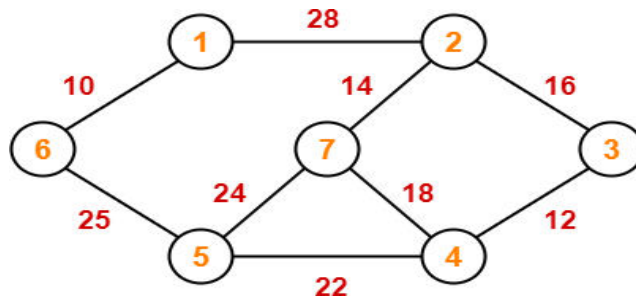
Total Practical Hours   **45**

Course Outcome

CO1: Demonstrate the various Linear data structures using simple applications.
CO2: Demonstrate the various Non-Linear data structures using simple applications.
CO3: Develop skills to use appropriate Data Structures for solving problems
CO4: To Implement various Sorting and Searching Techniques.
CO5: Implement various Algorithms Design Techniques suitable for different types ofproblem

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.Tech	**21IT3002**	**Object Oriented Programming using C++ Laboratory**	**0**	**0**	**3**	**1.5**

Course Objective

1. To understand the basic concepts of Object-Oriented Programming
2. To solve problems based on the concepts of Overloading and Friend Function inC++
3. To understand the concepts of Templates and Virtual Functions
4. To apply the concepts like polymorphism, inheritance and exception handling inC++
5. To apply File Concepts in Programming based on File Manipulation Applications

Exp. No	Description of the Experiments
1	Write a C++ Program to perform a Calculator Operation using Switch Case
2	Write a C++ program to print right angled (Right oriented) pyramid of numbers.
3	Write a C++ program to add two integer numbers using class and Objects
4	A customer in a departmental store is purchasing five products. The marketing prices of the five products are: Price of item 1 = Get input from the userPrice of item 2 = Get input from the userPrice of item 3 = Get input from the userPrice of item 4 = Get input from the userPrice of item 5 = Get input from the user Write a C++ program to hold / save the price of the five products through five different variables. Display each product's price, the subtotal of the sale, the amount of sales tax,and the total. Assume the sales tax is 8%.
5	Ramu went to a restaurant to had his meals. He is charged with Rs. 70.50. The tax should be 8% of the meal cost. The tip should be 10% of the total after adding the tax. Display the meal cost, tax amount, tip amount, and total bill on thescreen. Write a C++ Program to demonstrate this scenario.
6	Write a C++ Program to Calculate Difference Between Two Time Period using Structures
7	Draft a C++ Program to Calculate Average of 'n' Numbers Using Arrays
8	Write a C++ program to create student class with the followingattributes: Name, RollNo, Dept, TotalMarks Do the following Operations with the above read values: 1. ReadValues() 2. Print_student_details() 3. Find_percentage() Demonstrate the above concept using Classes and Objects Concept along with the use of Arrays to Store the values
9	With the help of Operator Overloading Concept in C++ , Use Prefix Increment ++ to illustrateoperatoroverloading with return type
10	Write C++ Program to Subtract Complex Number Using Operator Overloading

11	Using Function Overloading in C++, write a program to add numbers.
	Method 1: takes 2 input as integer data type
	Method 2: takes 2 input as float data type
	Method 3: takes 3 input of type integer and float mixed with each other

12   Suppose you have a Piggie Bank with an initial amount of $50 and you have to add some more amount to it. Create a class 'AddAmount' with a data member named 'amount' with an initial value of $50. Now make two constructors of this class as follows:

1 - without any parameter - no amount will be added to the PiggieBank
2 - having a parameter which is the amount that will be added to the PiggieBank
Create an object of the 'AddAmount' class and display the final amount in the Piggie Bank.

13   Write a Simple Program for C++ Program for Friend Function to mean/average of 2 values

14   Class Square is a friend of Class Rectangle. Write a C++ Program to find the area of thesquare and rectangle using Friend Class Concept.

15   Write a Simple Program to swap two numbers using Function Template

16   Using Class Template write a program to find maximum of two numbers

17   Implement the concept of Class Template Array Program to Search a Number from an array.

18   Write a small program for Exception Handling with Multiple Catch Example Program

19   Write a Simple C++ Program for Catch All or Default Exception Handling

20   Write an example program for Exception Handling Divide by Zero Exception

21   Simple C++ Program for Nested Exception Handling

22   Write an Example Program to illustrate Private Base Class for Employee Salary Calculation.

23   Write a C++ program to read and print student's information using two classes byimplementing simple inheritance concept

24   Simple Program for Virtual Base Class Using C++ Programming To calculate the total markof a student using the concept of virtual base class.

25   Write a C++ program to demonstrate example of hierarchical inheritance to get square andcube of a number

26   Ankit is a very competitive person and always tries to compare him to other. He has got 5 subjects in his course and he wants to make a list of total marks and average marks of the students in his class with their roll numbers. He wants to use the concept of multi-level inheritance doing this. Help him achieve the requiredgoal.
Student class is already been created.

Create 2 classes:
Test: containing the marks of a student in 5 subjects inheriting class student (having rollnumber of the student).
Result: containing the function Display() to compute the total and average and thendisplaying the output as Roll number, total and average which are space separated.

14

Input:
Most of the input is handled for you by the locked code in the editor. The first line will contain the number of test cases(number of students) Each test case has roll number of student in the first line followed by 5 space separated floating numbers in the second line.
Output:
For each test case or student, the output should consist of 3 space-separated values- Rollnumber, total marks, averagemarks
1 < n < 100
0 <= marks <= 100

Constraints: 1 < T <= 100

Create two classes:
Cuboid
The Cuboid class should have three data fields- length, width and height of int types. Theclass should have display() method, to print the length, width and height of the cuboid separated by space.
CuboidVol
The CuboidVol class is derived from Cuboid class, i.e., it is the sub-class of Cuboid class. The class should have read_input() method, to read the values of length, width and height ofthe Cuboid. The CuboidVol class should also overload the display() method to print the volume of the Cuboid (length * width * height).

27   **Input:**
The first line contains the number of test cases and one and only line of each test casecontains 3 space separated integer denoting length, width, and height of the Cuboid

Output:
The output should consist of exactly two lines:
In the first line, print the length, width, and height of the cuboid separatedby space. In the second line, print the volume of the cuboid.
Constraints:

0 <= (length, width, height) <= 100

Create 2 Classes
Class 1: Shape – Base Class
28   Class 2: Rectangle – Derived Class 1
from Shape Class 3: Triangle – Derived
Class 2 from Shape

Use Abstract Class Concept to find area of a Rectangle and Triangle.

29 Consider this is the Content in the file name
"**Input.txt**" Welcome to Hindusthan College of
Engineering and Technology!
AvulPakirJainulabdeen Abdul Kalam was an Indian aerospace scientist who servedas the
11th President of India from 2002 to2007.
He was born and raised in Rameswaram, Tamil Nadu and studied physics and aerospace
engineering. Born: 15 October 1931,Rameswaram
Died: 27 July 2015, Shillong
Full name: AvulPakirJainulabdeen Abdul Kalam
Awards: Bharat Ratna, Hoover Medal, Padma Vibhushan,
MORE Education: Madras Institute of Technology, Anna
University (1955–1960)

Write a Program to count the number of lines in this file

30 Consider this is the Content in the file name
"**Input.txt**" Welcome to Hindusthan College of
Engineering and Technology!
AvulPakirJainulabdeen Abdul Kalam was an Indian aerospace scientist who served asthe11th
President of India from 2002 to2007.
He was born and raised in Rameswaram, Tamil Nadu and studied physics and aerospace
engineering. Born: 15 October 1931,Rameswaram
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Full name: AvulPakirJainulabdeen Abdul Kalam
Awards: Bharat Ratna, Hoover Medal, Padma Vibhushan,
MORE Education: Madras Institute of Technology, Anna
University(1955–1960)

Write a C++ Program to copy data from Input.txt and Paste it inOutput.txt

45

Total Practical Hours

**Course
Outcome**

CO1: Able to Understand advanced use of Arrays in C++ programming.

CO2: Able to create Classes and Objects and use them in their program

CO3: Able to Understand the concept of pointers in C++ programming.

CO4: Able to identify the exception in program and handle them.

CO5: Able to model and implement software solutions with Object Oriented design
concepts

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	21MC3191	Indian Constitution	2	0	0	0

Course Objective

1. Sensitization of student towards self, family (relationship), society and nature.
2. Understanding (or developing clarity) of nature, society and larger systems, on thebasis of human relationships and resolved individuals.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTALE PRINCIPLES** Meaning of the constitution law and constitutionalism – Historical perspectiveof the constitution of India – salient features and characteristics of the constitution of India.	4
II	**FUNDAMENTAL RIGHTS** 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.	4
III	**PARLIAMENTARY FORM OF GOVERNMENT** 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.	4
IV	**LOCAL GOVERNANCE** Local self-government -constitutional scheme of India – Scheme of fundamental right to equality – scheme of fundamental right to certain freedomunder article19 – scope of the right to life and personal liberty under article 21.	4
V	**INDIAN SOCIETY** Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	4
	TOTAL INSTRUCTIONAL HOURS	**20**

Course Outcome CO1: Understand the functions of the Indian government CO2.Understand and abide the rules of the Indian constitution.

TEXT BOOKS:

T1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India, NewDelhi.T2.
R.C.Agarwal, (1997) Indian Political System, S.Chand and Company, New Delhi.
T3. Maciver and Page, Society: An Introduction Analysis, Mac Milan India Ltd., New Delhi.
T4. K.L.Sharma, (1997) ―Social Stratification in India: Issues and Themes‖, Jawaharlal NehruUniversity, New Delhi.

REFERENCE BOOKS:

R1. Sharma, Brij Kishore, Introduction to the Constitution of India: Prentice Hall of India, New Delhi.R2.
U.R.Gahai, Indian Political System , New Academic Publishing House, Jalaendhar.
R3. R.N. Sharma, Indian Social Problems, Media Promoters and Publishers Pvt. Ltd.

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Programme	Course code	Course title	L	T	P	C
BE/BTECH	21HE3071	Career Guidance – Level III Personality, Aptitude and Career Development	2	0	0	0

Course Objectives:
1. Solve Logical Reasoning questions of easy to intermediate level [SLO6]
2. Solve Quantitative Aptitude questions of easy to intermediate level [SLO7]
3. Solve Verbal Ability questions of easy to intermediate level [SLO8]
4. Display good writing skills while dealing with essays [SLO12]

Expected Course Outcome:

Enable students to solve Aptitude questions of placement level with ease, as well as writeeffective essays.

Student Learning Outcomes (SLO):   6, 7, 8, 12

Module:1	Logical Reasoning	6 hours	SLO:6

Clocks, calendars, Direction sense and Cubes
- Clocks
- Calendars
- DirectionSense
- Cubes

Data interpretation and Data sufficiency
- Data Interpretation –Tables
- Data Interpretation - PieChart
- Data Interpretation - BarGraph
- Data Sufficiency

Module:2	Quantitative Aptitude	7 hours	SLO: 7

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
- Problems based on races

Profit and loss, Partnerships and averages
- Basic terminologies in profit and loss

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- Partnership
- Averages
- Weighted average

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
- Problems based on races

Profit and loss, Partnerships and averages
- Basic terminologies in profit and loss
- Partnership
- Averages
- Weighted average

| Module:3 | Verbal Ability | 5 hours | SLO: 8 |

Sentence Correction
- Subject-Verb Agreement
- Modifiers
- Parallelism
- Pronoun-Antecedent 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

| Module:4 | Writing skills for placements | 2 hours | SLO: 12 |

Essay writing
- Idea generation for topics
- Best practices
- Practice and feedback

| **Total Lecture hours:** | **20 hours** |

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	21HE3073	**Leadership Management Skills**	1	0	0	0

Course Objective

1. To know about the leadership skills that is to be acquired for success.
2. To become a teamwork expert, real world problem solver, your views will be challenged
3. To gain global perspective and becoming an effective communicator
4. To understand about learning, negotiation and decision making
5. To get first-hand information about the skills we possess and to work on improvement.

Exp. No	Description of the Experiments
1	Strategic thinking skills
2	Planning and Delivery skills
3	People management skills (Delegation)
4	Change management and Innovation skills
5	Communication skills
6	Persuasion and influencing skills
7	Learning Agility
8	Motivation
9	Personality
10	Emotions
11	Perception
12	Negotiation
13	Decision making
14	Problem solving
15	Building trust

Total Practical Hours   15

Course Outcome

Upon completion of this course, the students will be able to
CO1: To practice essential leadership skills in day to day operations CO2: To work on leadership skills in the study environment
CO3: To understand and develop the skills consciously.
CO4: To know about the real worth of all the skills for success
CO5: To Analyze the real worth of the person and suggestion for improvement.

Text Books:
T1- A Review of Leadership Theory And Competency Frameworks, Bolden, R., Gosling, J,Marturano, A. and Dennison, P. June 2003
T2- Leading from Within: Building Organizational Leadership Capacity-David R. Kolzow, PhD,2014

Reference Books:
R1: Seven Habits Of Highly Effective People – Stephen R.Covey
R2: The Art of Business Leadership: Indian Experiences – G.Balasubramaniam
R3: Developing the Leader Within You-John C. Maxwell

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SYLLABUS

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21MA4102	DISCRETE MATHEMATICS	3	1	0	4

The student should be able

Course Objective	1	Illustrate logical theory and proportional calculus techniques that will create logical thinking.
	2	Explain counting problems using mathematical induction, inclusion and exclusion principles.
	3	Analyze the Boolean algebra which is used in the Boolean logics and circuits.
	4	Apply formal mathematical methods to prove properties of languages, and Context free grammar.
	5	Describe discrete knowledge in computer engineering through finite automata theory.

Unit	Description	Instructional Hours
I	**MATHEMATICAL LOGIC** Propositional logic - Tautology and Contradiction - Propositional equivalences – Normal forms - Principal normal forms - Theory of Inference.	12
II	**COMBINATORICS** Mathematical induction – Recurrence relations – Solving linear recurrence relations -generating functions – principle of inclusion and exclusion – applications	12
III	**LATTICES AND BOOLEAN ALGEBRA** Lattices – Properties of lattices – Lattices as algebraic system – Sub lattices – Some special lattices – Boolean algebra – Definition and simple properties.	12
IV	**FORMAL LANGUAGES** Languages and Grammars - Classification of Grammars – Context Free Grammars and Languages – Derivations.	12
V	**FINITE STATE AUTOMATA** Concepts of Automata Theory–Finite Automata–Types of finite Automata - Deterministic Finite State Automata(DFA),Non-Deterministic Finite State Automata(NFA) – Transition Diagrams - Equivalence of DFA and NFA.	12

Total Instructional Hours

Course Outcome	CO1	Study the notion of mathematical thinking, proofs, and algorithmic thinking.
	CO2	Solve problems using counting techniques and recurrence relations.
	CO3	Infer the knowledge about Lattices and Boolean Algebra.
	CO4	Understand the knowledge of formal languages of Compiler Design
	CO5	Apply the knowledge of finite automata theory and design discrete problems.

TEXT BOOK:

T1 Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education Asia, Delhi, 2016.

T2 Kenneth H rosen , Discrete Mathematics and its Application, Tata McGraw Hill,New Delhi,2018.

REFERENCES:

R1 Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science‖, McGraw Hill,Inc. New York, 30th reprint, 2008.

R2 Kenneth H.Rosen, Discrete Mathematics and its Applications, seventh Edition, Tata Mc Graw Hill Pub.Co.Ltd.,New Delhi, 2013.

R3 John. C. Martin, Introduction to Languages and the Theory of Computation, Tata McGraw-Hill, 2003. R4 - Hopcroft J.E and Ullman,J.D, Introduction to Automata Theory, Languages and Computation,

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**21IT4201**	**JAVA PROGRAMMING**	**3**	**0**	**0**	**3**

	The student should be able	
Course Objective	1	Learn the basics of Java programming language
	2	Discuss the packages and interfaces in Java programming
	3	Learn IO streams and multithreading in Java
	4	Learn generics and collections framework in Java
	5	Understand Event handling and swing in Java

Unit	Description	Instructional Hours
I	**INTRODUCTION** Review of Object-oriented Programming-Introduction to java programming-Features of Java Language, JVM -The Java Environment-Primitive Data types-variables-arrays-control statements-classes and objects-access specifier-methods-constructor-finalize method-strings-Inheritance –class hierarchy– polymorphism – dynamic binding – final keyword – abstract classes.	9
II	**INTERFACES AND PACKAGES** Interfaces-Defining an interface-implementing an interface-applying interface-variables in interface-extended interface-- Packages-defining package-access protection-importing packages -Exception Handling-exception types-uncaught exception-multiple catch-nested try-throw and finally-built-in exceptions-user defined exceptions	9
III	**IO STREAMS AND MULTITHREAD** I/O basics- reading console input -writing console output-reading and writing files-Serialization-Multithreaded programming-java thread model-thread priorities-synchronization-thread class and runnable interface-creating multiple threads-inter thread communication.	9
IV	**GENERICS AND COLLECTIONS FRAMEWORK** Generics- simple Generic Example-Generic class with parameters-The General Form of a Generic Class-Bounded Types-Creating Generic method- Generic interfaces-Generic class hierarchies-Generic restrictions. Collections overview-interfaces-classes-an iterator.	9
V	**EVENT HANDLING AND SWING** Window fundamentals-layout managers-working with 2D shapes-Using color, fonts and images-The Delegation Event Model-Event Classes- The ActionEvent Class- The AdjustmentEvent Class-TheComponentEvent Class- The	9

Container Event Class-Event Listener Interfaces-The ActionListener Interface-The Adjustment Listener Interface-The Component Listener Interface-The Container Listener Interface-Introduction to Swing- Swing components-Text Fields, Text Areas-Buttons-Check Boxes-Radio Buttons-Lists- Choices-Scrollbars-windows-Menus-Dialog Boxes.

Total Instructional Hours 45

	CO1	To Understand the basics of Java Programming
	CO2	Design program using User Defined packages and interfaces
Course	CO3	Develop applications using Multithreading concepts in java
Outcome	CO4	Design real time applications using Generics and Collection frameworks.
	CO5	Apply Event handling classes and Swing concepts to create different applications in java

TEXT BOOK:

T1   Herbert Schildt, Java: The Complete Reference,Tenth edition, McGraw – Hill 2018. ISBN: 9789387432291

REFERENCES:

R1   E.Balagurusamy,Programming with java A Primer‖, 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

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT4202	ADVANCED DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Objective

The student should be able
1. Learn the fundamentals of data models.
2. Acquire knowledge about ER diagrams and Normalization.
3. Gain knowledge about various SQLs and optimization techniques
4. Acquire knowledge about various storage media and databases.
5. Familiarize with the concepts of transactions and concurrency control

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DBMS** Purpose of Database System - Database characteristics - Data Models –Database Architecture – Key issues and challenges in Database Systems - Introduction to relational databases – Relational Model – Relational Algebra	9
II	**DATABASE DESIGN** Relational DBMS – ER model - Extended ER - Functional Dependencies, Non - loss Decomposition, Anomaly - 1NF to 5NF	8
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	**INDEXING AND HASHING** Basic concepts, Ordered Indices: Dense and Sparse Indices – Multi Level Indices – Index Update. B+ - Tree Index Files: Structure of a B+-Tree – Queries in B+ –Trees – Static Hashing, Dynamic Hashing.	9
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 – Dead lock	10
	Total Instructional Hours	**45**

Course Outcome

CO1	Able to design a Data Model.
CO2	Apply ER Diagrams and Normalization concepts for real time applications. CO3: Apply SQL queries and optimization techniques in real time.
CO3	Apply SQL queries and optimization techniques in real time.
CO4	Evaluate the performance of various storage media.
CO5	Apply Transactions and Concurrency mechanisms for real time applications

TEXT BOOK:

T1 Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016. ISBN 9780133971279

T2 Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Seventh Edition, Tata McGraw Hill, 2019. ISBN: 9789339212124

REFERENCES:

R1 C.J.Date, A.Kannan and S.Swamynathan, An Introduction to Database Systems, Eighth Edition, Pearson Education, 2012. ISBN 13: 9788177585568

R2 Raghu Ramakrishnan, ― Database Management Systems‖, Fourth Edition, Tata McGraw Hill, 2014. ISBN: 9789339213114

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**21IT4251**	**OBJECT ORIENTED SOFTWARE ENGINEERING**	**3**	**0**	**2**	**4**

<table>
<tr>
<td rowspan="6">Course
Objective</td>
<td colspan="2">The student should be able</td>
</tr>
<tr>
<td>1</td>
<td>To study pioneer of Software Development Life Cycle, Development models andAgile Software development.</td>
</tr>
<tr>
<td>2</td>
<td>To study fundamental concepts in Software Metrics, Measures and the techniques of estimation.</td>
</tr>
<tr>
<td>3</td>
<td>To discuss various issues and solutions in software Requirements.</td>
</tr>
<tr>
<td>4</td>
<td>To learn the process to model the Software Product.</td>
</tr>
<tr>
<td>5</td>
<td>To gain the techniques and skills on how to use modern software tools to support software projects and to expose Software Process Improvement and Reengineering</td>
</tr>
</table>

Unit	Description	Instructional Hours
I	**Introduction to Software and Software Engineering** The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models-Prescriptive Process Models, Specialized Process Models, Process, Product and Process. Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools.	9
II	**Managing Software Project** Software Metrics (Process, Product and Project Metrics), Software Project Estimations- COCOMO II, Software Project Planning process, ProjectScheduling & Tracking, Risk Management- Software Risks, Risk identification, RMMI.	9
III	**Requirement Analysis and Specification** Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering, System Architecture Applications-Satellite Based Navigation, Artificial Intelligence: Cryptanalysis. **Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).**	8+4(P)
IV	**Object Modeling** The Object Model, Classes and Objects, Classification, Static Modeling - Introduction to UML - Use Case Diagram, Domain Models, and UML Class	9+6(P)

Diagram.

Identify Use Cases and develop the Use Case model and identify the business activities and develop an UML Activity diagram,

Identity the conceptual classes and develop a domain model with UML Class diagram and draw the State Chart diagram

Dynamic Modeling

Interaction and Package Diagram, Activity Diagrams and Modeling, State Machine Diagram and Modeling, UML Component Diagram, UML Deployment Diagram, Object Design, Applying GoF Design Patterns.

V

Using the identified scenarios find the interaction between objects and represent them using UML Interaction Diagrams and draw the Package diagram,   7+8(P)

Draw Component and Deployment diagrams, Practice forward engineering and reverse engineering

| | Total Instructional Hours | 60 |

Course Outcome	CO1	Prepare SRS (Software Requirement Specification) document and SPMP(Software Project Management Plan) document.
	CO2	the concept of Functional Oriented and Object-Oriented Approach forSoftware Design.
	CO3	Recognize how to ensure the quality of software product, different qualitystandards and software review techniques.
	CO4	Apply various Modelling techniques to design the product.
	CO5	Able to understand modern Agile Development and Service Oriented Architecture Concept of Industry.

TEXT BOOK:

T1   Roger S.Pressman, Bruce R. Maxim, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 8th edition (2015). ISBN: 9789353165710

T2   Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Object-Oriented Analysis and Design with Applications, Pearson India; 3rd edition (2010) ISBN-13: 9780132797443

REFERENCES:

R1   Ian Sommerville, Software engineering, Pearson education Asia, 10th Edition,2015 ISBN 9780133943252

R2   PankajJalote, Software Engineering – A Precise Approach Wiley, 2010, ISBN 8126523115

R3   Craig Larmen, Applying UML and Patterns, Pearson Education; 3rd edition, 2015 ISBN-13: 9789332553941

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**21IT4253**	**PRINCIPLES OF OPERATING SYSTEMS**	**3**	**0**	**2**	**4**

Course Objective	**The student should be able** 1 Study the basic concepts and understand the structure of Operating Systems 2 Learn about Processes, Scheduling algorithms. 3 Learn about 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.	9
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.	9
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.	9
V	**VIRTUAL MACHINES** Overview– Building Blocks –Types of Virtual Machines and Their Implementations –Virtualization– Virtual Machine Examples.	6
	Total Instructional Hours	**45**

Course Outcome	CO1	Compare the various System Calls and programs.
	CO2	Analyse the various Scheduling algorithms.
	CO3	Compare Deadlock Concepts and various memory management schemes.
	CO4	Analyse and implement a Storage Management Concepts.
	CO5	Study the Virtual Machine Concepts.

TEXT BOOK:

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

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

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT4001	JAVA PROGRAMMING LABORATORY	0	0	3	1.5

Course Objective

The student should be able

1 To practice implementing Object Oriented Concepts, Package creation in Javausing appropriate coding standards

2 To explore inheritance, interface and exception handling techniques.

3 To practice multithread programming.

4 To practice writing generic programs and collection classes in Java

5 To develop simple applications using Event handling and swing concepts.

Exp No	Description of the Experiments
1	Ritik wants a magic board, which displays a character for a corresponding number for his science project. Help him to develop such a Java application. For example, when the digits 65,66,67,68 are entered, the alphabet ABCD are to be displayed. [Assume the number of inputs should be always 4.]
2	Write a Java program to calculate the fuel consumption of your truck. The program should ask the user to enter the quantity of diesel to fill up the tank and the distance covered till the tank goes dry. Calculate the fuel consumption and display it in the format (liters per 100 kilometers). Convert the same result to the U.S. style of miles per gallon and display the result. If the quantity or distance is zero or negative display" is an Invalid Input". [Note: The US approach of fuel consumption calculation (distance / fuel) is the inverse of the European approach (fuel / distance). Also note that 1 kilometer is 0.6214 miles, and 1 liter is 0.2642 gallons. The result should be with two decimal places.
3	Vohra went to a movie with his friends in a Wave theatre and during break time he boughtpizzas, puffs and cool drinks. Consider the following prices: Rs.100/pizza Rs.20/puffs Rs.10/cool drink Generate a bill in Java for What Vohra has bought.
4	HICET wants to recognize the department which has succeeded in getting the maximum number of placements for an academic year. The departments that have participated in the recruitment drive are CSE, ECE, MECH. Help the college find the department gettingmaximum placements. Check for all the possible output given in the sample snapshot. Note : If any input is negative, the output should be "Input is Invalid". If all department has equal number of placements, the output should be "None of the department has got the highest placement".
5	Rhea Pandey's teacher has asked her to prepare well for the lesson on seasons. When herteacher tells a month, she needs to say the season corresponding to that month. Write a program to solve the above task. Spring – March to May, Summer – June to August,Autumn – September to November and, Winter – December to February. Month should be in the range 1 to 12. If not the output should be "Invalid month".
6	Write a Java program to read the value of an integer m and display the value of n is 1. when m is larger than 0, 0 when m is 0 and -1 when m is less than0.
7	Write a Java program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate point lies.

9
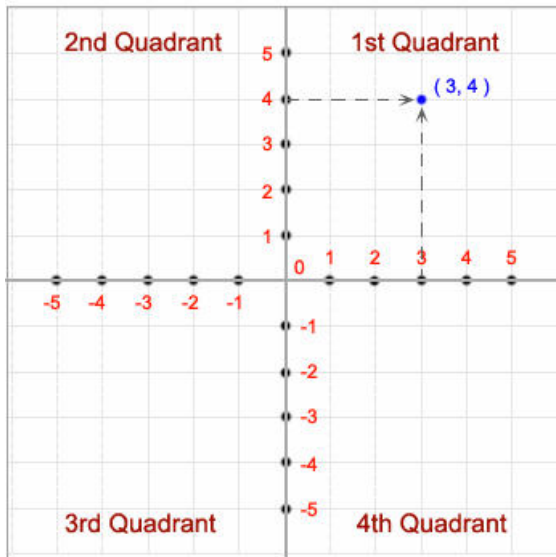
Write a Java program to find the eligibility of admission for a professional course based on the following criteria:

Eligibility Criteria:

Marks in Maths>=65 and Marks in Phy>=55 and Marks in Chem>=50 and Total in all three subject

8   >=190 or Total in Maths and Physics >=140 Input the marks obtained in Physics :65

Input the marks obtained in Chemistry :51 Input the marks obtained in Mathematics :72 Total marks of Maths, Physics and Chemistry: 188

Total marks of Maths and Physics: 137

The candidate is not eligible.

There is a jar full of candies for sale at a mall counter. The jar has the capacity N, that is JAR can contain maximum N Candies when a JAR is full. At any point in time, JAR can have an M number of candies where M<=N. Candies are served to the customers. JAR is never remaining empty as when the last K candidates are left, JAR is refilled with new candidates in such a way that JAR gets full. Write a Java to implement the above scenario. Display JAR at the counter with the available number

9   of candies. Input should be the number of candies one customer orders at a point in time. Update the JAR after every purchase and display JAR at the counter. The output should give the number of candies sold and the updated number of candies in the JAR. If the input is more than the number of candies in JAR, return "INVALIDINPUT".

Given, N=10, Where N is the number of candies available, K<=5, Where K is the number of minimum candies that must be inside JAR ever.

XYZ Technologies is in the process of increment the salary of the employees. This increment is done based on their salary and their performance appraisal rating. 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

10   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".

11   Write a program to create a class Student2 along with two method getData(),printData() to get the value through argument and display the data inprintData. Create the two objects s1, s2 to declare and

access the values from classSTtest.

12 Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.

13 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 functions to print the nth value in the Fibonacci sequence.

14 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.

15 Write a Java program that reads a file name from the user, and then displaysinformation about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

16 Write a Java program to count a total number of duplicate elements in an array.

17 Write a program in C to merge two arrays of same size sorted in descending order.

18 Write a Java program to find sum of rows and columns of a Matrix.

19 Write a Java program to set zeroes in lower triangular of a Matrix.

20 Write a Java program to check whether a given substring is present in the given string.

21 Write a Java program to read n strings through keyboard and sort it.

22 Write a Java Program to read an excel.

23 Write a java program in which you will declare two interface sum and Add inheritsthese interfaces through class A1 and display their content.

24 Write a Java program that creates three threads. First thread displays "GoodMorning" everyone second, the second thread displays "Hello" every two seconds

and the third thread displays "Welcome" every three seconds.

25 Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

26 Write a java program that simulates a traffic light. The program lets the user selectone of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the Program starts.

27 Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display theresult. Handle any possible exceptions like divide by zero.

28	Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the

exception in a message dialog box.

29	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even,second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
30	Write programs of database connectivity using JDBC-ODBC drivers.

Total Instructional Hours :   45

Course	CO1	Understand the basics of Java Programming
	CO2	Design program using Inheritance, interface and exception handling techniques.
Outcome	CO3	Develop applications using multithread programming.
	CO4	Implement data structure concepts using Generic programs and collection classes.
	CO5	Design real time applications using Event handling and Swing

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21IT4002	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	3	1.5

Course Objective	The student should be able
	1 To understand data definitions and data manipulation commands.
	2 To learn the use of nested and join queries
	3 To understand views and constraints
	4 To understand functions, procedures and procedural extensions of data bases
	5 To understand design and implementation of typical database applications

Exp. No	Description of the Experiments
1	Definition Commands, Data Manipulation Commands for inserting, deleting, updating andretrieving tables
2	Database Querying – Simple queries, Nested queries, Sub queries and Joins
3	Views, Sequences, Synonyms
4	Database Programming: Implicit and Explicit Cursors
5	Procedures and Functions
6	Triggers
7	Exception Handling
8	Database Design using ER Modeling, Normalization

Total Instructional Hours   45

Scenario 1

Example 1:

Table 1: Busdiy

Buscode	BusDesc
01	Super Delux
02	Delux
03	Super Fast
04	Normal

Table 2: Busroute

Route_id	Route_no	Buscode	Origin	Dest	Fare	Dist	Capacity
201	33	01	Chennai	Madurai	170	300	45
202	25	02	Trichy	Madurai	45	100	50
203	15	03	Nellai	Madurai	30	90	50
204	36	04	Chennai	Bangalore	150	250	55
205	40	01	Bangalore	Madurai	170	250	45
206	38	02	Madurai	Chennai	160	300	50
207	39	03	Hyderabad	Chennai	160	190	50
208	41	04	Chennai	Cochin	148	320	55
209	47	02	Chennai	Coimbatore	165	300	50
210	46	04	Coimbatore	Chennai	150	300	55

Table 3: Busdepot

Place_id	Place	Address	Station
01	Chennai	12, Beach Rd	Broadway
02	Madurai	17, Bye Pass Rd	Ellis Nagar
03	Trichy	11, First Cross Road	Tollgate
04	Bangalore	15, Second St	Malleswaram
05	Hyderabad	115, Lakeview Rd	Charminar
06	Nellai	12, Temple Rd	Town

Table 4: Journey

J-Id	Date	Time	Route_id	Buscode
01	13-Jan-97	10:00:00	201	01
02	13-Jan-97	12:00:00	201	01
03	13-Jan-97	13:00:00	201	01
04	13-Apr-97	15:00:00	202	02
05	13-Apr-97	17:00:00	202	03
06	13-Apr-97	19:00:00	203	04

Table 5: Ticket

J-Id	Tick_no	Dob	Doj	Time	Station	Origin	Dest	Adults	Child	Totfare	Route_id
01	001	10-Dec-96	13-Jan-97	10:00:00	Broadway	Chennai	Madurai	1	1	225	201
02	002	12-Dec-96	13-Jan-97	12:00:00	Broadway	Chennai	Madurai	2	0	90	202
03	003	01-Jan-97	13-Jan-97	13:00:00	Broadway	Chennai	Madurai	1	1	255	201
04	004	02-Feb-97	13-Apr-97	15:00:00	Tollgate	Trichy	Madurai	3	0	90	203
05	005	05-Mar-97	13-Apr-97	17:00:00	Tollgate	Trichy	Madurai	1	0	150	204
06	006	18-Mar-97	13-Apr-97	19:00:00	Town	Nellai	Madurai	1	1	90	202

Table 6: Ticketdetail

Tick_no	Name	Sex	Age	Fare
001	Latha	F	24	170
001	Anand	M	10	85
002	Pradeep	M	30	45
002	Kuldeep	M	32	45
003	Rakesh	M	48	170
003	Brindha	F	08	85
004	Radhika	F	22	30
004	Juliat	F	21	30

Constraints

1

Journey	Ticket
J_Id(primary key)	J_Id(Foreign key)
Day(Notnull)	Time(Notnull)
Time(Notnull)	Origin(Notnull)
	Dest(Notnull)

3

Busroute	Journey
Route_id (primary key)	Route_id (Foreign key)

4

Ticket	Ticketdetail
Tick_no (primary key)	Tick_no (Foreign key)
Sex (Check constraint for accepting either M of F)	

5

Busdiv	Journey
Buscode (primary key)	Buscode (Foreign key)

Create the above tables by applying the constraints specified and populate the tables. Perform various DML, TCL

14

commands (Select, Insert, Update, Delete, Commit, Rollback, Savepoint, Grant, Revoke). Perform various operation involving arithmetic operators, logical operators, comparison operators, character, number, date functions. Create a view view from the Journey table such that it contains Day, Time and route_idasJ_day,J_time, J_r_id as column headings. Update the jview such that the J_day is "20-jan-98" where J_r_id is 201. Select the contents of corresponding table that jview is based and check whether update has occurred. Perform various join operations on the tables Busdiv and Bus route

Create a synonym passenger for ticket detail table. Select contents of passenger. Create a synonym bus details for busroute table. Drop the passenger synonym. Create an index on route_id column of busroute table. Drop the index. Create a sequence ticket where minimum value is 1 and maximum value is 20 with an incrementof 2 and starting with 1. Insert the sequence ticket into the tick_no column of ticket table. Alter the sequence such that the maximum value is 15. List only the sequences created by you. List only the views created by you. List all the indexes createdby you. Drop all the database objects created by you. Create a procedure that will increment the selected records totfare in the ticket table by 100 update the table. Create a trigger that ensures no changes to the records on specified days.

Scenario 2:

Table 1: Emp

EmpNo	Ename	Job	MGR	HireDate	Sal	Comm	Deptno
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7788	SCOTT	ANALYST	7566	19-APR-87	3000		20
7839	KING	PRESIDENT		17-NOV-81	5000		10
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7876	ADAMS	CLERK	7788	23-MAY-87	1100		20
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

Table 2: Dept

DeptNo	Dname	Loc
10	Accounting	New York
20	Research	Dallas
30	Sales	Chicago
40	Operations	Boston

Table 3: Salgrade

Grade	LoSal	HiSal
1	700	1200
2	1201	1400
3	1401	2000
4	2001	3000
5	3001	9999

Create the above tables by applying the necessary constraints and populate the tables. Perform various DML, TCL commands (Select, Insert, Update, Delete, Commit, Rollback, Save point, Grant, Revoke). Performvarious operation involving arithmetic operators, logical operators, comparison operators, character, number, date functions. Perform various join operations on the tables Emp and Dept. Create Sequence Next_Empno Start with

8000 Increment By 1. Create view from emp table where job is salesman. Create a Procedure that lists all employees' numbers and names from the 'emp' table using a cursor. Create Procedure that selects an employee row given the employee number and displays certain columns. Create statement-level triggers that display a message after an insert, update, or deletion to the 'emp' table.

Scenario 3:

A new supermarket will be opened in 3 months. The owner wants to have a software to manage the supermarket data (inventory, customers, sales,..). Design a database to insert, retrieve, update data. ex. When a product is sold to a customer, the database changes may need to be done reducing the inventory. Real world need for creating views. Provide different Users different roles for separate DB.

Scenario 4:

Design database for university which should include details about student, faculty, course, department. Create, populate the database, perform updates and retrieval. Create views and triggers that does not allow manipulation during holidays. Provide different privileges to different users.

Course Outcome	CO1	Able to populate and query a Database
	CO2	Able to create different applications using SQL commands
	CO3	Able to Create and maintain tables using PL/SQL
	CO4	Able to use front end tool
	CO5	Able to design and implementation of typical Database applications

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21AC4191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

		The student should be able
Course Objective	1	The course aims at imparting basic principles of thought process, reasoning and inferencing.
	2	Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
	3	Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature arealso important in modern society with rapid technological advancements and societal disruptions.
	4	The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view, basic principles of Yoga and holistic health care system, Indian philosophical traditions, Indian linguistic tradition and Indian artistic tradition.

Unit	Description	Instructional Hours
I	Basic Structure of Indian Knowledge System	4
II	Modern Science and Indian Knowledge System	4
III	Yoga and Holistic Health care	4
IV	Philosophical tradition	4
V	Indian linguistic tradition (Phonology, Morphology, Syntax and semantics),Indian artistic tradition and Case Studies.	4
	Total Instructional Hours	**20**

Course Outcome	CO1	Ability to understand the structure of Indian system of life.
	CO2	Connect up and explain basics of Indian Traditional knowledge in modernscientific perspective

REFERENCES:

R1 V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014

R2 Swami Jitatmanand, Modern Physics and Vedant, BharatiyaVidyaBhavanR3. Fritzof Capra, Tao of Physics

R3 Fritzof Capra, Tao of Physics

R4 Fritzof Capra, The wave of Life.

R5 V N Jha(Eng. Trans,), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, makuam

R6 Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.

R7 GN Jha(Eng. Trans.) Ed. R N Jha, Yoga-darshanam with VyasaBhashya, VidyanidhiPrakasham, Delhi, 2016.

R8 RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi,2016.

R9 P R Sharma (English translation), ShodashangHridayam

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21HE4072	**CAREER GUIDANCE – LEVEL IV** Personality, Aptitude and Career Development	2	0	0	0

Course Objective	**The student should be able** 1 Solve Logical Reasoning questions of easy to intermediate level [SLO6] 2 Solve Quantitative Aptitude questions of easy to intermediate level [SLO7] 3 Solve Verbal Ability questions of easy to intermediate level [SLO8] 4 Crack mock interviews with ease [SLO13] 5 Be introduced to problem-solving techniques and algorithms [SLO14]

Module:1	**Logical Reasoning**	**3 hours**	**SLO:**6

Logical connectives, Syllogism and Venn diagrams
- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation
- Venn Diagrams – Solving

Module:2	**Quantitative Aptitude**	**6 hours**	**SLO:** 7

Logarithms, Progressions, Geometry and Quadratic equations
- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded in equalities
- Quadratic Equations

Permutation, Combination and Probability
- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination
- Probability

Module:3	**Verbal Ability**	**2 hours**	**SLO:** 8

Critical Reasoning
- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

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| **Module:4** | **Recruitment Essentials** | **1 hour** | **SLO:** 12 |

Cracking interviews - demonstration through a few mocks
Sample mock interviews to demonstrate how to crack the:
- HRinterview
- MRinterview
- Technical interview

Cracking other kinds of interviews
- Skype/ Telephonicinterviews
- Panelinterviews
- Stressinterviews

Resume building – workshop
> A workshop to make students write an accurate resume

| **Module:5** | **Problem solving and Algorithmic skills** | **8 hours** | **SLO:** 12 |

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

| | **Total Instructional Hours** | **20** |

| **Course Outcome** | CO1 | Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays. |

SYLLABUS

Programme/ sem	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	1. Construct the characteristic polynomial of a matrix and use it to identify eigenvalues and Eigenvectors 2. To impart the knowledge of sequences and series. 3. Analyseanddiscussthemaximaandminimaofthefunctionsofseveralvariables. 4. Evaluate the multiple integrals and apply in solving problems. 5. Apply 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, Jacobian, Maxima, minima and saddle points; Method of Lagrange 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; Green's theorem, Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	**60**

Course Outcome	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: Compute partial derivatives of function of several variables and write Taylor's series for functions with two variables. CO4: Evaluate multiple integral and its applications in finding area, volume. CO5: Apply the concept of vector calculus in two and three dimensional spaces.

TEXTBOOKS:

T1:G.B.Thomas and R.L.Finney,"Calculus and Analytical Geometry", 9[th]Edition Addison Wesley Publishing company, 201 6.

T2:Erwin Kreyszig,"Advanced Engineering Mathematics",John Wiley&Sons, 2019.

T3:K.P.Umaand 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

R2 - StraussM.J,G.L.Bradley andK.J.Smith,"Multi variable calculus",PrenticeHall, 2002.

R3 - Veerarajan T,"Engineering Mathematics",McGraw Hill Education(India)Pvt Ltd, NewDelhi, 2016.

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PROGRAMME/SEM	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	1. To improve the communicative proficiency of learners 2. To help learners use language effectively in professional writing 3. To advance the skill of maintaining the suitable to of communication. 4. To introduce the professional life skills. 5. To impart official communication etiquette.

Unit	Description	Instructional Hours
I	**Language Proficiency:** Types of Sentences, Functional Units, Framing question. **Writing:** process description, Writing Checklist. **Vocabulary** – words on environment. **Practical Component: Listening**- Watching short videos and answer the questions, **Speaking**- Self introduction, formal& semi-formal	7+2
II	**Language Proficiency**: Tenses, Adjectives and adverbs. **Writing:** Formal letters (letters conveying positive and negative news), Formal and informal email writing (using emoticons, abbreviations& acronyms), reading comprehension. **Vocabulary**– words on entertainment. **Practical Component: Listening**-Comprehensions based on TED talks **Speaking-** Narrating a short story or an event happened in their life	7+2
III	**Language Proficiency:** Prepositions, phrasal verbs. **Writing:** Formal thanks giving, Congratulating, warning and apologizing letters, cloze test. **Vocabulary** – words on tools. **Practical Component: Listening**-Listen to songs and answer the questions **Speaking**-Just a minute	5+4
IV	**Language Proficiency:** Subject verb concord, Prefixes & suffixes. **Writing:** Preparing agenda &minutes, writing an event report. **Vocabulary**– words on engineering process. **Practical Component: Listening**- Comprehensions based on Talk of orators or interview shows **Speaking-**Presentation on a general topic with ppt.	5+4
V	**Language Proficiency:** Modal Auxiliaries, Active & passive voice, **Writing:** Project report(proposal progress),sequencing of sentences **Vocabulary**–words on engineering material. **Practical Component: Listening**- Listening- Comprehensions base on Nat Geo/Discovery channel videos **Speaking-** Preparing posters and presenting as a team.	6+3

Total Instructional Hours   **45**

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Course Outcome	CO1:To communicate in a professional forum
	CO2:To speak or write a content in the proficient language
	CO3:Tomaintainanduseappropriatetoneofthecommunication.
	CO4:To read, write and present in a professional way.
	CO5:To follow the etiquettes informal communication.

TEXT BOOKS:

T1- Norman Whit by, "Business Benchmark - Pre - intermediate to Intermediate", Cambridge University Press,2016.T2-Raymond Murphy, "Essential English Grammar", Cambridge University Press,2019.

REFERENCE BOOKS:

R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice",Oxford University Press, 2009

R2-RaymondMurphy, "English Grammar in Use"-4[th]editionCambridgeUniversityPress,2004.

R3-KamaleshSadanan"A Foundation Course for the Speakers of Tamil-Part-I & II",Orient Blackswan,2010.

Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E./ B.Tech/I	22CY1151	CHEMISTRY FOR CIRCUIT ENGINEERING (ECE, EEE, EIE, BME,CSE, IT, AIML)	2	0	2	3

Course Objective

The learner should be able to
1. Acquire knowledge on the concepts of chemistry involved in day today life.
2. Identify the water related problems and water treatment techniques.
3. Enhance the fundamental knowledge on electro chemistry and the mechanism of corrosion and its control.
4. Gain knowledge on the nuclear energy source and batteries.
5. Extend the knowledge on the concepts of spectroscopy and its applications.

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE**	**6**

Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics- Preparation, properties and uses of PVC, Teflon and Thermo setting plastics - Preparation, properties and uses of Polyester and Polyurethane.

| **II** | **WATER TECHNOLOGY** | **6+9=15** |

Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary 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.**

| **III** | **ELECTROCHEMISTRY AND CORROSION** | **6+6= 12** |

Electro chemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bed worth rule – electro chemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HCl vs NaOH). Estimation of Ferrous iron by Potentiometry.**

| **IV** | **ENERGY SOURCES AND STORAGE DEVICES** | **6** |

Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium ion battery- fuel cell H_2 -O_2 fuel cell applications.

| **V** | **SPECTROSCOPY** | **6** |

Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) - applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles –

instrumentation (block diagram only) – Estimation of nickel by atomic absorption spectroscopy.

Total Instructional Hours   45

Course Outcome

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

CO1: List out the chemicals used in food, soaps and detergents, drugs, cosmetics and plastics

CO2: Differentiate hard and soft water and solve the related problems on water purification in domestic aswell as in industries.

CO3: Develop knowledge on the basic principles of electro chemistry and understand the causes ofcorrosion, its consequences to minimize corrosion to improve industrial design

CO4: Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities

CO5: List out the applications of spectroscopic techniques in various engineering fields.

TEXT BOOKS

T1 - P.C.Jain& Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2018).

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

REFERENCE BOOKS:

R1 - ShikhaAgarwal "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).

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Programme / Semester	Course Code	Name of the Course	L	T	P	C
B.E. / I	22CS1151	**PROBLEM SOLVING USING C PROGRAMMING**	**2**	**0**	**2**	**3**

Course Objective	**The learner should be able to**
	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.	7
II	**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. *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

III   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

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:

6+4

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.

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*

IV	**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. *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.* Enter your PlainText: All the best Enter the Key: 1 The encrypted Text is: BmmuifCftu	**5+4**
V	**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. *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   **30+15**

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

CO1: Develop simple algorithms for arithmetic and logical problems.

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

Course Outcome
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: YashvantKanetkar, "Exploring C", BPB Publishers, 2nd edition, 2003.

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

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Programme /sem	Course Code	Name of the Course	L	T	P	C
B.Tech	22CS1152	OBJECT ORIENTED PROGRAMMING USING PYTHON (Common to CSE, IT, ECE and AI&ML)	2	0	2	3

Course Objective	**The learner should be able to**
	1. To read and write simple Python programs.
	2. To develop Python programs with conditionals and loops.
	3. To define Python functions and call them.
	4. To understand OOP concepts and write programs using classes and objects.
	5. To do input/output with files in Python.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PYTHON** What is Python - Advantages and Disadvantages, Benefits and Limitation- Downloading and Python-installation-Python Versions-Running Python Scripts, Executing scripts with python launcher-Using interpreter interactively- Using variables-String types: normal, raw and Unicode-String operations and functions- Math operator and functions. Illustrative program: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.	7+2(P)
II	**DATA TYPES, STATEMENTS,CONTROL FLOW** Data Types(List, Tuple, string, dictionary, set)-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 programs: Find the square root of a number, To find the given number is Prime or not, Write a Python program which accepts a sequence of comma-separated numbers from user, generate a list and find the sum and average of the numbers.	5+4(P)
III	**PYTHON FUNCTIONS** Introduction to functions-Global and local variable in python-Decorators in python-Python lamda functions-Exception handling in python. Illustrative programs: Square root, GCD, exponentiation, linear search, binary search, Write a menu driven program to perform the following task: a) A function Sum_DigN( ) to find the s um of the digits of a given n umber, b) A recursive function Sum_DigR( ) to find the same.	5+4(P)
IV	**PYTHON OOPS** Introduction to oops concept-Python class and objects-Constructor in python- Inheritance- Types of inheritance- Encapsulation in python- Polymorphism in python. Illustrative programs: Write a Python program using class for the calculation of telephone bill. The charges for the calls are fixed as follows: Unit Call Cost/unit Below 100 calls No Charge, only rental amount Rs. 250 100-150 calls Rs. 1.00 151-300 calls Rs. 2.50 301-600 calls Rs. 4.50 Above 600 Rs. 6.00	5+4(P)

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V	FILES, PACKAGES	

File handling in python-Open a file in python-How to read from a file in python-writing to file in python-Python numpy- Python pandas. Illustrative programs: How to display the contents of text file in reverse order? Write the code for the same, not exceeding 10 lines of code, Creating Modules and Packages for arithmetic Operations.

5+4(P)

Total Instructional Hours   45

Course Outcome

At the end of the course, the learner will be able to
CO1: Understanding the basic concepts to read, write and execute simple python programs.
CO2: Apply the conditional and looping concepts for solving problems.
CO3: Apply functions to decompose larger complex programs.
CO4: Understanding the OOPS concepts and writing programs using classes and objects
CO5: Understand to read and write data from/to files in Python Programs.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCE BOOKS:

R1: Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
R2: Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.
R3: Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

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Programme	Course Code	Name of the Course	L	T	P	C
B TECH	**22IT1152**	**Introduction to Web Application Development**	2	0	2	3

Course Objective	1. To discuss the essence of software development methods 2. To gain knowledge about basic HTML Tags. 3. To create static websites using HTML. 4. To impart knowledge about Cascading Style sheet. 5. To design a front end web application using HTML and CSS

Unit	Description	Instructional Hours
I	**Unit-1 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.	**5**
II	**Unit-2 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. **Illustrative problems**: Designing a web page using HTML basic tags, Developing web site with suitable contents and links, Designing web pages using lists and tables, Designing a web page using images and embed an image map in a web page	**(6+4)**
III	**Unit-3 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. **Illustrative problems:** Designing the Login form with username, password and submit field, Designing a course registration form.	**(6+4)**
IV	**Unit-4 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. **Illustrative problems:** Developing a web application using internal, external and embedded style sheet, Applying style specification in HTML page using CSS.	**(6+4)**
V	**Unit-5 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.	**(6+4)**

Illustrative problems: Developing an web application using CSS Positioning.

Total Instructional Hours   45

<table>
<tr><td rowspan="5">**Course Outcome**</td><td>1.</td><td>Basic understanding of development of software life cycle.</td></tr>
<tr><td>2.</td><td>To understand basic HTML Tags.</td></tr>
<tr><td>3.</td><td>Designing a simple web application using HTML.</td></tr>
<tr><td>4.</td><td>Understanding about the usage of Cascading Style Sheet.</td></tr>
<tr><td>**5.**</td><td>Creating a front end Web application using HTML and CSS</td></tr>
</table>

TEXT BOOKS:

T1 – Roger S.Pressman, Bruce R. Maxim, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 8th edition (2015). ISBN: 9789353165710

T2- Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

T3- Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.

REFERENCE:
R1 - Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
R2 - https://www.w3schools.com/
R3 - https://www.tutorialspoint.com/

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Programme/ sem	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech /II	22HE1071	UNIVERSAL HUMAN VALUES –II (COMMON TO ALL BRANCHES)	2	0	0	2

Course Objective

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' toensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human realityand 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 theNeeds 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. Interconnectedness, self-regulation and Mutual Ful filment 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**

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	CO1: To become more aware of holistic vision of life - themselves and their surroundings.
Course	CO2: To become more responsible in life, in the Society and in handling problems with sustainableSolutions.
Outcome	CO3: To sensitive towards their commitment towards what they understood towards environment andSocially responsible behavior.
	CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life andIn 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'Manualfor*AFoundationCourseinHumanValuesandProfessionalEthics*,RRGaur, R Asthana,G P Bagaria, 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

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

R4.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
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Programme/ sem	Course Code	Name of the Course	L	T	P	C
B.E./ B.Tech /II	22HE1072	**ENTREPRENEURSHIP &INNOVATION**	1	0	0	1

Course Objective	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/PitchDeck
11	Negotiating Deals
12	New Venture Creation
13	Lean Start-ups
14	Entrepreneurial Ecosystem
15	Velocity Venture

Course Outcome	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 effectivelyandefficientlythepotentialofnewbusinessopportunities.
	CO4:Assess the market potential for a new venture, including customer need, competitors, andindustry attractiveness.
	CO5:Develop a business model for a new venture,including revenue.Margins,operations, Workingcapital, and investment

TEXT BOOKS

T1**:** Arya Kumar "Entrepreneurship–Creating and leading an Entrepreneurial Organization", Pearson, Second Edition(2012).
T2: Emrah Yayici"Design Thinking Methodology", Artbiz tech, First Edition(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).

WEBRESOURCES

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/III.	22MC1092	**INDIAN CONSTITUTION**	2	0	0	0

Course Objective	1. Sensitization of student towards self,family(relationship), society and nature 2. Understanding(or developing clarity)of nature,society and larger systems,on the basis o fhuman relationships and resolved individuals 3. Strengthening of self-reflection 4. Development of commitment and courage to act

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism– Historical perspective of the constitution of India– salient features and characteristics of theconstitution of India.	6
II	**FUNDAMENTAL RIGHTS** 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
III	**PARLIAMENTARY FORM OF GOVERNMENT** 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
IV	**LOCAL GOVERNANCE** 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
V	**INDIAN SOCIETY** 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	Upon completion of the course, students will be able to CO1: Understand the functions of the Indian government. CO2:Understand and abide the rules of the Indian constitution

TEXT BOOKS:
T1-DurgaDasBasu,"Introduction to the Constitution of India", Prentice Hall of India, NewDelhi,1997.
T2- Agarwal R C.,"Indian Political System", S. Chand and Company, NewDelhi,1997.
T3-MaciverandPage,"Society:An Introduction Analysis",Mac Milan India Ltd., NewDelhi.
T4-SharmaKL., "Social Stratification in India: Issuesand Themes", Jawaharlal NehruUniversity, NewDelhi,1997.

REFERENCE BOOKS:
R1 - Sharma, Brij Kishore,"Introduction to the Constitution of India: , Prentice Hall of India, NewDelhi.
R2 - Gahai U R.,"Indian Political System",New Academic Publishing House, Jalaendhar.
R3 - Sharma R N.,"Indian Social Problems", Media Promoters and Publishers Pvt.Ltd.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E/B.Tech	22IT1151	Python Programming and Practices (ECE, AERO)	2	0	2	3

Course Objective	1. To know the basics of algorithmic problem solving 2. To read and write simple Python programs 3. To develop Python programs with conditionals and loops and to define Python functions and call them 4. To use Python data structures –- lists, tuples, dictionaries 5. To do input/output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	(5+2)
II	**DATA, STATEMENTS, 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;	(6+4)
III	**FUNCTIONS, STRINGS** Functions, parameters and arguments; Fruitful functions: return values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module.	(6+4)
IV	**LISTS, TUPLES, 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.	(6+4)
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages	(6+2)

TOTAL INSTRUCTIONAL HOURS 45

S.No	List of Experiments
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 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 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.
9	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
10	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
11	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.
12	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.
13	Read the N no of elements from the user and append it into the list, perform linear search operations using python programming List operations
14	Read the List of Numbers from the user with N elements and perform Selection sorting operation using python programming.
15	Write a python program to take input as filename with extension, perform reading and writing operations in the file.
Course Outcome	CO1: Develop algorithmic solutions to simple computational problems CO2: Read, write, execute by hand simple Python programs CO3: Structure simple Python programs for solving problems and Decompose a Python program into functions CO4: Represent compound data using Python lists, tuples, dictionaries CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff 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: Charles Dierbach, ─Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.

R2: Timothy A. Budd, ─Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015

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

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SYLLABUS

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22MA2103**	**DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA (AIML,CSE,IT)**	**3**	**1**	**0**	**4**

Course Objective		**The student should be able**
	1	Describe some methods to solve different types of first order differential equations.
	2	Understand the various approach to find general solution of the ordinary differential equations
	3	Evaluate 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, cosax- – 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 – Hermitian and Skew Hermitian matrices – Properties (without proof) – Unitary matrix – Properties (without proof) - Inner product spaces – Gram – Schmidt orthogonalization	**12**
	Total Instructional Hours	**60**

Course Outcome	CO1	Apply few methods to solve different types of first order differential equations.
	CO2	Evaluate the solutions of higher 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 space

TEXT BOOK:

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

REFERENCES:

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.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22PH2101	BASICS OF MATERIAL SCIENCE (Common to all branches except MCT)	2	0	0	2

Course Objective

The student should be able
1. Gain knowledge about Crystal systems and crystal structures
2. Understand the knowledge about electrical properties of materials
3. Enhance the fundamental knowledge in semiconducting materials.
4. Gain knowledge about magnetic materials
5. Acquire fundamental knowledge new engineering materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**CRYSTAL PHYSICS** Crystal systems - Bravais lattice - Lattice planes - Miller indices – Inter planar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures -– Fermi-Dirac statistics – Density of energy states .	6
III	**SEMICONDUCTING MATERIALS** Introduction – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Intrinsic semiconductor — electrical conductivity – band gap determination. - Extrinsic semiconductor – n type and p type semiconductor –Light Emitting Diode.	6
IV	**MAGNETIC MATERIALS** Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications.	6
V	**NEW ENGINEERING MATERIALS** Metallic glasses: melt spinning process, Preparation and applications - shape memory alloys: phases, shape memory effect - Characteristics of SMA : Pseudoelastic effect, Super elasticity and Hystersis. Applications of SMA. Nanomaterials preparation (bottom up and top down approaches) – various techniques - pulsed laser deposition - Chemical vapor deposition	6
	Total Instructional Hours	**30**

Course Outcome

CO1	Understand the Crystal systems and crystal structures in the field of Engineering
CO2	Illustrate the fundamental of electrical properties of materials
CO3	Discuss concept of acceptor or donor levels and the band gap of a semiconducting materials
CO4	Develop the technology of the magnetic materials and its applications in engineering field
CO5	Understand the advanced technology of new engineering materials in the field of Engineering

TEXT BOOK:

T1 Rajendran V, "Materials Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2 M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New

REFERENCES:

R1 Charles Kittel "Introduction to Solid State Physics". Wiley., New Delhi 2017
R2 Dr. M.Arumugam "Materials Science " Anuradha publications., 2019

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)	2	0	2	3

Course Objective

The student should be able
1 To improve essential business communication skills.
2 To enrich employability knowledge.
3   To acquire the crucial organizing ability in official forum.
4 To impart important business writings.
5 To make effective presentation with essential etiquette.

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature **Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech**	9
II	Language Proficiency: 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**	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension, Vocabulary– words on society **Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation**	9
IV	Language Proficiency: Idioms 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**	9
V	Language Proficiency: spotting errors 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.**	9
	Total Instructional Hours	**45**

Course Outcome

CO1 To the business procedure and promotion skills.
CO2 To make oral and written presentation in corporate forum.
CO3 To schedule official events and participate in official discussions without reluctance.
CO4 To take an effective role and manage in an organizational sector.
CO5 To prepare and demonstrate a professional presentation

TEXT BOOK:

T1 Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016.
T2 Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.
T3

REFERENCES:

R1 Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009.
R2 Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009.
R3 Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

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Programme	Course code	Name of the course	L	T	P	C
		PHYSICS FOR CIRCUIT ENGINEERING				
B.TECH.	22PH2151	PROGRAMME	2	0	2	3
		(AIML, CSE, ECE, EEE, EIE, IT & BME)				

The student should be able

<table>
<tr><td rowspan="6">Course Objective</td><td>1</td><td>Gain knowledge about laser, their applications, become conversant with principles of optical fiber and its applications</td></tr>
<tr><td>2</td><td>Enhance his fundamental knowledge about properties of matter</td></tr>
<tr><td>3</td><td>Understand the concept of wave optics</td></tr>
<tr><td>4</td><td>Gain knowledge about quantum mechanics to explore the behavior of sub atomic particles</td></tr>
<tr><td>5</td><td>Acquire fundamental knowledge of Ultrasonics and their applications.</td></tr>
</table>

Unit	Description	Instructional Hours
I	**LASER AND FIBER OPTICS** Spontaneous emission and stimulated emission –Type of lasers – Nd:YAG laser - Laser Applications – Holography – Construction and reconstruction of images. Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index and modes) – Fiber optical communication link. **Determination of Wavelength and particle size using Laser**	6
II	**PROPERTIES OF MATTER** Elasticity – Hooke's law – Poisson's ratio – Bending moment – Depression of a cantilever – Determination 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**	6
III	**WAVE OPTICS** Interference of light – air wedge –Thickness of thin paper (Testing of thickness of surface) -Michelson interferometer - Diffraction of light –Fraunhofer diffraction at single slit – Diffraction grating - Plane Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating** **Determination of thickness of a thin wire – Air wedge method**	6
IV	**QUANTUM PHYSICS** Black body radiation –Compton effect: theory and experimental verification – wave particle duality –concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box.	6
V	**ULTRASONICS** Production – Piezoelectric generator – Properties of Ultrasonic waves. Determination of velocity using acoustic grating – Cavitation. Industrial applications – Drilling and welding – Nondestructive testing (pulse echo system). Medical applications – Ultrasound Scanner – A – mode – B- mode and C –mode.	6
	Total Instructional Hours	30
	Total Lab Instructional Hours	30

5

	CO1	Understand the advanced technology of LASER and optical communication in the field of engineering
Course Outcome	CO2	Illustrate the fundamental properties of matter
	CO3	Discuss the Oscillatory motions of particles
	CO4	Understand the dual nature of matter and the Necessity of quantum mechanics.
	CO5	Develop the Ultrasonics technology and its applications in NDT.

TEXT BOOK:

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, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCES:

R1   M.N Avadhanulu and PG Kshirsagar"A Text Book of Engineering physics"S.Chand and Company ltd., NewDelhi 2016

R2   Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2021

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22IT2251	Python Programming and Practices (Common to IT, CSE & AIML)	2	0	2	3

Course Objective

The student should be able
1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs
3. To develop Python programs with conditionals and loops and to define Python functions and call them
4. To use Python data structures –- lists, tuples, dictionaries
5. To do input/output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	(5+2)
II	**DATA, STATEMENTS, 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;	(6+4)
III	**FUNCTIONS, STRINGS** Functions, parameters and arguments; Fruitful functions: return values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module.	(6+4)
IV	**LISTS, TUPLES, 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.	(6+4)
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages	(6+2)
	Total Instructional Hours	**45**

S.No	List of Experiments
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.

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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 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 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.
9	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
10	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
11	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.
12	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.
13	Read the N no of elements from the user and append it into the list, perform linear search operations using python programming List operations
14	Read the List of Numbers from the user with N elements and perform Selection sorting operation using python programming.
15	Write a python program to take input as filename with extension, perform reading and writing operations in the file.

	CO1	Develop algorithmic solutions to simple computational problems
	CO2	Read, write, execute by hand simple Python programs
Course Outcome	CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
	CO4	Represent compound data using Python lists, tuples, dictionaries
	CO5	Read and write data from/to files in Python Programs.

TEXT BOOK:

T1	Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff 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

REFERENCES:

R1	Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
R2	Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015
R3	Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22IT2252**	**Relational Database Management System**	**2**	**0**	**2**	**3**

	The student should be able
Course Objective	1 List and explain the fundamental concepts of a relational database system.
	2 Utilize a wide range of features available in a DBMS package.
	3 Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.
	4 Manipulate a database using SQL.
	5 Assess the quality and ease of use of data modeling and diagramming tools.

Unit	Description	Instructional Hours
I	**UNDERSTANDING DATABASE CONCEPTS** Introduction-tables-Primary keys-Foreign keys-Installation of SQLite-Installation of DB2 data database-Database storage introduction-Database normalization-Indexes and how they are used in databases-Configure non-clustered indexes-Configure clustered indexes	9
II	**ENTITIES AND RELATIONSHIPS** Introduction to Entities and Relationships-Entities and Their Attributes-Domains-Basic Data Relationships-Documenting Relationships-Dealing with Many-to-Many Relationships-Relationships and Business Rules-Data Modeling Versus Data Flow-Schemas	3+6(P)
III	**RELATIONAL DATABASE DESIGN THEORY** Introduction to The Relational Data Model-Understanding Relations-Primary Keys-Representing Data Relationships-Views-The Data Dictionary-Normalization-Translating an ER Diagram into Relations-Normal Forms-Types of Normal Forms-Database Design and Performance Tuning introduction-Indexing-Clustering-Partitioning-Understand data definition language (DDL)	5+4(P)
IV	**USING INTERACTIVE SQL AND MANIPULATE A RELATIONAL DATABASE** Introduction to manipulating data-Understand data manipulation language (DML)-JDBC As The Fundamental Java API - JDBC basics-JPA as the JAVA ORM API-From JDBC to JPA	5+4(P)
V	**DATABASE IMPLEMENTATION ISSUES** Database Security Introduction-Sources of External Security Threats-Sources of Internal Threats-External Remedies-Internal Solutions-Understanding Database Backup and Restore-Understand different types of backups-Define a backup and recovery strategy-Test your knowledge	5+4(P)
	Total Instructional Hours	**45**

S.No	List of Experiments
1	Creating indexes
2	Create Tables
3	Create Stored Procedures and Functions
4	Read data using SELECT statements
5	Query Multiple tables with join statements
6	Create database and connecting to table using Java API
7	CRUD Operation using JPA

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| 8 | Set permissions on database |
| 9 | Restore a database |

	CO1	Describe the fundamental elements of relational database management systems
	CO2	Explain the basic concepts of relational data model, entity-relationship model, relational
Course	CO3	Improve the database design by normalization.
Outcome	CO4	Design ER-models to represent simple database application scenarios
	CO5	Convert the ER-model to relational tables, populate relational database and formulate SQL

TEXT BOOK:

T1   IBM Course Ware

REFERENCES:

R1   Database Design and Relational Theor-Normal Forms and All That Jazz.,2019

R2   Pro SQL Server Relational Database Design and Implementation-Louis Davidson, Jessica Moss.,2016

R3   Relational Theory for Computer Professionals-C.J. Date.,2013

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22IT2253**	**DYNAMIC WEB DESIGN** **(Common to IT, CSE & AIML)**	**2**	**0**	**2**	**2**

Course Objective	**The student should be able** 1 To get Introduction to Java Script 2 To understand about Dialog box and functions in Java Script 3 To learn about Control statements in Java script 4 To study bout Arrays and objects in Java Script 5 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 Types-Identifiers - Operators. *Conversion of Celsius to Fahrenheit using JavaScript. Java Script to perform Arithmetic Operations-Calculation of diameter, circumference and area of the circle.*	7+2
II	**DIALOG BOX AND FUNCTIONS** User Input with prompt Dialogs (alert, prompt, confirm) - Arithmetic operations using prompt (Detail) - Display Date and Time with Greeting - Functions-Function Expression - Arrow Function. *Input two Integers from user and displays the sum, product, difference and quotient of the two numbers using functions and alert box. Input three integers from user and display sum, average in alert dialog using functions.*	7+2
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. *Check for eligibility to drive a vehicle - Rate the student performance 5 to 1 using switch- loop that will iterate from 0 to 15. For each iteration, it will check if the current number is odd or even, and display a message to the screen.*	7+2
IV	**ARRAYS AND OBJECT** Arrays - Declaring and Allocation Arrays - Array Methods - Built in Object - Math – String-Date – Boolean – documents – window - using cookies. *Random Image Generator Using Arrays - Display current Date and Time in a Web page.*	7+2
V	**EVENT HANDLING AND REGULAR EXPRESSION**	7+2

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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. *Form validation - Design Job Skills web page-what happens for a failing applicant and a successful applicant.*

Total Instructional Hours	**45**

Course Outcome	CO1	Design simple dynamic web pages
	CO2	Develop a web page using prompt and using functions.
	CO3	Creation of dynamic web page using Control Statements
	CO4	Creating an interactive webpage using Arrays and Objects
	CO5	Design a web page that handles Events.

TEXT BOOK:

T1   Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Fourth Edition, Pearson Education, 2006.

T2   Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.

REFERENCES:

R1   Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

R2   John Dean "WEB PROGRAMMING with HTML5, CSS, and JavaScript", Bartlett Learning, LLC 2019.

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Programme	Course code	Name of the course	L	T	P	C
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	CO1	Fabricate wooden components and pipe connections including plumbing works.
	CO2	Fabricate simple weld joints.
	CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22HE2071**	**DESIGN THINKING**	**2**	**0**	**0**	**2**

Course Objective	**The student should be able**	
	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	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 BOOK:

T1 Nigel Cross, "Design Thinking", Kindle Edition

REFERENCES:

R1 Tom Kelley, "Creative Confidence", 2013.
R2 Tim Brown, "Change by Design", 2009

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22HE2072**	**SOFT SKILLS AND APTITUDE I**	**0**	**0**	**0**	**1**

Course Objective		**The student should be able**
	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	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

REFERENCES:

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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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.

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.

அலகு III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:   **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்

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விளையாட்டுகள்.

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.

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.

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)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
    (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text
    Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference
    Book.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	**22MC2092**	**HERITAGE OF TAMIL**	**2**	**0**	**0**	**0**

Course Objective	**The student should be able** 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, Kaniyan koothu, 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	CO1	Learn about the works pertaining to Sangam age
	CO2	Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
	CO3	Appreciate 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

TEXTBOOKS:

Chairman - BoS
IT - HiCET

Dean – Academics

Dean (Academics)
HiCET

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).

REFERENCES:

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 Text Bookand Educational Services Corporation, Tamil Nadu)
R3	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Chairman - BoS
IT - HiCET

Dean (Academics)
HiCET

CO'S, PO'S & PSO'S MAPPING

SEMESTER I - R2022

AY2022-23 – Batch 2022

Course Code & Name : 22MA1101/ MATRICES AND CALCULUS

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	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2	2

Course Code & Name : 22HE1151 / ENGLISH FOR ENGINEERS

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

Course Code & Name : 22CY1151/ CHEMISTRY FOR CIRCUIT ENGINEERING

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	-	-	-
CO2	2	3	2	1	1	1	1	-	1	-	1	2	-	-	-
CO3	2	2	2	2	1	1	1	-	1	-	1	2	-	-	-
CO4	2	2	3	1	2	1	1	-	1	-	2	2	-	1	1
CO5	2	3	3	2	2	1	1	-	1	-	1	2	-	-	-
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1	1

Course Code & Name: 21IT1151/ Problem Solving using C programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	0	0	1	0	0	0	0	0	1	1	1	2	2
CO2	1	1	1	0	1	0	0	0	1	0	0	1	1	2	2
CO3	1	1	1	0	1	0	0	0	0	1	0	1	0	1	1
CO4	1	1	1	0	0	0	0	0	1	0	1	1	0	1	1
CO5	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
Avg	1.4	1	1	0	0.6	0	0	0	0.4	0.4	0.6	1	0.6	1.4	1.4

Course Code & Name: 22IT1152 Introduction to Web Application development

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	0	0	1	1	0	0	0	0	1	1	0	0
CO2	3	3	3	1	2	1	1	0	0	0	1	1	1	1	1
CO3	3	2	3	2	1		2	0	1	0	2	2	3	2	2
CO4	3	3	3	1	0	1	2	0	1	0	0	2	2	3	3
CO5	3	3	3	0	2		2	0	1	0	1	3	3	3	3
Avg	3	2.8	3	0.8	1	1	1.6	0	0.6	0	0.8	1.8	2	1.8	1.8

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER I - R2022

AY2022-23 – Batch 2022

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	I	22MA1101	Matrices and Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2	2
		22HE1151	English for Engineers	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2	2
		22CY1151	Chemistry for Circuit Engineers	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1	1
		22CS1151	Problem solving using C programming	1.4	1	1	0	0.6	0	0	0	0.4	0.4	0.6	1	0.6	1.4	1.4
		22IT1152	Introduction to Web Application Development	3	2.8	3	0.8	1	1	1.6	0	0.6	0	0.8	1.8	2	1.8	1.8

Course Code & Name : 22MA2103   Differential Equations And Linear Algebra

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	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2	2

Course Code & Name : 22PH2101   Basics of Material Science

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

Course Code & Name : 22HE2151   Effective Technical Communication

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	-	-	-
CO2	2	3	2	1	1	1	1	-	1	-	1	2	-	-	-
CO3	2	2	2	2	1	1	1	-	1	-	1	2	-	-	-
CO4	2	2	3	1	2	1	1	-	1	-	2	2	-	1	1
CO5	2	3	3	2	2	1	1	-	1	-	1	2	-	-	-
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1	1

Course Code & Name: 22PH2151   Physics for Circuit Engineering

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 22IT2251   Python programming and Practices

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	0	1	0	0	2	0	0	1	1	0	0
CO2	3	1	1	3	0	3	0	1	2	0	0	2	1	1	1
CO3	3	1	1	3	0	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	0	2	0	0	2	0	0	1	1	0	0
Avg	3	1	1	3	0	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 22IT2252   Relational Database Management System

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	0	0	1	1	0	0	0	0	1	1	0	0
CO2	3	3	3	1	2	1	1	0	0	0	1	1	1	1	1
CO3	3	2	3	2	1		2	0	1	0	2	2	3	2	2
CO4	3	3	3	1	0	1	2	0	1	0	0	2	2	3	3
CO5	3	3	3	0	2		2	0	1	0	1	3	3	3	3
Avg	3	2.8	3	0.8	1	1	1.6	0	0.6	0	0.8	1.8	2	1.8	1.8

Course Code & Name: 22IT2253   Dynamic Web Design

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	0	0	1	0	0	0	0	0	1	1	1	2	2
CO2	1	1	1	0	1	0	0	0	1	0	0	1	1	2	2
CO3	1	1	1	0	1	0	0	0	0	1	0	1	0	1	1
CO4	1	1	1	0	0	0	0	0	1	0	1	1	0	1	1
CO5	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
Avg	1.4	1	1	0	0.6	0	0	0	0.4	0.4	0.6	1	0.6	1.4	1.4

Course Code & Name: 22ME2001   Engineering Practices

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	1	3	0	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	0	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	0	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	0	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	0	2	0	0	0	0	0	2	3	1	0	0
Avg	**3**	**1**	**2**	**0**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**

Course Code & Name: 22HE2071   Design Thinking

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	**3**	**2**	**1**	**3**	**2**	**2**	**0**	**1**	**2**	**0**	**0**	**1**	**1**	**1**	**1**

Course Code & Name: 22HE2072   Soft Skills and Aptitude 1

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	1	1	0	2	0	0	1	0	1	0	3	1	0	0
CO2	3	1	2	0	1	0	0	1	0	1	0	1	0	0	0
CO3	3	1	1	0	3	0	0	1	0	1	0	2	1	0	0
CO4	3	1	3	0	2	0	0	1	0	1	0	1	1	1	1
CO5	3	1	3	0	1	0	0	1	0	1	0	1	1	0	0
Avg	**3**	**1**	**2**	**0**	**2**	**0**	**0**	**1**	**0**	**1**	**0**	**2**	**1**	**0**	**0**

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	II	22MA2103	Differential Equations And Linear Algebra	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2	2
		22PH2101	Basics of Material Science	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2	2
		22HE2151	Effective Technical Communication	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1	1
		22PH2151	Physics for Circuit Engineering	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
		22IT2251	Python programming and Practices	3	1	1	3	0	2	0	1	2	0	0	1	1	1	1
		22IT2252	Relational Database Management System	3	2.8	3	0.8	1	1	1.6	0	0.6	0	0.8	1.8	2	1.8	1.8
		22IT2253	Dynamic Web Design	1.4	1	1	0	0.6	0	0	0	0.4	0.4	0.6	1	0.6	1.4	1.4
		22ME2001	Engineering Practices	3	1	2	0	2	2	0	1	1	0	2	2	1	0	0
		22HE2071	Design Thinking	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		22HE2072	Soft Skills and Aptitude 1	3	1	2	0	2	0	0	1	0	1	0	2	1	0	0

Chairman - BoS
IT - HiCET

Dean (Academics)
HiCET

5

CO'S, PO'S & PSO'S MAPPING

SEMESTER III – R2019

AY2022-23 – Batch 2021

Course Code & Name: 21MA3151   Statistics and Queuing Theory

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT3201   Data Structures and Algorithm Design

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 21IT3202   Object Oriented Programming Using C++

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT3203   Computer Organization and Architecture

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 21IT3251   Digital Principles and System Design

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	1	1	0	2	0	0	1	0	1	1	3	1	0	0
CO2	3	1	2	0	1	0	0	1	0	1	0	1	0	0	0
CO3	3	1	1	0	3	0	0	1	0	1	0	2	1	0	0
CO4	3	1	3	0	2	0	0	1	0	1	1	1	1	1	1
CO5	3	1	3	0	1	0	0	1	0	1	1	1	1	0	0
Avg	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0

Course Code & Name: 21IT3001   Data Structures and Algorithm Laboratory

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT3002   Object Oriented Programming using C++ Laboratory

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	**3**	**2**	**1**	**3**	**2**	**2**	**0**	**1**	**2**	**0**	**0**	**1**	**1**	**1**	**1**

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER III – R2019

AY2022-23 – Batch 2021

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
II	III	21MA3151	Statistics and Queuing Theory	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT3201	Data Structures and Algorithm Design	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		21IT3202	Object Oriented Programming Using C++	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT3203	Computer Organization and Architecture	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		21IT3251	Digital Principles and System Design	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0
		21IT3001	Data Structures and Algorithm Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT3002	Object Oriented Programming using C++ Laboratory	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

CO'S, PO'S & PSO'S MAPPING

SEMESTER IV – R2019

AY2022-23 – Batch 2021

Course Code & Name: 21MA4102   Discrete Mathematics

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT4201   Java Programming

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 21IT4202   Advanced Database Management Systems

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT4251   Object Oriented Software Engineering

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 21IT4253   Principles of Operating Systems

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	1	1	0	2	0	0	1	0	1	1	3	1	0	0
CO2	3	1	2	0	1	0	0	1	0	1	0	1	0	0	0
CO3	3	1	1	0	3	0	0	1	0	1	0	2	1	0	0
CO4	3	1	3	0	2	0	0	1	0	1	1	1	1	1	1
CO5	3	1	3	0	1	0	0	1	0	1	1	1	1	0	0
Avg	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0

Course Code & Name: 21IT4001   Java Programming Laboratory

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 21IT4002   Database Management Systems Laboratory

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	**3**	**2**	**1**	**3**	**2**	**2**	**0**	**1**	**2**	**0**	**0**	**1**	**1**	**1**	**1**

Course Code & Name: 21AC4191   Essence of Indian tradition knowledge/Value Education

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	**3**	**1**	**2**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**

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DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER IV – R2019

AY2022-23 – Batch 2021

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
II	IV	21MA4102	Discrete Mathematics	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT4201	Java Programming	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		21IT4202	Advanced Database Management Systems	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT4251	Object Oriented Software Engineering	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		21IT4253	Principles of Operating Systems	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0
		21IT4001	Java Programming Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		21IT4002	Database Management Systems Laboratory	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		21AC4191	Essence of Indian tradition knowledge/Value Education	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Chairman - BoS
IT - HiCET

Dean (Academics)
HiCET

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CO'S, PO'S & PSO'S MAPPING

SEMESTER V – R2019

AY2022-23 – Batch 2020

Course Code & Name: 19IT5201   Mobile Computing

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	2	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	**3**	**1**	**2**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**

Course Code & Name: 19IT5202   Computer Networks

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	0	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	0	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	0	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	**3**	**2**	**1**	**3**	**2**	**2**	**0**	**1**	**2**	**0**	**0**	**1**	**1**	**0**	**1**

Course Code & Name: 19IT5203   Microcontrollers and Embedded Systems

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	**3**	**2**	**2**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**

Course Code & Name: 19IT5204   Artificial Intelligence and Machine Learning

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	0	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	0	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	0	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	0	1

Course Code & Name: 19IT5205   Data Warehousing and Data Mining

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	1	1	0	2	0	0	1	0	1	1	3	1	0	0
CO2	3	1	2	0	1	0	0	1	0	1	0	1	0	0	0
CO3	3	1	1	0	3	0	0	1	0	1	0	2	1	0	0
CO4	3	1	3	0	2	0	0	1	0	1	1	1	1	0	1
CO5	3	1	3	0	1	0	0	1	0	1	1	1	1	0	0
Avg	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0

Course Code & Name: 19IT5001   Machine Learning Laboratory

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT5002   Mobile Application Development Laboratory

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	0	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	0	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	0	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	0	1

Course Code & Name: 19IT5351R   Internet and Web Technology

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	1	0	2	0	0	1	0	1	1	3	1	0	0
CO2	3	2	2	0	1	0	0	1	0	1	0	1	0	0	0
CO3	3	2	1	0	3	0	0	1	0	1	0	2	1	0	0
CO4	3	2	3	0	2	0	0	1	0	1	1	1	1	0	1
CO5	3	2	3	0	1	0	0	1	0	1	1	1	1	0	0
Avg	3	2	2	0	2	0	0	1	0	1	1	2	1	0	0

Course Code & Name: 19IT5352   Advanced Java Programming

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	1	0	0	3	0	0	0	0	0	2	2	1	0	2
CO2	3	1	3	0	3	0	0	0	1	0	0	1	1	0	2
CO3	3	1	2	0	3	0	0	0	0	1	0	3	0	0	1
CO4	1	1	3	0	0	0	0	0	1	0	1	1	0	0	1
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	0	1
Avg	3	1	2	0	2	0	0	0	0	0	1	2	1	0	1

Course Code & Name: 19IT5353   C# and .Net Programming

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	0	0	3	0	0	0	0	0	2	2	1	0	2
CO2	3	1	3	0	3	0	0	0	1	0	0	1	1	0	2
CO3	3	3	2	0	3	0	0	0	0	1	0	3	0	0	1
CO4	1	1	3	0	0	0	0	0	1	0	1	1	0	0	1
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	0	1
Avg	**3**	**2**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**	**1**

Course Code & Name: 19IT5354   Advanced Data Structure

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	0	0	0	1	0	0	0	0	0	1	1	1	0	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	0	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	0	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Avg	**3**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**0**

Course Code & Name: 19IT5355   Advanced Database Technology

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	1	0	0	0	0	0	0	2	3	3	2	0	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	0	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	**3**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**2**	**0**	**0**

Course Code & Name: 19IT5356 Ethical Hacking

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	0	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	0	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	0	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	0	1

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER V – R2019

AY2022-23 – Batch 2020

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
III	V	19IT5201	Mobile Computing	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
		19IT5202	Computer Networks	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		19IT5203	Microcontrollers and Embedded Systems	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		19IT5204	Artificial Intelligence and Machine Learning	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		19IT5205	Data Warehousing and Data Mining	3	1	2	0	2	0	0	1	0	1	1	2	1	0	0
		19IT53XX	**Professional Elective-I**															
		19IT5001	Machine Learning Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
			19IT53XX PROFESSIONAL ELECTIVE - I															
III	V	19IT5351R	Internet and Web Technology	3	2	2	0	2	0	0	1	0	1	1	2	1	0	0
		19IT5352	Advanced Java Programming	3	1	2	0	2	0	0	0	0	0	1	2	1	1	1
		19IT5353	C# and .Net Programming	3	2	2	0	2	0	0	0	0	0	1	2	1	1	1
		19IT5354	Advanced Data Structure	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0
		19IT5355	Advanced Database Technology	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
		19IT5356	Ethical Hacking	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

CO'S, PO'S & PSO'S MAPPING
SEMESTER IV – R 2019
AY2022-23 – BATCH 2020

Course Code & Name: 19IT6181   Software Project Management

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	2	3	1	1	-	1	-	2	3	1	1	1
CO2	3	3	2	2	1	1	1	-	1	-	2	2	1	1	1
CO3	3	3	2	-	2	1	1	-	1	-	1	2	1	1	1
CO4	3	2	-	1	3	1	1	-	1	-	1	2	1	1	1
CO5	3	2	3	1	2	1	1	-	1	-	2	2	1	1	1
Avg	3	2.6	2.5	1.5	2.2	1	1	-	1	-	1.6	2.2	1	1	1

Course Code & Name: 19IT6201   Internet of Things

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	0	0	0	1	0	0	0	0	0	1	1	1	0	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Avg	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0

Course Code & Name: 19IT6202R   Principles of Compiler Design

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	0	0	2	0	0	0	0	0	1	2	3	0	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0	0
Avg	3	2	0	0	1	0	0	0	0	0	1	2	1	0	0

Course Code & Name: 19IT6251   Cryptography and Network Security

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	0	0	0	0	0	0	0	0	1	3	3	2	2
CO2	2	1	1	0	0	0	0	0	0	0	0	1	2	2	2
CO3	2	1	2	0	0	0	0	0	0	1	0	2	0	2	2
CO4	3	3	1	0	0	0	0	0	0	0	1	1	0	2	2
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	2	2
Avg	2	2	1	0	0	0	0	0	0	0	1	2	1	2	2

Course Code & Name: 19IT6001   Internet of Things Laboratory

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	2	2	1	1	0	1	0	1	1	3	0	0	0
CO2	3	3	2	2	2	2	0	1	0	1	0	1	0	2	2
CO3	3	3	2	2	2	2	0	1	0	1	0	2	0	1	1
CO4	3	3	2	2	2	2	0	1	0	1	1	1	0	1	1
CO5	3	3	2	2	2	2	0	1	0	1	1	1	0	2	2
Avg	3	3	2	2	2	2	0	1	0	1	1	2	0	1	1

Course Code & Name: 19IT6003   Project based Learning

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	0	0	0	1	0	0	0	0	0	1	1	1	0	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Avg	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0

Course Code & Name: 19IT6301   Business Intelligence and Analysis

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	0	0	2	0	0	0	0	0	1	2	3	0	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0	0
Avg	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**	**0**

Course Code & Name: 19IT6302   Information Security

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	0	0	3	0	0	0	0	0	2	2	1	2	2
CO2	3	1	3	0	3	0	0	0	1	0	0	1	1	2	2
CO3	3	3	2	0	3	0	0	0	0	1	0	3	0	1	1
CO4	1	1	3	0	0	0	0	0	1	0	1	1	0	1	1
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	1	1
Avg	**3**	**2**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**1**	**1**

Course Code & Name: 19IT6303   Software Design

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	0	0	2	0	0	0	0	0	1	2	3	0	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0	0
Avg	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**	**0**

Course Code & Name: 19IT6304 Natural Language Processing

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	0	0	0	0	0	0	0	0	1	3	3	2	2
CO2	2	1	1	0	0	0	0	0	0	0	0	1	2	2	2
CO3	2	1	2	0	0	0	0	0	0	1	0	2	0	2	2
CO4	3	3	1	0	0	0	0	0	0	0	1	1	0	2	2
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	2	2
Avg	2	2	1	0	0	0	0	0	0	0	1	2	1	2	2

Course Code & Name: 19IT6305 Soft Computing

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	2	2	1	1	0	1	0	1	1	3	0	0	0
CO2	3	3	2	2	2	2	0	1	0	1	0	1	0	2	2
CO3	3	3	2	2	2	2	0	1	0	1	0	2	0	1	1
CO4	3	3	2	2	2	2	0	1	0	1	1	1	0	1	1
CO5	3	3	2	2	2	2	0	1	0	1	1	1	0	2	2
Avg	3	3	2	2	2	2	0	1	0	1	1	2	0	1	1

Course Code & Name: 19IT6307 Virtual Reality and Augmented Reality

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	0	0	0	1	0	0	0	0	0	1	1	1	0	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Avg	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0

Course Code & Name: 19IT6308   Web Development - I

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	0	0	2	0	0	0	0	0	1	2	3	0	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0	0
Avg	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**	**0**

Course Code & Name: 19IT6402   Machine Learning for Engineers

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	0	0	0	0	0	0	0	0	1	3	3	2	2
CO2	2	1	1	0	0	0	0	0	0	0	0	1	2	2	2
CO3	2	1	2	0	0	0	0	0	0	1	0	2	0	2	2
CO4	3	3	1	0	0	0	0	0	0	0	1	1	0	2	2
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	2	2
Avg	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**2**	**2**

DEPARTMENT OF INFORMATION TECHNOLOGY

REGULATIONS 2019(AMENMENDS)

SEMESTER IV

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Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
III	VI	19IT6181	Software Project Management	3	2.6	2.5	1.5	2.2	1	1	-	1	-	1.6	2.2	1	1	1
		19IT6201	Internet of Things	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0
		19IT6202R	Principles of Compiler Design	3	2	0	0	1	0	0	0	0	0	1	2	1	0	0
		19IT63XX	Professional Elective II															
		19XX64XX	Open Elective I															
		19IT6251	Cryptography and Network Security	2	2	1	0	0	0	0	0	0	0	1	2	1	2	2
		19IT6001	Internet of Things Laboratory	3	3	2	2	2	2	0	1	0	1	1	2	0	1	1
		19IT6003	Project based Learning	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0
			19IT63XX Professional Elective - II															
III	VI	19IT6301	Business Intelligence and Analysis	3	2	0	0	1	0	0	0	0	0	1	2	1	0	0
		19IT6302	Information Security	3	2	2	0	2	0	0	0	0	0	1	2	1	1	1
		19IT6303	Software Design	3	2	0	0	1	0	0	0	0	0	1	2	1	0	0

		19IT6304	Natural Language Processing	2	2	1	0	0	0	0	0	0	0	1	2	1	2	2
		19IT6305	Soft Computing	3	3	2	2	2	2	0	1	0	1	1	2	0	1	1
		19IT6307	Virtual Reality and Augmented Reality	3	1	1	1	1	0	0	0	1	0	1	1	1	0	0
		19IT6308	Web Development - I	3	2	0	0	1	0	0	0	0	0	1	2	1	0	0
			19ITXX64XX Open Elective - I															
III	**VI**	**19IT6402**	Machine Learning for Engineers	2	2	1	0	0	0	0	0	0	0	1	2	1	2	2

CO'S, PO'S & PSO'S MAPPING

SEMESTER VII – R 2019

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Course Code & Name: 19IT7201   **Distributed and Cloud Computing**

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	3	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	3	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	2	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	3	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 19IT7202   **Data Science and Analytics**

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	1	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT7203   **Software Testing and Quality Assurance**

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 19IT7001   Distributed and Cloud Computing Laboratory

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	1	1	2	0	0	0	0	0	0	1	1	0	0
CO2	3	2	1	1	2	0	0	1	0	0	0	2	1	1	1
CO3	3	3	1	1	2	0	0	1	0	0	0	1	1	1	1
CO4	3	2	1	1	0	0	0	1	0	0	0	2	1	1	1
CO5	3	1	1	1	2	0	0	0	0	0	0	1	1	0	0
Avg	3	2	1	1	2	0	0	1	0	0	0	1	1	1	1

Course Code & Name: 19IT7002   Data Analytics Laboratory

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT7901   Project Work - Phase I

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT7301   Social Network analysis

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	1	0	2	0	0	0	2	0	0	1	1	0	0
CO2	3	2	1	0	2	0	0	1	2	0	0	2	1	1	1
CO3	3	3	1	0	2	0	0	1	2	0	0	1	1	1	1
CO4	3	2	1	0	0	0	0	1	0	0	0	2	1	1	1
CO5	3	1	1	0	2	0	0	0	2	0	0	1	1	0	0
Avg	3	2	1	0	2	0	0	1	2	0	0	1	1	1	1

Course Code & Name: 19IT7302   Cyber Forensics

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT7303   Software Documentation

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	1	0	1	0	0	0	0	1	3	0	1	1	1
CO2	2	2	1	0	1	1	0	1	0	0	3	1	3	0	0
CO3	3	3	1	0	1	1	0	1	0	0	0	2	1	1	1
CO4	1	2	1	0	0	1	0	1	0	0	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	0	1	1	1	0	0
Avg	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1

Course Code & Name: 19IT7304   Principles of Management

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT7305   Software Architecture

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT7306   Green Computing

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	1	0	1	0	0	0	0	1	3	0	1	1	1
CO2	2	2	1	0	1	1	0	1	0	0	3	1	3	0	0
CO3	3	3	1	0	1	1	0	1	0	0	0	2	1	1	1
CO4	1	2	1	0	0	1	0	1	0	0	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	0	1	1	1	0	0
Avg	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1

Course Code & Name: 19IT7401   Cyber Security

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	0	0	0	0	1	0	0	2	3	3	2	1	1
CO2	3	2	0	0	1	0	1	0	0	1	3	1	3	0	0
CO3	3	2	0	0	1	0	1	0	0	2	0	2	1	0	0
CO4	3	2	0	0	0	0	1	0	0	1	1	1	2	1	1
CO5	3	2	0	0	0	0	1	0	0	2	1	1	1	0	0
Avg	3	2	0	0	0	0	1	0	0	2	2	2	2	0	0

DEPARTMENT OF INFORMATION TECHNOLOGY

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AY2022-23 – Batch 2019

Mapping of Course Outcome and Programme Outcome:

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19IT7201	Distributed and Cloud Computing	3	3	1	3	2	2	0	1	2	0	0	1	1	1	1
19IT7202	Data Science and Analytics	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
19IT7203	Software Testing and Quality Assurance	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
19IT73XX	**Professional Elective III**															
19XX74XX	**Open Elective II**															
19IT7001	Distributed and Cloud Computing Laboratory	3	2	1	1	2	0	0	1	0	0	0	1	1	1	1
19IT7002	Data Analytics Laboratory	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
19IT7901	Project Work - Phase I	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
19IT73XX PROFESSIONAL ELECTIVE - III																
19IT7301	Social Network analysis	3	2	1	0	2	0	0	1	2	0	0	1	1	1	1

Code	Name														
19IT7302	Cyber Forensics	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
19IT7303	Software Documentation	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1
19IT7304	Principles of Management	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
19IT7305	Software Architecture	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
19IT7306	Green Computing	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1
19ITXX74XX OPEN ELECTIVE - II																
19IT7401	Cyber Security	3	2	0	0	0	0	1	0	0	2	2	2	2	0	0

Chairman - BoS
IT - HiCET

Dean (Academics)
HiCET

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CO'S, PO'S & PSO'S MAPPING

SEMESTER VIII – R 2019

AY2022-23 – Batch 2019

Course Code & Name: 19IT8901   Project Work – Phase II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	0	0	1	0	0	0	0	1	3	0	1	1
CO2	2	2	0	0	1	1	0	1	0	0	3	1	3	0
CO3	3	3	0	0	1	1	0	1	0	0	0	2	1	1
CO4	1	2	0	0	0	1	0	1	0	0	1	1	2	1
CO5	3	2	0	0	0	0	0	0	0	0	1	1	1	0
Avg	2	2	0	0	1	1	0	1	0	0	2	1	2	1

Course Code & Name: 19IT8301   Graphics and Multimedia

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	1	3	3	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	1	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT8302   Software Process

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	1	3	2	1	0	0	2	0	0	1	1	0	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1

Course Code & Name: 19IT8303   Service Oriented Architecture

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	1	1	2	0	0	0	0	0	0	1	1	0	0
CO2	3	2	1	1	2	0	0	1	0	0	0	2	1	1	1
CO3	3	3	1	1	2	0	0	1	0	0	0	1	1	1	1
CO4	3	2	1	1	0	0	0	1	0	0	0	2	1	1	1
CO5	3	1	1	1	2	0	0	0	0	0	0	1	1	0	0
Avg	3	2	1	1	2	0	0	1	0	0	0	1	1	1	1

Course Code & Name: 19IT8304   Human Computer Interaction

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT8305   Mobile Edge Systems

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT8311   Robotics and its Applications

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	1	0	2	0	0	0	2	0	0	1	1	0	0
CO2	3	2	1	0	2	0	0	1	2	0	0	2	1	1	1
CO3	3	3	1	0	2	0	0	1	2	0	0	1	1	1	1
CO4	3	2	1	0	0	0	0	1	0	0	0	2	1	1	1
CO5	3	1	1	0	2	0	0	0	2	0	0	1	1	0	0
Avg	3	2	1	0	2	0	0	1	2	0	0	1	1	1	1

Course Code & Name: 19IT8306   Information Retrieval Technologies

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT8307   Block Chain Technology

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	1	0	1	0	0	0	0	1	3	0	1	1	1
CO2	2	2	1	0	1	1	0	1	0	0	3	1	3	0	0
CO3	3	3	1	0	1	1	0	1	0	0	0	2	1	1	1
CO4	1	2	1	0	0	1	0	1	0	0	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	0	1	1	1	0	0
Avg	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1

Course Code & Name: 19IT8308   Professional Ethics

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	2	0	0	0	3	0	3	0	1	0	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0	0
Avg	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

Course Code & Name: 19IT8309   Deep Learning Techniques

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	1	0	0	0	0	0	0	2	3	3	2	1	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0

Course Code & Name: 19IT8310   Management Information System

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	1	0	1	0	0	0	0	1	3	0	1	1	1
CO2	2	2	1	0	1	1	0	1	0	0	3	1	3	0	0
CO3	3	3	1	0	1	1	0	1	0	0	0	2	1	1	1
CO4	1	2	1	0	0	1	0	1	0	0	1	1	2	1	1
CO5	3	2	1	0	0	0	0	0	0	0	1	1	1	0	0
Avg	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1

Course Code & Name: 19IT8312   Quantum Computing

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	0	0	0	0	1	0	0	2	3	3	2	1	1
CO2	3	2	0	0	1	0	1	0	0	1	3	1	3	0	0
CO3	3	2	0	0	1	0	1	0	0	2	0	2	1	0	0
CO4	3	2	0	0	0	0	1	0	0	1	1	1	2	1	1
CO5	3	2	0	0	0	0	1	0	0	2	1	1	1	0	0
Avg	3	2	0	0	0	0	1	0	0	2	2	2	2	0	0

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER VIII – R2019

AY2022-23 – Batch 2019

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IV	VIII	19FT83XX	**Professional Elective –IV**															
		19FT83XX	**Professional Elective- V**															
		19IT8901	**Project Work – Phase II**	2	2	0	0	1	1	0	1	0	0	2	1	2	1	
			19IT83XX Professional Elective - IV															
IV	VIII	19IT8301	Graphics and Multimedia	3	1	2	2	2	2	0	1	1	0	2	2	1	0	0
		19IT8302	Software Process	3	2	1	3	2	2	0	1	2	0	0	1	1	1	1
		19IT8303	Service Oriented Architecture	3	2	1	1	2	0	0	1	0	0	0	1	1	1	1
		19IT8304	Human Computer Interaction	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
		19IT8305	Mobile Edge Systems	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0
		19IT8311	Robotics and its Applications	3	2	1	0	2	0	0	1	2	0	0	1	1	1	1
			19IT83XX Professional Elective - V															
IV	VIII	19IT8306	Information Retrieval Technologies	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
		19IT8307	Block Chain Technology	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1
		19IT8308	Professional Ethics	3	2	2	2	2	2	0	1	1	0	2	2	1	0	0

		19IT8309	Deep Learning Techniques.	3	2	1	1	0	0	0	0	0	2	2	2	2	0	0
		19IT8310	Management Information System	2	2	1	0	1	1	0	1	0	0	2	1	2	1	1
		19IT8312	Quantum Computing	3	2	0	0	0	0	1	0	0	2	2	2	2	0	0

Chairman - BoS
IT - HiCET

Dean (Academics)
HiCET