

Puducherry Technological University,
Puducherry –605014
(A Technological University of Government of Puducherry)



Curriculum and Syllabi
for
B.Tech (INFORMATION TECHNOLOGY)
(Effective from Academic year 2024-25)

**(Subject to the Approval of the Fifth Academic Council meeting of
Puducherry Technological University)**

CURRICULUM AND SYLLABUS

The Curriculum of B.Tech. (Information Technology) is designed to fulfil the Program Educational Objectives (PEO) and the Program Outcomes (PO) listed below.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1	Core Competence: To provide students with Core Competence in fundamental knowledge necessary to formulate, analyse and solve problems in IT discipline.
PEO2	Industry compliance: To engraft ability in creativity and design of information technology and impart knowledge and skills to analyse, design, test, and implement various software as well as hardware applications.
PEO3	Professionalism: To inculcate in students to maintain high professionalism and ethical standards, to work as part of teams on multidisciplinary projects and diverse professional environments, and relate engineering issues to the society, global economy, and emerging technologies
PEO4	Entrepreneurial skills: To produce graduates with technical, communication and leadership skills in professional environment or as entrepreneurs with social responsibility and human values in multicultural and multidisciplinary environments.
PEO5	Continuous Learning: To motivate students to pursue higher education in engineering or other professional fields

PROGRAM OUTCOMES (PO)

PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1	Emerging Technologies and Innovations: Graduates will be equipped to adopt and integrate emerging technologies in IT to solve real-world problems.
PSO2	Professionalism and Ethical Practices: Graduates will be able to practice IT in a professional, ethical, and socially responsible manner, contributing to the betterment of society through technological innovation and problem-solving

Distribution of credits among the subjects grouped under various categories:

Courses are grouped under various categories and the credits to be earned in each category of courses are as follows:

Sl. No.	Category	Credits	Course Category Code (CCC)
1	Basic science courses	20	BSC
2	Engineering science courses	6	ESC
3	Professional core courses	94	PCC
4	Professional elective courses	12	PEC
5	Ancillary Stream Courses	12	ANC
6	Ability enhancement courses	10	AEC
7	Skill enhancement courses	6	SEC
8	Value added courses	4	VAC
	Total	164	

Semester-wise Courses and Credits

Semester I

Group-II (CS1, CS2, IT1, EE1, EI1, CE1, CE2)

Course Code	Course	CCC	Periods			Credits
			L	T	P	
	3 weeks compulsory Induction Program					
MAUC101	Mathematics I	BSC	3	1		4
ITUC101	Information Technology Essentials	PCC	3	1		4
CYUC101	Chemistry	BSC	3			3
CSUC101	Programming for Problem Solving	ESC	2			2
HSUA101	English for Communication	AEC	2			2
GEUS102	Basic Engineering Skills Laboratory - II	SEC	1		4	3
GEUV102	Essence of Indian Traditional Knowledge	VAC	1			1
CYUC102	Chemistry Laboratory	BSC			2	1
CSUC102	Computer Programming Laboratory	ESC			2	1
Total			15	2	8	
			25			21

CCC - Course Category Code, L-Lecture, T – Tutorial, P – Practical

Semester II

Group-II (CS1, CS2, IT1, EE1, EI1, CE1, CE2)

Course Code	Course	CCC	Periods			Credits
			L	T	P	
MAUC102	Mathematics II	BSC	3	1		4
ITUC102	Digital System Design	PCC	3	1		4
PHUC101	Physics	BSC	3			3
MEUC101	Engineering Graphics	ESC	1		4	3
HSUA102	Professional English	AEC	2			2
GEUS102	Basic Engineering Skills Laboratory - I	SEC	1		4	3
GEUV101	NSS, Yoga and Health	VAC			2	1
PHUC102	Physics Laboratory	BSC			2	1
Total			13	2	12	
			27			21

Exit Option for the students who opt to exit after completion of first year of B.Tech Programme and have secured a minimum of 42 credits will be awarded a UG certificate in a discipline if, in addition they complete one vocational course of 4 credits during the summer vacation of the first year

Semester III

Course Code	Course	CCC	Periods			Credits
			L	T	P	
ITUC103	Data structures	PCC	3	1		4
ITUC104	Object Oriented Programming using C++ and Java	PCC	3			3
ITUC105	Operating Systems	PCC	3			3
ITUC106	Computer Architecture	PCC	3	1		4
HSUA103	Entrepreneurship	AEC	2			2
GEUV104	Universal Human values	VAC	1			1
ITUC107	Data structures Lab	PCC			3	1.5
ITUC108	Object Oriented Programming Lab (C++ and Java)	PCC			3	1.5
ITUC109	Operating Systems Lab	PCC			3	1.5
Total			15	2	9	-
			26			21.5

Semester IV

Course Code	Course	CCC	Periods			Credits
			L	T	P	
MAUC107	Mathematics for Computing	PCC	3	1		4
ITUC110	Design and Analysis of Algorithms	PCC	3			3
ITUC111	Computer Networks	PCC	3	1		4
ITUC112	Information Coding Techniques	PCC	3			3
HSUA104/ HSUA106	Design Thinking/Foreign language	AEC	2			2
GEUV103	Environmental Education	VAC	1			1
ITUC113	Design and Analysis of Algorithms Lab	PCC			3	1.5
ITUC114	Computer Networks Lab	PCC			3	1.5
ITUC115	Python programming Lab	PCC			3	1.5
Total			15	2	9	
			26			21.5

Course Code	Course	CCC	Periods			Credits
			L	T	P	
	Ancillary stream course I	ANC	3			3
ITUH101	Foundations of Data Science	HNC	3	1		4

Exit Option for the students who opt to exit after completion of first year of B. Tech Programme and have secured a minimum of 87 credits will be awarded a UG Diploma in a discipline if, in addition they complete one vocational course of 4 credits during the summer vacation of the second year.

Semester V

Course Code	Course	CCC	Periods			Credits
			L	T	P	
ITUC116	Software Engineering	PCC	3		2	4
ITUC117	Database Management Systems	PCC	3			3
ITUC118	Web Essentials	PCC	3			3
HSUA105	Industrial Economics and Management	AEC	2			2
ITUEXXX	Professional Elective1	PEC	3	1		4
ITUC119	Mobile Application Development Lab	PCC			3	1.5
ITUC120	Database Management Systems Lab	PCC			3	1.5
ITUC121	Web Essentials Lab	PCC			3	1.5
Total			14	1	11	
			26			20.5

Course Code	Course	CCC	Periods			Credits
			L	T	P	
	Ancillary stream course2	ANC	3			3
ITUH102	Data Engineering Principles	HNC	3	1		4

Semester VI

Course Code	Course	CCC	Periods			Credits
			L	T	P	
ITUC122	Data Mining and Data Warehousing	PCC	3			3
ITUC123	Information security	PCC	3			3
ITUC124	Artificial Intelligence and Machine Learning	PCC	3			3
ITUEXXX	Professional Elective2	PEC	3	1		4
ITUC125	Data Mining and Data Analytics Lab	PCC			3	1.5
ITUC126	Artificial Intelligence and Machine Learning Lab	PCC			3	1.5
ITUC127	Data visualization Lab	PCC			3	1.5
ITUC128	Internship	PCC				2
Total			12	1	9	
			22			19.5

Course Code	Course	CCC	Periods			Credits
			L	T	P	
	Ancillary stream course3	ANC	3			3
ITUH103	Multi-biometrics	HNC	3	1		4

Exit Option for the students who opt to exit after completion of third year of B. Tech Programme and have secured a minimum of 132 credits will be awarded a B.Sc. (Engg.) in a discipline.

Semester VII

Course Code	Course	CCC	Periods			Credits
			L	T	P	
ITUC129	Full Stack Web Development	PCC	3			3
ITUC130	Deep Learning	PCC	3			3
ITUC131	Automata and Compiler Design	PCC	3		2	4
ITUEXXX	Professional Elective3	PEC	3	1		4
ITUC132	Mini project	PCC			4	2
ITUC133	Full Stack Web Development Lab	PCC			4	2
ITUC134	Comprehensive viva	PCC				1
Total			12	1	10	
			23			19

CourseCode	Course	CCC	Periods			Credits
			L	T	P	
	Ancillary stream course4	ANC	3			3
ITUH104	Software Defined Networks	HNC	3	1		4

Semester VIII

CourseCode	Course	CCC	Periods			Credits
			L	T	P	
ITUC135	Project work	PCC			16	8
Total						
						8

Course Code	Course	CCC	Periods			Credits
			L	T	P	
ITUH105	Seminar	HNC				2

List of Professional Elective Courses

Professional Elective	Coursecode	Course	Semester
Professional Elective I	ITUE101	Internet of Things	V
	ITUE102	Object Oriented Analysis and Design	
	ITUE103	Business Intelligence	
	ITUE104	Soft computing	
	ITUE105	Wireless Networking and Mobile Communication	
Professional Elective II	ITUE106	Cloud Computing	VI
	ITUE107	DevOps	
	ITUE108	IT operations and Management	
	ITUE109	UI & UX Design	
	ITUE110	Privacy and Security in Online Social Media	
Professional Elective III	ITUE111	Ethical hacking	VII
	ITUE112	Generative AI	
	ITUE113	Big Data Analytics	
	ITUE114	Cognitive Science	
	ITUE115	Block chain Technologies	

Ancillary stream Elective course

Ancillary stream title: Data Science (for Other Department students)	
Course code	Course Name
ITUN101	Data structures and Algorithms
ITUN102	Database systems
ITUN103	Applied Data science using Python
ITUN104	Introduction to Machine Learning

Ancillary stream title: Information Technology Essentials (for Other Department students)	
Course code	Course Name
ITUN101	Data Structures and Algorithms
ITUN105	Java and Internet Programming
ITUN106	IoT and Python programming
ITUN107	Web Design and Development

Ancillary stream title: Inter Departmental Electives (Business Analytics)	
Course code	Course Name
ITUI101	Digital Marketing
ITUI102	Business Process
ITUI103	Social Network Analysis
ITUI104	Industry 4.0 with Industrial IoT

SYLLABI FORMAT

Department: IT		Programme: B.Tech						
Semester : III		CourseCategoryCode: PCC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC103	Data Structures	3	1	-	4	40	60	100
Prerequisite:	CSUC101 – Programming for problem solving							
Course Outcome	CO1	Learn the data representation of linear and nonlinear data structures and their associated operations						
	CO2	Design Linear data structures and their operations using array based or non-array based methods						
	CO3	Design Nonlinear data structures, traversals and their operations using alternate methods						
	CO4	Employ suitable data structure to solve known and unknown applications						
UNIT-I	Stacks and Queues				Periods:12			
Stack and its operations – Representation - LIFO – Push and Pop - Applications of Stacks –infix expression to postfix expression conversion – postfix expression evaluation –algorithms. Queue and its operations – Representation – FIFO – Types of queues - Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues, Algorithms – Applications of queues – De-queues - Multi stacks and multi queues								CO1 CO2 CO4
UNIT-II	Linked Lists				Periods:12			
Singly linked lists, Representation methods, operations - Traversing, Searching, Insertion into, Deletion from, Linked representation of Stack and Queue, Header nodes, Doubly linked list –representation methods, operations, Circular Linked Lists: all operations and their algorithms – multi lists – Sparse matrix using linked lists								CO1 CO2 CO4
UNIT-III	Trees				Periods:12			
Tree Terminologies – General Tree - Binary Tree – Representation – traversal methods – Conversion of general tree to binary tree, Threaded Binary Tree, Binary Search Tree, AVL Tree – algorithms for insertion and deletion of nodes - Expression trees – Game trees – decision trees – disjoint sets								CO1 CO3 CO4
UNIT-IV	Graphs				Periods:12			
Graph Terminologies - Representations - Graph Traversal methods – Bi-connectivity - Connected Components -Spanning Trees –prim’s algorithm and kruskal’s algorithm - Transitive Closure - Shortest Path Algorithms –Dijkstra Algorithm-Floyd-Warshall Algorithm- Activity Networks -Topological Sorting -Critical Paths.								CO1 CO3 CO4
UNIT-V	Advanced structures				Periods:12			
m-way search trees - B-tree – B+ Trees –Tries –Search, Insertion and Deletion Hash Table – Hashing function – open addressing – chaining – Rehashing Priority Queues(Heaps)– Binary heap – d-Heaps – Leftist Heaps – Binomial Heaps								CO1 CO3 CO4
Lecture Periods:45		Tutorial Periods:15		Practical Periods:		Total Periods:60		
Reference Books:								
1. Sharika.T.R, WillsonJoseph.C and Reshma.M.R, A guide to data structures and algorithms, Notion Press, 2024 2. Narasimha Karumanchi, Data Structures and Algorithms made easy, Careermonk Publications, 2023 3. Ritika Mehra, Data structures using C, Pearson Education, 2021 4. E.Horowitz, S.Sahni and S. Anderson, Fundamentals of Data structures in C, Second Edition, Universities Press, 2018. 5. Ellis Horowitz, Sartaj Sahni,“Fundamentals of Data Structures”, Illustrated Edition, Galgotia Publications, Second Edition, 2008. 6. ReemaT hareja, “Data Structures using C”, Oxford University Press, 2011. 7. C.A.V.Pai, “Data Structures and Algorithms, Concepts, Techniques and Applications”, McGraw Hill Education, First edition, 2017.								

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	1		2							2	2	2
CO2	2	2		2							2	2	2
CO3	2	2		2							2	2	2
CO4	2	1		2							3	2	2

Department : IT		Programme :B.Tech.						
Semester : III		CourseCategory Code: PCC				Semester Exam Type: TY		
Course Code	Course Name	Periods / Week		Credit		Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC104	Object Oriented Programming using C++ and Java	3	-	-	3	40	60	100
Prerequisite:	CSUC101 – Programming for problem solving							
Course Outcome	CO1	Understands the basic Concepts of OOPs (C++)						
	CO2	Implements object oriented programs in C++						
	CO3	Understands the basics of Java						
	CO4	Learns Inheritance and Polymorphism, Packages, Interfaces(Java)						
	CO5	Learns Inheritance and Polymorphism, Packages, Interfaces and JDBC (Java)						
UNIT-I	Basics of Object Oriented Programming							Periods: 9
Object Oriented Programming - Concepts – Objects – Classes – Methods - Messages –Abstraction - Encapsulation – Inheritance – Abstract Classes – Polymorphism. Introduction To C++ – Classes – Access Specifies – Function and Data Members –Function Overloading – Friend Functions – Static Members – Objects – Pointers and Objects – Constant Object–Nested Class – Local Classes								CO1
UNIT-II	Constructors and Overloading, Exception Handling, Inheritance and Polymorphism							Periods: 9
Constructors – Default Constructor – Parameterized Constructors – Constructor with Dynamic Allocation – Copy Constructor – Destructors – Operator Overloading – Overloading through Friend Functions – Exception Handling – Try-Catch-Throw Paradigm – Exception Specification – Terminate and Unexpected Functions – Uncaught Exception - Inheritance – Public, Private, and Protected Derivations – Multiple Inheritance – Virtual Base Class - Virtual Functions – Pure Virtual Functions								CO1, CO2
UNIT-III	Basics of Java							Periods: 9
Creation of Java, importance of Java to internet, byte code, Java buzzwords, data types, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program. Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, overloading methods and constructors, parameter passing - call by value, nested classes and inner classes, exploring the String class.								CO3
UNIT-IV	Inheritance and Polymorphism, Packages, Interfaces (Java)							Periods: 9
Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.								CO1, CO4
UNIT-V	Exception Handling, Threads, Applets (Java)							Periods: 9
Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally Keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle ,creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. JDBC Connectivity: Getting Started sets up a basic database development environment - Processing SQL Statements with JDBC: Establishing a Connection, Connecting with DataSource Objects, Handling SQL Exceptions, Setting Up Tables, Retrieving and Modifying Values from Result Sets , Using Prepared Statement and Transaction								CO5
Lecture Periods: 45		Tutorial Periods:		Practical Periods:		Total Periods:45		

Reference Books:

1. Object Oriented Programming with C++, 8th Edition, E. Balagurusamy Paperback – Big Book, 24 September 2020
2. Programming with Java, 7th Edition E. Balagurusamy, Paperback, 12 November 2023
3. S. B. Lippman, JoseeLajoie, “Barbara E. Moo, “C++ Primer”, Sixth Edition, Pearson Education, 2012.
4. B. Stroustrup, “The C++ Programming Language”, Sixth Edition, Pearson Education, 2014.
5. D. S. Malik, “C++ Programming: From Problem Analysis to Program Design”, Eighth Edition 2017.
6. The Complete Reference Java J2SE 13th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2025.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	2	2	3							1	3	2
CO2	2	3	3	3							1	3	1
CO3	2	2	2	3							2	2	3
CO4	2	2	2	3							2	2	2
CO5	2	2	2	3							2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT			Programme: B.Tech					
Semester :III			CourseCategoryCode:PCC			SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC105	Operating Systems	3	-	-	3	40	60	100
Prerequisite:		-						
Course Outcome	CO1	Explain with thorough understanding, the concept of operating systems and the functions of process, memory, disk and file management systems of an OS						
	CO2	Apply various CPU scheduling algorithms and compare them						
	CO3	Apply process synchronization mechanisms, deadlock prevention, detection, and recovery schemes						
	CO4	Apply different memory management schemes and disk management schemes						
	CO5	Analyze the functionalities of file systems and virtual machines concepts of different operating systems						
UNIT-I	Operating Systems Overview				Periods: 9			
Introduction to operating systems – Computer system organization, architecture – Operating system operations – Resource management –security and protection – Distributed systems – Computing Environments–Open-sourceoperatingsystems–OSServices–Useroperating-systeminterface–System calls–System services–OS structure–OS generation–System Boot							CO1	
UNIT-II	Process Management				Periods: 9			
Process concept, scheduling – Operations on processes – Inter-process communication – Examples – Multicore Programming–Multi threading models–Thread Libraries–Threading issues–OS examples CPU Scheduling: Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple processor scheduling – Real Time CPU Scheduling - Operating system examples – Algorithm Evaluation.							CO1,CO2	
UNIT-III	Process Synchronization				Periods: 9			
The critical section problem–Peterson’s solution –Synchronization hardware–Mutex Locks-Semaphores – Monitors -- Classic problems of synchronization – Critical regions – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock.							CO1, CO3	
UNIT-IV	Memory And Storage Management				Periods: 9			
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing. Mass Storage system – Disk Structure - Disk Scheduling and Management- I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.							CO1,CO4	
UNIT-V	File System And Virtual Machines				Periods: 9			
File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Case Study: Linux OS.							CO1, CO5	
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -		Total Periods: 45		
Reference Books:								

1. Andrew S. Tannenbaum, Modern Operating Systems, 5th Edition, Pearson, 2024.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
3. William Stallings, "Operating Systems Internals and Design Principles", Pearson Education, Ninth Edition, 2021.
4. Dhananjay M. Dhamdhere, "Operating System a Concept Based Approach" McGraw Hill Publication, Third Edition, 2017.
5. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Pearson Education, Fifth Edition, 2021.
6. Rajiv Chopra, "Operating Systems: - A Practical Approach", Fourth Edition, S Chand and Company, 2023.

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO 11	PS01	PSO2
CO1	2	2	-	1	-	-	-	-	-	-	-	2	-
CO2	2	3	1	3	-	-	-	-	-	-	1	2	1
CO3	2	3	1	3	-	-	-	-	-	-	1	2	1
CO4	1	3	1	3	-	-	-	-	-	-	1	2	1
CO5	2	2	1	2	-	-	-	-	-	-	1	2	1

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech.						
Semester : III			CourseCategoryCode: PCC			SemesterExamType: TY			
Course Code	Course Name		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUC106	Computer Architecture		3	1	-	4	40	60	100
Prerequisite:			-						
Course Outcome	CO1	Understand the basic components of Processor, Memory and I/O Units.							
	CO2	Understand Parallel processor and multicore Processor architectures.							
	CO3	Analyse the operations of various processor architectures.							
	CO4	Analyse the operations of various memory and I/O devices.							
	CO5	Apply the technologies in the processor, memory and I/O architectures							
UNIT-I	Introduction					Periods: 12			
Basic concepts and computer evolution – top-level view of computer function and interconnection – number systems – computer arithmetic.									CO1
UNIT-II	Processor Organization					Periods: 12			
Processor Structure and Function – Reduced Instruction Set Computers – Instruction-level parallelism and superscalar processors – Control unit operation and microprogrammed control.									CO2
UNIT-III	Memory Organization					Periods: 12			
Memory hierarchy: Principle of locality – characteristics of memory systems – memory hierarchy – performance modelling on a multilevel memory hierarchy – Cache memory: Principles – elements of Cache design – Intel x86 Cache organization –IBM z13 cache organization – Cache performance models – Internal memory: Semiconductor Main memory – Error correction – DDR DRAM – EDRAM – Flash memory – Nonvolatile Solid-state memory technologies – External Memory: Magnetic Disk – Raid – Solid State Drives – Optical Memory – Magnetic Tape.									CO3
UNIT-IV	Input/Output Organization					Periods: 12			
External Devices – I/O Modules – Programmed I/O – Interrupt-Driven I/O – Direct Memory Access – Direct Cache Access – I/O Channels and Processors – External Interconnection Standards – IBM z13 I/O Structure .									CO4
UNIT-V	Parallel Processing and Multicore Computers					Periods: 12			
Parallel Processing: Multiple processors Organization – symmetric multiprocessors – Cache coherence and the MESI protocol – Multithreading and Chip multiprocessors – Clusters – Nonuniform Memory Access. Multicore Computers: Multicore organization – heterogeneous multicore organization – Intel Core i7-5960X – arm Cortex-A15 MP Core – IBM Z13 Mainframe.									CO5
Lecture Periods: 45			TutorialPeriods: 15		PracticalPeriods: -		TotalPeriods: 60		
ReferenceBooks:									
1. William Stallings, Computer Organization and Architecture, Prentice-Hall of India, Pvt. Ltd., Eleventh edition, 2021. 2. M. Morris Mano, Computer System Architecture, Prentice-Hall of India, Pvt. Ltd., Revised Third edition, 2017. 3. Kai Hwang and NagrshJotwani, Advanced Computer Architecture, McGraw-Hill, 2020. 4. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, Computer Organization, McGraw-Hill, 2021. 5. John P. Hayes, Computer Architecture and Organisation, McGraw Hill, 1998. 6. John L. Hennessy and David A Patterson, Computer Architecture-A quantitative approach, Morgan Kaufmann, 2020.									

CO-PO / PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : HSS				Programme: B.Tech.					
Semester : III				Course Category Code: AEC			Semester Exam Type:		
Course Code	Course Name		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
HSUA103	Entrepreneurship		2	-	-	2	40	60	100
Prerequisite:									
Course Outcome	CO1	Understand entrepreneurial mindset, problem identification, customer segmentation, and value proposition development.							
	CO2	Develop and validate business models, test solutions, and create a Minimum Viable Product (MVP) through iterative feedback.							
	CO3	Analyze financial planning, revenue models, pricing strategies, and investor expectations for startup funding.							
	CO4	Apply sales, branding, digital marketing, automation, and teamwork strategies to successfully launch and scale a venture.							
UNIT-I		Problem Identification and Customer Discovery				Periods: 6			
Entrepreneurial mindset – Identifying business opportunities – Effectuation principles – Design Thinking for problem-solving – Consumer segmentation and customer persona – Value Proposition Canvas (VPC) – Unique Value Proposition (UVP) – Market research techniques – Emerging trends: AI in market research.									CO1
UNIT-II		Business Model and Lean Startup				Periods: 6			
Types of business models – Lean Canvas vs. Business Model Canvas – Competitor analysis – Blue Ocean Strategy – Building and testing Minimum Viable Product (MVP) – Build-Measure-Learn feedback loop – Digital Prototyping tools – Rapid Experimentation – Agile startup methodology.									CO1, CO2
UNIT-III		Revenue Models, Costing, and Financial Planning				Periods: 6			
Revenue models: Subscription, Freemium, and Pay-per-use – Unit economics: Cost structures and pricing strategies – Funding sources: Bootstrapping, Crowdfunding, Venture Capital – Investor expectations and funding rounds – Pitching to investors – Financial forecasting and break-even analysis – Government startup incentives.									CO2, CO3
UNIT-IV		Digital Marketing and Sales Strategies				Periods: 6			
Brand positioning and storytelling – Social media marketing and digital presence – SEO, SEM, and paid advertising – Data-driven marketing strategies – Sales funnels – Unique Sales Proposition (USP) – B2B vs. B2C sales – CRM tools for customer engagement – Customer retention strategies.									CO3, CO4
UNIT-V		Team Building, Compliance, and Scaling				Periods: 6			
Building and managing startup teams – Remote collaboration tools – Business registration and legal compliance – Intellectual Property Rights (IPR) for startups – Growth hacking and automation – Scaling strategies: Expansion and franchising – Emerging trends: AI in entrepreneurship, blockchain applications – Exit strategies: Mergers, acquisitions, IPOs.									CO5
Lecture Periods: 30		Tutorial Periods:		Practical Periods:			Total Periods: 30		
Reference Books:									
1. Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Crown Business, 1st Edition (2011).									
2. Alexander Osterwalder& Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Wiley, 1st Edition (2010).									
3. Ash Maurya, Running Lean: Iterate from Plan A to a Plan That Works, O'Reilly Media, 2nd Edition (2019).									
4. Steve Blank and Bob Dorf,TheStartup Owner's Manual: The Step-by-Step Guide for Building a Great Company, K&S Ranch, 1st Edition (2012).									

CO-PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	2	3	2	1	3	2	2	2	2	1	1
C02	3	3	3	2	3	2	2	3	3	2	2
C03	1	2	3	3	2	1	1	2	3	3	2
C04	2	2	2	3	2	2	2	3	3	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : HSS				Programme: B.Tech.					
Semester : IV				Course Category Code: VAC			Semester Exam Type:		
Course Code	Course Name:	Periods / Week			Credit	Maximum Marks			
		L	T	P		C	CA	SE	TM
GEUV104	Universal Human Values	1	0	0	1	100	0	100	
Prerequisite:	-								
Course Outcome	CO1	Develop a Holistic Understanding of Value Education							
	CO2	Foster Personal and Social Harmony							
	CO3	Enhance Awareness of Universal Co-existence							
	CO4	Apply Ethical and Humanistic Principles in Professional and Personal Life							
Module--I	Introduction to Value Education				Periods: 3				
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 Fulfil the Basic Human Aspirations								CO1	
Module-II	Harmony in the Human Being				Periods: 3				
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health								CO2	
Module-III	Harmony in the Family and Society				Periods: 3				
Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order								CO2	
Module-IV	Harmony in the Nature/Existence :				Periods: 3				
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence								CO3	
Module-V	Implications of the Holistic Understanding				Periods: 3				
A Look at Professional Ethics : (3 hours) 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								CO4	
Lecture Periods: 15		Tutorial Periods: 0		Practical Periods:0		Total Periods: 15			
Reference Books:									
1. Student Induction Program Handbook v2 by AICTE NCC-IP sub-committee: Dr. Rajneesh Arora, Chairman NCC-IP, Dr. Shishir Gaur, Convener NCC-IP, Dr. Ruchir Gupta, Member NCC-IP.									
2. a foundation course in R R Gaur R Asthana G P Bagaria HUMAN VALUES and professional ethics , R R Gaur R Asthana G P Bagaria									
3. Understanding Human Being, Nature and Existence Comprehensively By UHV Team (https://uhv.org.in/uhve)									
4. Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics RR Gaur, R Asthana, GP Bagaria									

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	3	3	2	2	2	3
CO2	2	2	2	2	2	3	3	3	3	2	3
CO3	3	2	2	2	2	3	3	2	2	2	3
CO4	3	2	2	2	3	3	3	2	2	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech						
Semester : III				CourseCategoryCode: PCC			SemesterExamType: LB			
Course Code	Course Name			Periods/Week			Credit		MaximumMarks	
				L	T	P	C	CA	SE	TM
ITUC107	Data Structures Lab			-	-	3	1.5	40	60	100
Prerequisite:		-								
Course Outcome	CO1	Learn to implement linear and non-linear data structures as abstract data type using appropriate data declaration and associated operations								
	CO2	Implement data structures using alternate methods for known applications								
	CO3	Experiment suitable data structures in problem solving and real time applications								
Choice of 10-12 experiments from the following										
1. Stack operations using arrays / linked lists 2. Queue operations using arrays / linked lists 3. Conversion of Infix expression to postfix expression using stack 4. Postfix expression evaluation using stack 5. Implementation of circular queue / priority queue / deque 6. Singly linked list operations using arrays / pointers 7. Doubly linked list operations using arrays / pointers 8. Polynomial addition using linked list									CO1 CO2 CO3	
9. Implementation of binary tree using array / pointers 10. Binary tree traversal algorithms 11. Implementation of graphs(directed / undirected) using adjacency matrix / adjacency list 12. Graph traversal algorithms 13. Binary search tree implementation and search operation 14. Hashing functions and collision resolution techniques 15. Solving algorithmic problems on coding platforms like Hacker Rank									CO1 CO2 CO3	
LecturePeriods:			TutorialPeriods:			PracticalPeriods:45			TotalPeriods:45	
ReferenceBooks:										
1. ReemaThareja, “Data Structures using C”, Oxford University Press, 2011. 2. Data Structures Lab manual, Department of IT, PTU, 2024.										

CO-PO / PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2							1	3	2
CO2	3	2	1	2							1	3	2
CO3	2	1	1	1							1	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department :IT			Programme :B.Tech.					
Semester : III			Course Category Code: PCC			Semester Exam Type: LB		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC108	Object Oriented Programming Lab (C++ and Java)	-	-	3	1.5	40	60	100
Prerequisite								
	CO1	Learn the Basics of C++ and Java						
	CO2	Implement the Programming features of C++ and Java						
	CO3	Implement Advanced C++ Programming and Java						
LIST OF EXPERIMENTS								
<p><u>C++ Programs</u></p> <p>1. Implement Programs to demonstrate the use of Classes, Objects, Constructor and Destructor, Control Structures, Arrays and Pointers.</p> <p>2. Implement Programs to demonstrate the use of different types of overloading and type casting.</p> <p>3. Implement Programs to demonstrate the use of Virtual Base Classes, Pure Virtual Function and various types of Inheritance.</p> <p>4. Implement Programs to demonstrate the use of different types of Polymorphism</p> <p>5. Implement Programs to demonstrate the use of Exception Handling</p> <p><u>Java Programs</u></p> <p>6. Implement Programs to demonstrate the use of Packages</p> <p>7. Implement Programs to demonstrate the use of Interfaces</p> <p>8. Implement Programs to demonstrate the use of Event Handling (if necessary)</p> <p>9. Implement Programs to demonstrate the use of Thread Handling</p> <p>10. Programs to implement JDBC connection.</p> <p>11. Solving programming problems on coding platforms like Hacker Rank</p>								CO1 CO2 CO3
Lecture Periods:		Tutorial Periods:		Practical Periods: 45		Total Periods: 45		

Reference Books:

1. Object Oriented Programming with C++, 8th Edition, E. Balagurusamy Paperback – Big Book, 24 September 2020
2. Programming with Java, 7th Edition E. Balagurusamy, Paperback, 12 November 2023
3. S. B. Lippman, JoseeLajoie, "Barbara E. Moo, "C++ Primer", Sixth Edition, Pearson Education, 2012.
4. B. Stroustrup, "The C++ Programming Language", Sixth Edition, Pearson Education, 2014.
5. The Complete Reference Java J2SE 13th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2025.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	2	2	3							1	3	2
CO2	2	3	3	3							1	3	1
CO3	2	2	2	3							2	2	3
CO4	2	2	2	3							2	2	2

Department:IT				Programme:B.Tech.						
Semester : III				CourseCategoryCode:PCC			SemesterExamType:LB			
Course Code	Course Name			Periods/Week			Credit	MaximumMarks		
				L	T	P	C	CA	SE	TM
ITUC109	Operating System Lab			-	-	3	1.5	40	60	100
Prerequisite	-									
Course Outcome	CO1	Demonstrate the use of system calls using Shell script and C								
	CO2	Implement processor, memory, storage management solutions using Shell script and C								
	CO3	Compare and contrast the existing Scheduling algorithms								
	CO4	Implement the process synchronization algorithms and file systems								
1. Study of basic Unix/Linux commands.									CO1	
2. Shell Programming Programs using the following system calls of Unix / Linux operating system: fork,exec, getpid, exit, wait, close ,stat, opendir, readdir Programs using the I/O system calls of UNIX operating system (open,read,write,etc)									CO1	
3. Implementation of scheduling algorithms (CPU and Disk)									CO2,CO3	
4. Implementation of synchronization problems using Semaphore									CO4	
5. Implementation of basic memory management schemes									CO2,CO3	
6. Implementation of virtual memory management schemes									CO2,CO3	
7. Implementation of file systems									CO4	
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45			Total Periods: 45			
Reference Books										
1. Andrew S. Tannenbaum, “Modern Operating Systems”, 5 th Edition, Pearson, 2024										
2. Rajiv Chopra, “Operating Systems: - A Practical Approach”, Fourth Edition, S Chand and Company, 2023										
3. Stephen G Kochan, Patrick Wood, “Shell Programming in Unix, Linux and OS X”, Pearson Education, Fourth Edition, 2016										
4. William Stallings,"Operating Systems Internals and Design Principles", Pearson Education, Ninth Edition, 2021										
5. Charles Crowley, Operating System –A Design-Oriented Approach, Mc Graw Hill, 2017										

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	2	-	-	1	-	-	-	-	-	-	-	2	2
CO2	3	3	2	3	-	-	-	-	-	-	2	1	1
CO3	2	3	2	3	-	-	-	-	-	-	2	1	1
CO4	1	3	1	1	-	-	-	-	-	-	2	1	1

Score: 3 – High; 2 – Medium; 1 – Low

Department : Mathematics				Programme : B. Tech						
Semester: IV				Course Category Code: BSC			Exam Type:TY			
Course Code	Course Name		Hours / Week			Credit	Maximum Marks			
			L	T	P	C	CA	SE	TM	
MAUC107	Mathematics For Computing		3	1	0	4	40	60	100	
Prerequisite		--								
Course Outcome:	CO1	Construct sample spaces of random experiments and discuss the discrete distributions and continuous distributions								
	CO2	Classify the random process and relate the appropriate queueing model to solve practical problems								
	CO3	Develop the knowledge of logical connectivity, compound propositions and formal symbols of propositional logic								
	CO4	Analyze the validity of logical arguments by making use of derivation process.								
	CO5	Develop the concept of Predicate calculus.								
UNIT – I		Probability and Distributions						Hours: 12		
Random Variables and their event spaces - Probability mass function, Distribution functions, Special discrete distributions: Bernoulli, Binomial, Poisson, Geometric distributions, Negative Binomial - Characteristic function. Reliability, Failure density and Hazard function - Some important Continuous distributions: Exponential, Hypo exponential, Erlang, Gamma, Hyper exponential, Weibull, Gaussian, Uniform and Pareto distributions										CO1
UNIT – II		Stochastic Processes and Queueing Models						Hours: 12		
Stochastic Processes: Definition, Classification of Stochastic Processes - Poisson process, Markov Process, Markov Chain. The Birth and Death process: M/M/1, M/M/c, M/M/1/N, M/M/c/N ($c < N$), M/M/c/c, M/M/ ∞ models only - derivation of mean number of customer in the system, queue and waiting time - Simple applications.										CO1, CO 2
UNIT – III		Mathematical Logic						Hours: 12		
Connectives, Statement formulae, well-formed formulae-Tautologies. Equivalence of Statement formulae, Duality law-Tautological implications- Functionally complete set of connectives-NAND and NOR connectives										CO3
UNIT – IV		Normal Forms and Inference Theory						Hours: 12		
Principal conjunctive and disjunctive normal forms-Inference calculus-validity of conclusion using truth table-Rules of inference - Derivation process - Conditional proof - Indirect method of proof - Derivation of validity of conclusion by these methods.										CO3, CO4
UNIT – V		Predicate Calculus						Hours: 12		
Predicate calculus: Predicates, The statement function, variables and quantifiers-Predicate formulas-symbolizing the statement. Inference theory of the predicate calculus-Rules of specification and generalization-Derivation of conclusion using the rules of inference theory.										CO3, CO4, CO5
Total contact Hours: 45		Total Tutorials: 15		Total Practical Classes:			Total Hours:60			
Reference Books:										
1. J.P.Tremblay and R.Manohar, Discrete Mathematical Structures with applications to Computer science, Tata McGraw-Hill Publishing company pvt. Ltd., New Delhi, 2002.										
2. Kishore S. Trivedi, Probability and Statistics with Reliability, Queueing and Computer Science Applications, John Wiley & Sons Inc. Second Edition, 2016.										
3. T. Veerarajan, Probability and Statistics, Random Processes and Queueing Theory" McGraw-Hill										

Education(India) Private Limited, 2018.

4. D.Gross and C.M.Harris, Fundamentals of Queuing Theory, Wiley Students Edition, Third Edition, 2008.
5. J.Medhi, Stochastic models in Queuing Theory, Academic Press, Second Edition, 2002.

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
CO1	3	2	-	2	-	-	-	-	-	-	-	3	-
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-
CO3	3	3	-	2	-	-	-	-	-	-	-	3	-
CO4	3	3	-	2	-	-	-	-	-	-	-	3	-
CO5	3	3	-	2	-	-	-	-	-	-	-	3	-

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester :IV		CourseCategoryCode:PCC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC110	Design and Analysis of Algorithms	3	-	-	3	40	60	100
Prerequisite:	ITUC103 Data structures							
Course Outcome	CO1	Recognize problems solvable by divide and conquer technique and apply						
	CO2	Demonstrate solving problems using greedy and dynamic programming techniques						
	CO3	Use backtracking and branch and bound techniques to solve classic problems						
	CO4	Experiment suitable techniques to solve a given problem instance and analyze its performance through time complexity						
UNIT-I	Algorithm Analysis and Divide and Conquer technique				Periods:9			
Introduction: Algorithm – characteristics – Time and space complexities - best, worst and average case analysis – the order of – asymptotic notations – big Oh, Omega and Theta notations - solving recurrences Divide and Conquer technique: Introduction – DANDC general method - Binary Search - finding maximum and minimum - merge sort – improved merge sort – quick sort – Strassen’s matrix multiplication.								CO1 CO4
UNIT-II	Greedy Technique				Periods:9			
Greedy Method: General Method – Knapsack Problem – MinimumSpanning Tree Algorithms – Single Source Shortest Path distance Algorithm – Job Scheduling - Optimal Storage on Tapes - Optimal Merge Patterns.								CO2 CO4
UNIT-III	Dynamic Programming Technique				Periods:9			
Dynamic Programming: Introduction - Principle of optimality – Multi-Stage Graphs – forward approach – backward approach - All Pairs Shortest Paths Algorithm – single source shortest paths with general weights algorithm - 0/1 Knapsack – Travelling Salesman Problem – Chained Matrix Multiplication.								CO2 CO4
UNIT-IV	Backtracking Method				Periods:9			
Backtracking: The General Method – 8-Queens Problem – Sum of Subsets – Graph Colouring – Hamiltonian Cycles –Knapsack Problem.								CO3 CO4
UNIT-V	Branch and Bound Technique				Periods: 9			
Branch and Bound: Least Cost (LC) Search – The 15-Puzzle Problem – Control Abstractions For LC-Search – Bounding – FIFO Branch and-Bound –LC branch and bound - 0/1 Knapsack Problem – FIFO branch and bound solution - Travelling Salesman Problem – LCBB solution.								CO3 CO4
LecturePeriods:45		Tutorial Periods:-		Practical Periods:-		Total Periods:45		
ReferenceBooks:								
1. S.Sridhar, Design and analysis of algorithms, Oxford university press, 2nd edition, 2023 2. SuchismitaMaiti, Mr. Suman Kumar Bhattacharyya, Mr. AnirbanBhar, Design And Analysis Of Algorithm A Beginner's Guide, Orange Books Publication, 2024 3. Michael T. Goodrich and Roberto Tamassia Design and Analysis of Algorithms, An Indian Adaptation, Wiley Publication, 2021 4. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 2009. 5. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, —Introduction to Algorithms, MIT Press, England, 2009 6. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, —Fundamentals of Computer Algorithms, Second Edition, Universities Press, 2011. 7. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.								

CO-PO / PSO MAPPING

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
C01	3	2	1	1							1	2	2
C02	3	2	1	1							1	2	2
C03	3	2	1	1							1	2	2
C04	3	2	1	2							1	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester : IV		CourseCategoryCode:PCC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC111	Computer Networks	3	1	-	4	40	60	100
Prerequisite:								
Course Outcome	CO1	Describe the functions of each layer in OSI and TCP/IP model, network connecting devices, transmission media used to communicate over the network						
	CO2	Discuss the various application layer protocols (HTTP, SMTP, FTP and DNS) used to communicate with servers and other applications						
	CO3	Demonstrate the transport layer protocols and client-server programming model for reliable communications using end-to-end solution						
	CO4	Examine the efficiency of various congestion control mechanism to improve quality of service of networking application						
	CO5	Design the topological and routing strategies for an IP based networking infrastructure						
UNIT-I	Need for Networking				Periods:12			
Computer Networks and the Internet: Service Description –The Network Edge: Access Networks– Physical Media. The Network Core: Packet Switching, circuit switching and A Network of Networks. - Delay, loss and throughput in Packet switched Networks – Protocol Layers and their models - History of Computer Networking and the Internet							CO1	
UNIT-II	Application Layer				Periods:12			
Principles of Network Applications – The Web and HTTP – Electronic Mail in the Internet– DNS – Peer to Peer Applications – Video streaming and content distribution Networks - Socket Programming: Socket programming with TCP and UDP.							CO1, CO2	
UNIT-III	Transport Layer				Periods:12			
Transport Layer Services– Multiplexing and De-multiplexing – Connectionless Transport: UDP – Principles of Reliable Data Transfer – Go-Back-N and Selective Repeat. Connection-Oriented Transport: TCP – TCP connection– Segment Structure – RTT estimation – Flow Control – Connection Management – Principles of Congestion Control – The causes and cost of congestion – Approaches to congestion control - TCP congestion control.							CO3	
UNIT-IV	Network Layer				Periods:12			
Overview of Network Layer: Data plane: What’s inside a router – The Internet Protocol : IPV4 datagram format – Ipv4 addressing- Network Address Translation- IPv6. Network Layer: Control plane – Routing algorithms: Link State routing – Distance Vector Routing – Intra AS routing in the Internet: OSPF – Routing among the ISPs: BGP – Internet Control Message Protocols – Network Management and SNMP.							CO4, CO5	
UNIT-V	Data Link Layer and LANs				Periods: 12			
Link Layer Services– Framing - Error correction and detection – Multiple Access Links and Protocols – Switched Local Area Networks – Link-Layer Addressing and ARP – Ethernet – Link layer switches – Virtual Local Area Networks (VLANs) - Data centre Networking - WiFi: IEEE 802.11 Wireless LANs.							CO1	
Lecture Periods: 45		Tutorial Periods:-15		Practical Periods: -		Total Periods:60		

Reference Books:

1. James F.Kurose, KeithW.Ross, "ComputerNetworking,ATop-DownApproachFeaturingtheInternet", Eighth Edition, Pearson Education, 2022.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2017.
3. Behrouz A Forouzan, Firouz Mosharraf "Computer Networks: A Top down Approach" Fifth Edition, McGraw Hill, 2023.
4. LarryL.Peterson, Bruce S.Davie, "Computer Networks: A Systems Approach", Sixth Edition, Morgan Kaufmann Publishers Inc., 2020.

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2										2	3	
CO2	2	2										3	2
CO3	2	2										2	1
CO4	2	2	2									2	2
CO5	2	2	2								1	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech							
Semester : IV				CourseCategoryCode: PCC			Semester ExamType: TY				
Course Code	Course Name			Periods/Week			Credit		Maximum Marks		
				L	T	P	C		CA	SE	TM
ITUC112	Information Coding Techniques			3	-	-	3		40	60	100
Prerequisite:											
Course Outcome	CO1	Learn the fundamentals of information and representation of text, image, audio and video.									
	CO2	Understand the basic data and source coding algorithms for multimedia data.									
	CO3	Compare various ITU/MPEG coding standards for different data.									
	CO4	Apply the efficient source coding algorithms in multimedia coding standards.									
UNIT-I	Introduction						Periods: 9				
Information – Entropy - Properties of information and Entropy- Relation between information and probability- Mutual and Self-Information - Coding theory- Code Efficiency and Redundancy-Shannon’s theorem – Construction of basic codes.										CO1	
UNIT-II	Text Coding						Periods: 9				
Shannon and Fano coding - Huffman coding– Arithmetic coding - Predictive coding - Run-length Encoding - Ziv-Lempel Coding – Predictive Coding – File Formats: text, audio, image and video file formats.										CO1, CO2	
UNIT-III	Audio Coding						Periods: 9				
Audio Coding: types – Linear Predictive Coding (LPC) – Code Excited LPC – Perceptual Coding - MPEG Audio Coding.										CO1, CO2	
UNIT-IV	Image Coding						Periods: 9				
Image Coding: Image representation – Transformation: DCT – DWT – Quantization: Scalar - Vector – Image Coding Standards: JBIG, JPEG and JPEG 2000.										CO3, CO4	
UNIT-V	Video Coding						Periods: 9				
Video Coding: Motion Estimation and Compensation – Types of Frames – Encoding and Decoding of Frames – Video Coding Standards: H.261, H.263, MPEG-1, MPEG-2, MPEG-4, H.264/AVC, H.265/HEVC, Internet Video Coding.										CO3, CO4	
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -			Total Periods: 45		
ReferenceBooks:											
1. Ze-Nian Li, Mark S. Drew and Jiang Chuan Liu, Fundamentals of Multimedia, Springer Edition, 2021.											
2. Monica Borda, Fundamentals in Information Theory and Coding, Springer, 2020.											
3. Ranjan Bose, Information theory, coding and cryptography, Tata McGraw Hill, 2018.											
4. K.R. Rao and J.J. Hwang, “Techniques and Standards for Image, Video and Audio Coding, Prentice Hall, 2020.											
5. Yun Q. Shi and Huifang Sun, Image and Video compression for Multimedia Engineering, CRC Press, third edition, 2019.											

CO-PO / PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : HSS			Programme: B.Tech.					
Semester : IV			Course Category Code: AEC			Semester Exam Type: TY		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
HSUA104	Design Thinking	2			2	40	60	100
Prerequisite:								
Course Outcome	CO1	Apply Design Thinking to solve engineering problems						
	CO2	Generate creative solutions for real-world problems using brainstorming and other idea-generation techniques						
	CO3	Build and test prototypes to validate design ideas and improve them based on user feedback.						
	CO4	Work in teams and communicate ideas effectively through presentations, reports, and discussions.						
UNIT-I	Introduction to Design Thinking				Periods: 6			
Understanding the Need for Design Thinking in Engineering - Five-Stage Process: Empathize, Define, Ideate, Prototype, Test - Case Studies: How Engineering Innovations Used Design Thinking - Mindset Shift: From Problem-Solving to Human-Centered Design Team Exercise: Identify a real-world engineering problem and discuss how Design Thinking can be applied.								CO1, CO4
UNIT-II	Empathize				Periods: 6			
Importance of User Research in Engineering Solutions - Techniques: Interviews, Observations, Surveys, Empathy Mapping - Engineering Constraints vs. User-Centric Needs - Role of Emotional Intelligence in Product Development Team Exercise: Conduct field research (interview users or observe a process) and create an Empathy Map for an engineering challenge.								CO1, CO2
UNIT-III	Define & Ideate				Periods: 6			
Problem Definition Techniques: How to Frame the Right Problem - Creating Point of View (POV) Statements - Brainstorming & Idea Generation Techniques: SCAMPER, Reverse Thinking, Mind Mapping - Evaluating and Selecting Feasible Engineering Solutions Team Exercise: Define a problem statement and conduct a Brainstorming Workshop to generate innovative solutions.								CO2, CO4
UNIT-IV	Prototyping				Periods: 6			
Importance of Rapid Prototyping in Engineering - Types of Prototypes: Paper, Digital, Physical Models, Simulation - Tools & Technologies: 3D Printing, CAD, Arduino, Low-Code Development - Iteration & Refinement – Learning from Failures. Team Exercise: Develop a low-fidelity prototype of an engineering solution and present it to peers for feedback.								CO3, CO4
UNIT-V	Testing, Iteration & Implementation				Periods: 6			
Methods of Testing: Usability Testing, A/B Testing, Stress Testing - Gathering Feedback: Stakeholder & User Insights - Iteration Strategies: Continuous Improvement & Agile Thinking - Real-World Engineering Applications of Design Thinking Team Exercise: Conduct a user test on the prototype, refine it based on feedback, and present the final solution in a showcase session.								CO3, CO4
Lecture Periods: 30		Tutorial Periods:		Practical Periods:		Total Periods: 30		
Reference Books:								
1. Michael Lewrick, Patrick Link, and Larry Leifer, <i>The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods</i> , Wiley, 1st Edition, 2020.								
2. Teun den Dekker, <i>Design Thinking</i> , Noordhoff Uitgevers bv, International Edition, 2020								
3. Angèle M. Beausoleil, <i>Business Design Thinking and Doing</i> , Palgrave Macmillan Imprint, Springer, 2022								
4. Soni Pavan, <i>Design your Thinking</i> , Penguin Random House India Publishing, 2020								
5. E Balagurusamy, <i>Design Thinking</i> , McGraw Hill; First Edition, 2024								

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	2	1	2	1	2	3
CO2	3	3	3	2	2	2	-	2	3	2	3
CO3	3	2	3	3	3	2	1	3	2	3	3
CO4	-	-	3	2	-	2	3	3	3	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department :HSS			Programme: B.Tech.					
Semester : IV			Course Category Code: AEC			Semester Exam Type: TY		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
HSUA106	Foreign Language - FRENCH	2	-	-	2	40	60	100
Prerequisite:								
Course Outcome	CO1	To acquire the basics of the French language						
	CO2	To apply the acquired basics of the language in expressing oneself						
	CO3	To develop basic conversation skills						
	CO4	To communicate their student life in the University context						
	CO5	To equip the students to communicate within technical contexts						
UNIT-I	Introduction To French And Basics				Periods: 6			
French alphabets and pronunciation – Greetings and Introductions (Bonjourçava?) – Numbers, days of the week, months, seasons – Classroom expressions and instructions – Articles (Definite and Indefinite) – Basic sentence structure (Subject – Verb Agreement)							CO 1	
UNIT-II	Personal Identity and Expressions				Periods: 6			
Introducing oneself and others (Je me présente.....) – Nationalities and Professions – Describing people (Physical appearance and Personality) – Possessive adjectives (mon, ma, mes...) – Gender and number agreement of adjectives							CO 2	
UNIT-III	Daily Life and Routines				Periods: 6			
Talking about daily activities and schedules (Je mëlève à7 heures...) – Telling the time and discussing time tables – Common verbs in the present tense (ER, IR, RE verbs) – Reflexive verbs (Se lever, s’habiller...)							CO3	
UNIT-IV	Directions and University Life				Periods: 6			
Asking for and giving directions (Oùest....? A gauche, A droite...) – Describing locations (Près de, loin de....)- Talking about University courses and subjects (J’étudiel’ingénierie...) - Prepositions of place (sur, sous, devant....) – Using Il y a and C’est for descriptions							CO4	
UNIT-V	Future Plans, Basic Technical Presentations and Technical and Engineering Contexts				Periods: 6			
Talking about future career goals (Je veuxdeveniringénieur.....) Using future proche for near future plans- Vocabulary related to Engineering disciplines – Talking about machines and materials (Acier, moteur, circuit....) – Giving simple presentations on technical topics – Introduction to passive voice (La machine estréparée....)							CO5	
Lecture Periods: 30		Tutorial Periods: -		Practical Periods:-		Total Periods: 30		
Reference Books:								
1. Nouvelle Generations A1, Luca Giachino, Carla Baracoo, Didier FLE, 2020, Paris								
2. Tech French – French for Science and Technology, Ingrid Le Gargasson, SharivaNaik et Claire Chaize, Goyal Publishers, 1 April 2011.								
3. Écho – Méthode de Français, A1 ,Girardet, Pecheur, CLE International,2013.								
4. ÉchoCahier personnel d’apprentissage, A1, Girardet, Pecheur, CLE International, 2013.								

CO-PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1								3	3		3
CO2								3	3		3
CO3								3	3		3
CO4								3	3		3
CO5								3	3		3

Score: 3 – High; 2 – Medium; 1 – Low

Department : HSS			Programme: B.Tech.						
Semester : IV			Course Category Code: VAC			Semester Exam Type: -			
Course Code	Course Name		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
GEUV103	Environmental Education		1	-	-	1	100	-	100
Prerequisite:	-								
Course Outcome	CO1	Recall the concept of environment ecology and Education.							
	CO2	Summarise the effect of population explosion, degradation of environment and global problem due to the anthropogenic activities.							
	CO3	Justify the need of pollution control and sustainable development for future.							
UNIT-I	Introduction to Environmental Education					Periods: 5			
Concept, scope and importance of Environmental Education - Objectives of Environmental Education - Concept of an Ecosystem: Structure and functions, Types of ecosystem (aquatic and terrestrial) - Biodiversity: Levels, values, threats and conservation - Natural resources: Renewable and Non-renewable resources.									CO1
UNIT-II	Environmental degradation and impact					Periods: 5			
Human population growth and its impact on environment - Deforestation: Causes and effects due to expansion of agriculture, firewood, mining and building of new habitats - Pollution: Definition, different types of Pollution - Air and water pollution: Causes and effect on environment - Climate change, Global warming, Ozone layer depletion and impacts on human communities.									CO2
UNIT-III	Conservation of environment					Periods: 5			
Control measures for various types of Pollution: use of renewable and alternate source of energy - Environmental laws: Environmental Protection Act (1986), Water Act (1974), Air Act (1981) - International agreements: Montreal and Kyoto Protocol, Paris Agreement - Concept of sustainable development and SDGs - Role of government, NGOs and individual in environmental conservation.									CO3
Lecture Periods: 15		Tutorial Periods:		Practical Periods:			Total Periods:		
Reference Books:									
1. Singh, J.S., Singh, S.P. and Gupta, S.R., 2014. "Ecology, Environmental Science and Conservation", S. Chand Publishing, New Delhi.									
2. Sharma, P. D., 2011. "Ecology and Environment", Rastogi Publications.									
3. ErachBharucha, 2010. "Text Book of Environmental Studies", University Grants Commission, Universities Press (India) Pvt.Ltd., Hyderabad.									

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1					3	1				1
CO2	1					3	1				1
CO3					1	3	2	1			2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech						
Semester : IV				CourseCategoryCode: PCC			Semester ExamType: LB			
Course Code	Course Name			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CA	SE	TM
ITUC113	Design and Analysis of Algorithms Lab			-	-	3	1.5	40	60	100
Prerequisite:		-								
Course Outcome	CO1	Apply and explain when an algorithmic design situation calls for divide-and-conquer, greedy, dynamic programming, Backtracking and Branch and bound techniques for classic problems							Apply	
	CO2	Implement alternate algorithmic methods for known and unknown applications							Apply	
	CO3	Experiment suitable algorithmic methods in real time applications and analyze the performance							Analyze	
Choice of 10-12 experiments covering all FIVE methods										
1. Binary search and finding minimum & maximum using DANDC method 2. Quick sort algorithm 3. Merge sort algorithm and Improved merge sort algorithm 4. Strassen’s Matrix multiplication using DANDC method 5. General Knapsack problem solution using Greedy method 6. Prim’s algorithm to find minimum spanning tree of a graph 7. Kruskal’s algorithm to find minimum spanning tree of a given graph 8. Dijkstra’s algorithm to find shortest path distance from a source to all destination									CO1 CO2 CO3	
9. All pairs shortest path distance algorithm using dynamic programming method 10. 0/1 knapsack problem solution using dynamic programming method 11. Travelling salesman problem solution using dynamic programming method 12. N queen’s problem solution using backtracking method 13. Sum of subsets problem solution using backtracking method 14. Graph Coloring problem solution using backtracking method 15. Hamiltonian Cycle problem solution using backtracking method 16. Branch and bound algorithm for 8 puzzle problem 17. Branch and bound algorithm for 0/1 knapsack problem 18. Solving algorithmic problems on coding platforms like HackerRank.									CO1 CO2 CO3	
LecturePeriods:		TutorialPeriods:		PracticalPeriods:45				TotalPeriods: 45		
ReferenceBooks:										
1. DeepshikhaAgarwal, A Practical Guide to Analysis and Design of Algorithms, Notion Press Media Pvt Ltd, 2021 2. Books for the language choice (C / C++ / Java) for coding the algorithms. 3. Design and Analysis of Algorithms Lab manual, Department of IT, PTU, 2024.										

CO-PO / PSO Mapping

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PS02
CO1	3	2	1	1							1	3	2
CO2	3	2	1	2							2	3	2
CO3	3	2	1	2							2	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech						
Semester : IV			CourseCategoryCode: PCC			SemesterExamType: LB			
CourseCode	Course Name		Periods/Week			Credit	MaximumMarks:100		
			L	T	P	C	CA	SE	TM
ITUC114	Computer Networks Lab		-	-	3	1.5	40	60	100
Prerequisite:			Programming knowledge on C/C++/Java/Python						
Course Outcome	CO1	Implement TCP and UDP sockets for various network application such as client-server chat, file transfer, real-time multimedia transmission							
	CO2	Implement sliding window protocols and RMI to provide reliable data delivery between nodes							
	CO3	Analyse the performance of TCP and UDP using the simulation tool							
S.No	Experiments								CO
1.	Use the commands ipconfig, route, hostname, arp, netstat, nslookup, nbtstat, netdiag, ping, and traceroute to understand the networking configuration of the computer that the student is working on								
2.	Implementation of Client Server Communication Using TCP a. Chat b. File transfer c. Concurrent server								CO1
2.	Applications using UDP Sockets like a. DNS b. chat								CO1
4	Write programs simulating ARP and RARP protocols								CO1
5	Implementation of Sliding Window Protocols: a. Stop and Wait Protocol b. Go Back 'N' Protocol c. Selective Repeat ARQ Protocol								CO2
6	Write a program to implement RPC (Remote Procedure Call) a. Arithmetic calculator b. Factorial of a number								CO2
7	Create a socket for HTTP for web page upload and download								CO1
8	Message passing using Message Window - Broadcasting								CO1
9	Message passing using Group Window - Multicasting								CO1
10	Simulate Distance Vector/ Link State Routing algorithm.								CO3
11	Packet Capture and Analysis : Study of frame format of IP, TCP and UDP datagrams and Traffic analysis using wireshark								CO3
Software: 1. C / C++ / Java / Python / Equivalent Compiler 2. Network simulator like NS2 / NS3 / Wireshark/ Equivalent									
LecturePeriods:			TutorialPeriods:-		PracticalPeriods: 45		TotalPeriods:45		
ReferenceBooks: 1. Harold, Elliotte Rusty. Java network programming. " O'Reilly Media, Inc.", 2004. 2. Dr. M.O. FaruqueSarker, Sam Washington, "Learning Python Network Programming", Packet Publisher, O'Reilly, June 2015. 3. https://www.w3schools.in/python-tutorial/network-programming 4. Cisco Packet Tracer /C, Java /Wireshark Tool									

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1								3	3	1
CO2	2	2	1	2								2	2
CO3	2	2	2	2					3		1	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech.						
Semester : IV				CourseCategoryCode: PCC			Semester ExamType: LB			
Course Code	Course Name			Periods/Week			Credit		Maximum Marks	
				L	T	P	C	CA	SE	TM
ITUC115	Python Programming Laboratory			-	-	3	1.5	40	60	100
Prerequisite	-									
Course Outcome	CO1	Develop and execute simple Python programs.								
	CO2	Decompose a Python program into functions								
	CO3	Represent compound data using Python data structures								
	CO4	Apply Python features in developing software applications								
1. Python programming using simple statements and expressions.									CO1	
2. Scientific problems using Conditionals and Iterative loops.									CO2	
3. Implementing real-time/technical applications using Lists, Tuples.									CO4	
4. Implementing real-time/technical applications using Sets, Dictionaries.									CO4	
5. Implementing programs using Functions.									CO2	
6. Implementing programs using Strings.									CO3	
7. Implementing programs using written modules and Python Standard Libraries.									CO3	
8. Implementing real-time/technical applications using File handling.									CO3, CO4	
9. Implementing real-time/technical applications using Exception handling.									CO3, CO4	
10. Developing a game activity using Py game like bouncing ball, car race etc.									CO2, CO3 CO4	
Lecture Periods: -		Tutorial Periods: -		Practical periods: 45			Total Periods: 45			
Reference Books										
1. Rob Mastrodomenico, “The Python Book”, Wiley, 2022. 2. Martin C. Brown, Python: The Complete Reference, Fourth edition, McGrawHill, USA, 2018. 3. Ashok Namdev Kamthane and Amit Ashok Kamthane, Programming and problem solving with python, McGraw Hill, USA, 2018. 4. Reema Thareja, Python programming using problem solving approach, Oxford University Press, India, 2017. 5. John V. Guttag, Introduction to Computation and Programming using Python”, The MIT Press, 2016. 6. Robert Sedgewick, Kevin Wayne, Robert Dondero "Introduction to Programming in Python: An Interdisciplinary Approach", Pearson India., 2016.										

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-
CO2	2	2	2	2	-	-	-	-	-	-	-	2	-
CO3	2	2	1	2	-	-	-	-	-	-	-	2	-
CO4	2	3	3	3	-	-	-	-	-	-	-	2	-

Department: IT		Programme:B.Tech.						
Semester :V		CourseCategoryCode:PCC				SemesterExamType: TY		
Course code	Course Name	Periods/Week			Credit	Maximum Marks		
		L	T	P		C	CA	SE
ITUC116	Software Engineering	3	-	2	4	40	60	100
Prerequisite	ITUC103 – Data structures							
Course Outcome	CO1	Remember and Understand basic definitions, concepts and all Software Engineering Lifecycle Models.						
	CO2	Apply Software Engineering Lifecycle Models for real-Time Projects.						
	CO3	Create requirement gathering report with DFD/ER/Use Case appropriate for chosen real-time projects.						
	CO4	Decompose with WBS to achieve modular design specification and create SDS Report.						
	CO5	Evaluate with software metrics for cost estimation and time schedule for chosen real-time projects.						
UNIT-I	Introduction to Software Engineering				Periods:9			
The Software Engineering Discipline – Evolution and Impact – Software Development Life Cycle –General V Model -Software Project versus Software Product. Software Life Cycle Models: Classic Water fall model–Iterative Life cycle model–Incremental Model, RAD Model, Prototyping model–Types of Prototype-Spiral model– WIN-WIN Spiral-Introduction to Agile, What is Agility?, Agile Process, Extreme Programming (XP), Agility and the cost of change.								
UNIT-II	Software Requirement Gathering				Periods:9			
Understanding Requirements: Requirements Engineering, Establishing the ground work form Brainstroming, identifying stakeholders, feasibilty study, requirements gathering for Data Flow Diagrams (DFDs), Entity-Relationship (ER) diagrams and Use Cases Model using Rational Rose Tool. Software Cost Estimation: Cost Estimation with activity chart and critical path method- COCOMO-I and COCOMO-II Model.								
UNIT-III	Software Design Specification				Periods:9			
Design Process – Characteristics of a Good Software Design –High Level Architectural Design- Decomposition Techniques with Work Break down Structure, Coupling and Cohesion –Types of Coupling and Cohesion, Approaches to Software Design for Structured DFD, Object Oriented ER and embedded Use case.								
UNIT-IV	Coding and Testing				Periods:9			
Coding – Testing –Error, bug , fault and failure, Verification and Validation testing–White Box testing – Unit Testing –Test Coverage Criteria Based On Data Flow Path Mechanisms–Cyclomatic Complexity – Regression Testing– smoke Testing- Integration testing –acceptance testing, along with functional testing - Structure Oriented Testing versus Object Oriented Testing -Black Box testing –BVA– System Testing.								
UNIT-V	Software Project Management and Quality Control				Periods:9			
Software Reliability – Software Quality – ISO 9000 – SEI CMM – Six Sigma. Measures and Measurements – Software Metric-ZIPF’s Law – Software Cost Estimation – Function Point Models–COCOMO Model–Delphi Method–Scheduling–Software reverse engineering– RiskManagement–Software maintenance process.								
Lecture Periods:45		Tutorial Periods:		Practical Periods:15		TotalPeriods:60		

References Books

1. Erik W. Larson , Clifford F. Gray and Rohit Joshi , "Project Management: The Managerial Process", 8th McGraw Hill Edition ISBN-13978-9354602078 October 2021.
2. Mall Rajib, Fundamentals of Software Engineering, PHI, 2014
3. Jalote Pankaj, Software Engineering: A Precise Approach, Wiley India, 2010
4. Pressman, Software Engineering Practitioner's Approach, McGraw Hill Education, 2012
5. Vliet V Hans, Software Engineering: Principles and Practice, John Wiley & Sons Ltd. 2008

Kjk2

Software Engineering Practical**Exercises**

1. Identify appropriate model for given domain-Case study on Importance of agile in real-time system.	Practical hours:6	CO1
2. Prepare SRS report in IEEE format for the given domain with DFD/ER/Use Case. Documenting and validating completeness and accuracy Eliciting Requirements	Practical hours:6	CO2, CO3
3. Prepare SDS report in IEEE format with WBS incorporating minimum three Modules for the given domain.	Practical hours:6	CO2, CO3
4. Apply all Test case generation for real-time Mini Projects.	Practical hours:6	CO3, CO4
5. Apply software standards for small real-time projects.	Practical hours:6	CO5

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	0	1	0	0	0	0	0	1	1	3	3
CO2	2	3	0	2	0	0	0	0	2	3	2	2	3
CO3	1	3	2	1	1	2	2	0	2	3	2	1	3
CO4	2	3	2	1	3	3	1	3	3	3	3	1	3
CO5	2	3	0	0	1	3	3	3	2	3	3	1	1

Department:IT				Programme:B.Tech						
Semester : V				CourseCategoryCode:PCC			SemesterExamType: TY			
Course Code	Course Name			Periods/Week			Credit	MaximumMarks		
				L	T	P	C	CA	SE	TM
ITUC117	Data Base Management Systems			3	-	-	3	40	60	100
Prerequisite:		ITUC103-Data Structures								
Course Outcome	CO1	Understand basics of DBMS with its Architecture								
	CO2	Create ER diagram with various Key Constraints								
	CO3	Apply various query Techniques and normalization techniques in real time database application								
	CO4	Apply concurrency control & recovery mechanism for database problems								
	CO5	Create Multidimensional DB for mini Project and Understand concepts of Distributed ,Parallel Database and Data Warehouse								
UNIT-I		Introduction To Databases							Periods:9	
Purpose of Database System – Data Versus Information –What is database system, purpose of database system, view of data, relational databases, Database System Architecture– Types of Architectures (Single-Tier Architecture, Two-Tier Architecture, Three-Tier Architecture)									CO1	
UNIT-II		Relational Database Design and SQL						Periods:9		
Relational Database Design: – Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Introduction to relational databases – Relational Model – Keys – SQL Queries with creation of Tables with attributes and its types including key sconstraints Data types- Key Constraints (primary key, foreign key, etc.) Basic SQL syntax (SELECT, FROM, WHERE, INSERT, UPDATE, DELETE)									CO2, CO3	
UNIT-III		Relational Algebra and Functional Dependencies						Periods:12		
Relational Algebra: Select Operation (or σ), Project Operation (or π), Union Operation (or \cup), Set Different Operation (or $-$), Cartesian Product Operation (or \times)' Rename Operation (or ρ) -Data manipulation -Data definition (DDL) -Data retrieval (DQL), JOIN Operation, SET Operation- PL/SQL, Trigger and cursor . Functional Dependencies– Normalization -First, Second, Third Normal Forms – Dependency Preservation – Boyce-Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form									CO2, CO3	
UNIT-IV		Transaction and File Organization and Indexing						Periods:8		
Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking mechanisms and Protocols – Two Phase Locking – Deadlock – Save Points – Roll back – SQL Facilities for Concurrency and Recovery.									CO3, CO4	
File Organization and Indexing: Sequential, indexed, and hashed files- RAID- Indexing and Hashing – B+ tree Index Files – B tree Index Files										
UNIT-V		Advanced database						Periods: 7		
Distributed Databases: Heterogeneous and Homogenous Database, Distributed Database Architecture - Introduction to Parallel Databases. Introduction to Data Warehouse: Definition – Multidimensional Data Model – Data Cube – Dimension Modelling– OLAP Versus OLTP Operations.									CO1, CO5	
Lecture Periods:45			Tutorial Periods:		Practical Periods:-			Total Periods:45		
ReferenceBooks										
1. RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, Global Edition, 2016										
2. A. Silberschatz, H. Korth, S. Sudarshan, Database System Concepts, Seventh Edition, McGraw-Hill, 2019.										
3. VladVlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati, An Introduction to Cloud Databases, O'Reilly Media, Inc., 2019										
4. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining and OLAP, Tata McGraw-Hill, 2004. Reprint 2014										

CO-PO/PSO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	1	1	3	3
CO2	2	3	-	-	-	-	-	-	2	3	2	2	3
CO3	2	3	3	-	1	3	2	-	2	3	2	2	3
CO4	2	3	3	-	3	3	1	3	3	3	3	3	2
CO5	2	3	1	-	2	3	3	3	3	3	3	2	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech.(IT)					
Semester : V			Course Category Code: PCC			Semester Exam Type: TY		
Course Code	Course Name	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC118	Web Essentials	3	-	-	3	40	60	100
Prerequisite	ITUC111 - Computer Networks							
Course Outcome	CO1	Discuss the concepts of internet protocols, web browsers and servers.						
	CO2	Demonstrate Scripting languages.						
	CO3	Organize XML documents including ActiveX controls.						
	CO4	Use Multimedia on web design for E-commerce.						
	CO5	Experiment Ajax programming in web services.						
UNIT-I	Introduction				Periods:09			
Introduction to Internet Principles and Components: History of the Internet andWorldWideWeb-HTML-protocols–HTTP,SMTP,POP3,MIME,IMAP.DomainNameServer,WebBrowsers and Web Servers, Dynamic HTML.								CO1
UNIT-II	Scripting Languages				Periods:09			
Client Side and Server Side Programming: Introduction to Java Scripts and VB Scripts– Object Based Scripting for the Web. Programming with JQuery– Structures – Functions – Arrays – Objects, Regular Expression in JavaScript. Java Server Pages – Session and Application management – Session Tracking and Cookies–Access database from JSP.								CO1,CO2
UNIT-III	XML, PHP and Servlets				Periods:09			
XML and ActiveX: Well-formed XML documents - XML markup-working with elements and attributes –Creating valid documents - XML objects and DOM.								CO3
Servlets: Installing Servlets, The Servlet Life Cycle, Servlet API, Cookies, Database Connectivity, Servlet Chaining. PHP – Working principle of PHP – Variables and Constants – Operators – Flow Control andLooping – Arrays – Strings – Functions – File Handling – File Uploading – Email Basics – Email withattachments – PHP and HTML – Simple PHP scripts – Databases with PHP.								
UNIT-IV	Electronic Commerce				Periods:09			
Multimedia and Web Application: Multimedia in Web design, Audio and video speech synthesis and recognition - Electronic Commerce – E-Marketing - Case studies: Amazon, Flipcart – Online Transactions- Online Payments and Security. Search and Design: Working of Search Engines – Search Engine Optimization (SEO) – Search Interfaces.								CO4
UNIT-V	Web Services and Ajax				Periods:09			
Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services. Ajax–Improving webpage performance using Ajax, Programming in Ajax.								CO4,CO5
Lecture Periods:45		Tutorial Periods:-		Practical Periods:-		Total Periods:45		
ReferenceBooks:								
1. N.P.Gopalan and J.Akilandeswari, “Web Technology: A Developer’s Perspective”, Second Edition,Prentice-HallofIndia,2014.								
2. Steven Holzener , “PHP – The Complete Reference”,McGraw-Hill, Jan 2020.								
3. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites”, 7 th Edition, O’Reilly Publishers, Jan 2025.								
4. Deitel and Deitel, Goldberg,“Internet and World Wide Web–How to Program”, Fifth Edition, Pearson Education Asia,2011.								
5. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP and UDDI”, Addison-Wesley, 2007.								

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	2	-	2	-	-	0	-	-	1	2	1
C02	2	-	2	-	3	-	-	0	-	-	2	2	2
C03	2	-	1	-	3	-	-	1	-	-	3	3	2
C04	2	-	2	-	2	-	-	3	-	-	3	2	2
C05	3	-	3	-	3	-	-	3	-	-	3	3	3

Department: HSS			Programme: B.Tech.					
Semester : V			CourseCategoryCode: AEC			SemesterExamType: TY		
Course Code	Course Name	Periods/ Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
HSUA105	Industrial Economics and Management	2	-	-	2	40	60	100
Pre-requisite	Nil							
Course Outcome	CO1	Demonstrate economic theories, revenue and cost concepts and set of analytical techniques applied to a variety of economic (and non-economic) and financial management issues.						
	CO2	Implement various management techniques based on the needs						
	CO3	Apply financial planning and Interpret company’s income statements and balance sheets to ascertain the financial position of a company.						
	CO4	Apply production planning, project scheduling and financial analysis to economic investment and project management problems.						
	CO5	Understand fundamental marketing concepts, apply them to real-world scenarios, and develop effective marketing strategies.						
UNIT-I	Micro and Macro Economics and its Applications					Periods:6		
Nature and Scope of Economic science – Micro Economics: Economic decisions and Technical decisions, Demand and Supply concepts, Market Equilibrium, Elasticity of Demand, Various concepts of Cost– Break Even Analysis – Market structure. Macro Economics: Measures of National Income–Inflation–Business Cycle.								CO1
UNIT-II	Management Techniques					Periods:6		
Introduction to Management –Functions of Management –F.W.Taylor’s Scientific Management– Henry Fayol’s Principles of Management. Forms of Business Organization, and Types of(Ownership)of a firm.								CO2
UNIT-III	Industrial Finance					Periods:6		
Need for Finance–Types of finance–Sources of finance. Final Accounts – Preparation of Trading, Profit and loss Account and Balance Sheet.								CO3
UNIT-IV	Production Management					Periods:6		
Types of Production system – Production Planning and control: Planning, Routing, Scheduling, Inspection and Dispatches. Concepts of Productivity–Measurement of Productivity.								CO4
UNIT-V	Marketing Management					Periods:6		
Core Concepts of Marketing – Marketing Vs Selling–Channels of Distribution–Promotion Vs. Advertising–Market Research Vs Marketing research.								CO5
Lecture Periods: 30		Tutorial Periods:–		Practical Periods:–		TotalPeriods: 30		
Reference Books								
1. Varshney Maheswari, Managerial Economics, SChand&Co, NewDelhi, 2011. 2. Dutt & Sundaram, Indian Economy, SChand&Co,NewDelhi,2015. 3. Pandeyl. M, Elements of Financial Management Wiley Eastern Ltd, NewDelhi,2015. 4. H.L. Ahuja, Macro Economics for Business and Management, SChand&CompanyLtd, 2011. 5. O.PKhanna, Industrial Engineering and Management, Dhanpat RaiandSons,2009. 6. Philip BKotler, Marketing Management, MacMillan, NewYork, 2011.								

CO-PO MAPPING

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

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester: V		Course Category Code: PCC			Semester Exam Type: LB			
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P		CA	SE	TM
ITUC119	Mobile Application Development Lab	-	-	3	1.5	40	60	100
Prerequisites	ITUC105 - Operating Systems							
Course Outcome	CO1	Install and configure Android application development tools.						
	CO2	Design and develop user Interfaces for the Android platform.						
	CO3	Apply Java programming concepts to Android application development.						
	CO4	Analyze business trends impacting mobile applications.						
	CO5	Implementation of mobile applications to real-world problems.						
1. Develop an application that uses GUI components, Font and Colors.								CO1,
2. Develop an application that uses Layout Managers and event listeners.								CO2
3. Write an application that draws basic graphical primitives on the screen.								CO2
4. Develop an application that makes use of databases.								
5. Develop an application that makes use of Notification Manager.								
6. Implement an application that uses Multi-threading.								CO3,
7. Develop a native application that uses GPS location information.								CO4
8. Implement an application that writes data to the SD card.								CO4
9. Implement an application that creates an alert upon receiving a message.								
10. Write a mobile application that makes use of RSS feed.								CO5
11. Develop a mobile application to send an email.								
12. Develop a Mobile application for simple needs (Mini-Project)								
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45		Total Periods: 45		
Reference Books								
1. Jerome DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, WroxPrInc, 2016.								
2. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide", 2017.								
3. Neil Smyth , "Android Studio 3.0 Development Essentials: Android", 8 th Edition, 2017.								
4. Pradeep Kothari, "Android Application Development (With Kitkat Support)", Black Book 2014.								
5. https://www.stannescet.ac.in/cms/staff/qbank/CSE/Lab_Manual-converted.pdf								
6. https://www.google.co.in/books/edition/Head_First_Android_Development								
7. http://repo.darmajaya.ac.id/5623/1/AndroidStudioEssentials.pdf								
8. https://developer.android.com/guide								
9. https://en.wikipedia.org/wiki/Android_10								
10. https://aws.amazon.com/mobile/mobile-application-development/								
11. https://en.wikipedia.org/wiki/Mobile_app_development								

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	1	3	-	3	2	-	-	2	2	2
CO2	2	2	2	2	3	-	3	2	-	-	2	2	2
CO3	2	3	1	1	3	-	3	2	-	-	2	3	2
CO4	2	2	2	2	2	-	3	2	-	-	3	2	2
CO5	3	2	3	2	3	-	3	3	-	-	3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT				Programme: B.Tech.					
Semester : V				Course Category Code: PCC			Semester Exam Type: LB		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks			
		L	T	P	C	CA	SE	TM	
ITUC120	Database Management Systems Lab	-	-	3	1.5	40	60	100	
Prerequisite	Nil								
Course Outcome	CO1	Understand the basic concepts database and its design principles							
	CO2	Formulate solutions to a broad range of query and data update problems using SQL							
	CO3	Master in SQL queries using advanced operators and concepts							
	CO4	Formulate Programming solutions for various queries using PL-SQL							
	CO5	Apply SQL query language with ODBC Connectivity for real time application							
1.Study of Database Concepts: Relational model – table – operations on tables – Schema- ER Diagram								CO1	
2.Study of SQL: Primitive Data Types – User Defined Data Types – create, alter, drop, select, insert, delete, update, commit, rollback, save point, grant, revoke - Built-in Functions – Integrity Constraint – Authorization – Transactions.								CO2	
3.AdvancedQuery Types: Set Operators- Union, Intersection, Difference, Cartesian product, and Divide Operations – Sub Queries – Join Queries – Nested Queries –Recursive Queries.								CO3	
4.Study of Procedural Query Language: Blocks, Exception Handling, Functions, Procedures, Cursors, Triggers, Packages.								CO4 CO5	
5.Design and develop Mini Project with Existing and advancement for real time Application with ODBC Connectivity: a. Library Information System b. Hospital Management System c. Students’ Information System d. Employee Information System. e. Real time Projects Like University Result processing system, Currency Conversion System etc								CO1, CO2, CO3, CO4, CO5	
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45		Total Periods: 45			
Reference Books									
1. Abraham Silberschatz, Henry F. Korth and S.Sudarshan, Database System Concepts, Sixth Edition, McGraw-Hill International Inc., 2011.									
2. https://www.tutorialspoint.com/									
3. https://www.w3schools.com/									

CO-PO/PSO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	0	-	0	0	-	0	0	1	1	3	3
CO2	2	3	0	-	0	0	-	0	2	3	3	2	3
CO3	2	3	3	-	1	3	2	0	2	3	2	2	3
CO4	2	3	3	-	3	3	1	3	3	3	3	3	2
CO5	2	3	1	-	2	3	3	3	3	3	3	2	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester : V		Course Category Code: PCC				Semester Exam Type: LB		
Course Code	Course Name	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC121	Web Essentials Lab	-	-	3	1.5	40	60	100
Prerequisite	ITUC111 - Computer Networks							
Course Outcome	CO1	Implement HTML file creation using file formatting, CSS.						
	CO2	Use scripting languages for linking and embedding documents.						
	CO3	Demonstrate the configuration of web servers. Use JSP for data accessing and session tracking.						
	CO4	Experiment client-side and server-side scripting.						
	CO5	Develop web applications (mini-project).						
1. Creation of HTML Files with CSS 2. Working with Client Side Scripting 2.1 VBScript 2.2 JavaScript							CO1,CO2,CO4	
3. Configuration of web servers 3.1 Apache Web Server 3.2 Internet Information Server(IIS) 4. Working with ActiveX Controls in web documents							CO3,CO4	
5. Experiments in Java Server Pages 5.1 Data Access Programming (using ADO) 5.2 Session and Application objects							CO3	
6. Working with other Server Side Scripting 6.1 Active Server Pages 6.2 Java Servlets 6.3 PHP							CO3,CO4	
7. Experiments in Ajax Programming 8. Developing Web Services 9. Developing any E-commerce application (Mini-Project)							CO4,CO5	
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45		Total Periods: 45		
Reference Books								
1. N.P.Gopalan and J.Akilandeswari, “Web Technology: A Developer’s Perspective”, Second Edition, Prentice-Hall of India, 2014.								
2. Steven Holzener , “PHP – The Complete Reference”,McGraw-Hill, Jan 2020.								
3. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites”, 7 th Edition, O’Reilly Publishers, Jan 2025.								
4. Deitel and Deitel, Goldberg,“Internet and World Wide Web–How to Program”, Fifth Edition, Pearson Education Asia, 2011.								
5. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP and UDDI”, Addison-Wesley, 2007.								
6. https://books.google.co.in/books/about/WEBTECHNOLOGY.html								

CO-PO/PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	2	-	2	-	-	0	-	-	1	2	1
CO2	2	-	2	-	3	-	-	0	-	-	2	2	2
CO3	2	-	1	-	3	-	-	1	-	-	3	3	2
CO4	2	-	2	-	2	-	-	3	-	-	3	2	2
CO5	3	-	3	-	3	-	-	3	-	-	3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech.(IT)						
Semester : VI		CourseCategoryCode: PEC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC122	Data Mining and Data Warehousing	3	-	-	3	40	60	100
Prerequisite		ITUC120 Data Base Management Systems						
Course Outcome	CO1	Understand Data Mining and Data Warehousing Architecture, concepts and techniques.						
	CO2	Analyse Multidimensional Data with OLAP Technology						
	CO3	Apply appropriate data mining techniques for respective Domain						
	CO4	Apply Data Warehouse Architecture with OLAP for real-time Project.						
	CO5	Create with Cloud simulator for pattern recognition and prediction.						
UNIT-I		Introduction to Data Mining				Periods:9		
Definition of data mining - data mining vs query tools – machine learning –taxonomy of data mining tasks–steps in data mining process–overview of data mining techniques								CO1
UNIT-II		Data Ware housing				Periods:9		
Definition – Multidimensional Data Model – Data Cube – Dimension Modelling– OLAP Operations – Data Warehouse Architecture – Data Mart– Meta Data – Types of Meta Data								CO2
UNIT-III		Data cleaning and Pre-Processing				Periods:9		
Data Cleaning – Pre-Processing techniques, Data Integration and Transformation –Data Reduction – Discretization and Concept Hierarchy Generation –Generalization –Summarization								CO2, CO3
UNIT-IV		Association Rule and Classification				Periods:9		
Association Rule – Mining Multi-Dimensional data from Transactional Database and Relational Database. Classification – Decision Tree Induction – Bayesian Classification – Prediction –Back Propagation								CO3, CO4
UNIT-V		Cluster analysis				Periods:9		
Cluster Analysis – K-Means Algorithm, Advantages and disadvantages of K-Means clustering, Types of Clustering-Hierarchical Method – Partitioning methods- Density BasedMethod – Outlier Analysis. Advanced topics: Web Mining-Difference between data mining and Web Mining – Web Content Mining – Web Structure Mining and Usage Mining. Applications : Case studies in Data Mining and web mining applications								CO4, CO5
Lecture Periods:45		Tutorial Periods:		Practical Periods:-		TotalPeriods:45		
Reference Books								
1. Mr. Prolay Biswas , Mrs. Frenisha Digaswala ,Mrs. Arpita Vaidya, Mr. Rahul Sharma, “Introduction to Data Mining: DM–ISBN-13 979-8893220841 Notion Press , 2024								
2. Paulraj Ponnaiah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley Publishers, 2001.								
3. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufman Publishers, 2011.								
4. Usama M.Fayyad, Gregory Piatetsky Shapiro, Padhraí Smyth, Ramasamy Uthurusamy, Advances in Knowledge Discover and Data Mining, The M.I.T.Press, 2012.								
5. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modelling, John Wiley and Sons Inc., 3rd edition 2019.								
6. Ken Yale, Robert Nisbet, Gary D. Miner, “Handbook of Statistical Analysis and Data Mining								

Applications" Second Edition , Elsevier 2017

7. Daniel T. Larose John Wiley & Sons, Hoboken, Discovering Knowledge in Data: An Introduction to Data mining, New Jersey, 2005.
8. Hand, Mannila and Smyth, Principles of Data Mining, Prentice Hall of India, New Delhi, 2009.
9. Sean Kelly, Data warehousing in action, John wiley& sons, reprint 2008.
10. Sam Anahory, Dennis Murrury, Data warehousing in the real world: A practical guide to build decision support System, Addition Wesley, Fourth Impression 2009.

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	0	1	0	0	1	0	0	1	1	3	3
CO2	2	3	0	2	0	0	1	0	2	3	2	2	3
CO3	2	3	3	1	1	3	2	0	2	3	2	2	3
CO4	2	3	3	1	3	3	0	3	3	3	3	3	2
CO5	2	3	1	1	2	3	3	3	3	3	3	2	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech						
Semester :VI				CourseCategoryCode:PCC			SemesterExamType:TY			
Course Code	Course Name			Periods/Week		Credit	MaximumMarks			
				L	T	P	C	CA	SE	TM
ITUC123	Information Security			3	-	-	3	40	60	100
Prerequisite	ITUC111 - Computer Networks									
Course Outcome	On successful completion of this course, the students will be able to:									
	CO1	Describe OSI security architecture and legal, ethical and professional issues in security.								
	CO2	Identify risks and appropriate security models.								
	CO3	Implement security technologies including encryption standards.								
	CO4	Experiment cryptographic techniques for message authentication.								
	CO5	Apply biometric and cyber security effectively for real-time applications.								
UNIT-I	Introduction							Periods:9		
Security Trends, OSI security architecture, Security attacks, security services, security mechanisms,-Security System Development Life cycle–Legal, Ethical and Professional issues.										CO1
UNIT-II	Security Analysis and Design							Periods:9		
Risk Management – Identifying and Assessing Risk – Assessing and Controlling Risk. Blueprint for Security- Information Security Policy-Standards and Practices–ISO17799/BS7799–NIST Models –VISA International Security Model – Design of Security Architecture.										CO1 CO2
UNIT-III	Physical Design and Encryption Techniques							Periods:9		
Security Technology–Intruders, Malicious software, Firewalls, Scanning and Analysis tools, Content filters. Encryption Techniques – Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard.										CO2 CO3
UNIT-IV	Public-Key Encryption And Hash Functions							Periods:9		
Advanced Encryption standard, Principles of public-key cryptosystem, Key management, Message Authentication and Hash functions, Digital Signatures and Authentication Protocols.										CO3,CO4
UNIT-V	Biometric and Cyber security							Periods:9		
Biometrics: Definition–TypesofBiometrics–Multibiometrics–Fusionmethods-Applications. Cyber Security: Introduction to Cyber security –Reasons of cyber crime, Damage to the organizations, Cyber security Components – Zero day attacks, Types of network attacks, Application security, Data security.										CO5
LecturePeriods:45			TutorialPeriods:		Practical Periods:-			TotalPeriods:45		
ReferenceBooks:										
1. Michael IE.Whitmanand Herbert J.Mattord,“Principles of Information Security”, Sixth Edition, Vikas Publishing House,NewDelhi,2018.										
2. William Stallings, Cryptography and Network Security, Principles and Practices”, Seventh Edition, Pearson Education,2017.										
3. Anand Shinde, “Introduction to Cyber Security: Guide to the World of Cyber Security”, Notion Press, 1 st Edition, 2021, ISBN-13: 978-1637816424										
4. John D. Woodward (Jr.), Nicholas M. Orlans, Peter T. Higgins,“Biometrics”,Mcgraw-hill, 2003.										
5. https://almuhammadi.com/sultan/sec_books/Whitman.pdf										
6. https://notionpress.com/in/read/introduction-to-cyber-security/										

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	0	2	-	2	2	3	2	-	-	2	2	2
CO2	2	2	2	-	3	2	3	2	-	-	2	2	2
CO3	2	3	2	-	2	2	3	2	-	-	2	3	3
CO4	2	2	2	-	3	2	3	2	-	-	3	2	2
CO5	3	3	3	-	3	3	3	3	-	-	3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT			Programme:B.Tech.					
Semester :VI			CourseCategory Code:PCC			SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P		C	CA	SE
ITUC124	Artificial Intelligence and Machine Learning	3		-	3	40	60	100
Prerequisite	ITUC103 Data structures ITUC110 Design and Analysis of Algorithms							
Course Outcome	CO1	Understand the search techniques.						
	CO2	Able to design different Knowledge Representation schemes for typical problems.						
	CO3	Apply AI techniques in developing real world applications.						
	CO4	Identify applications suitable for different types of machine learning with suitable justification						
	CO5	Design and make modifications to existing machine learning algorithms to suit an individual application						
UNIT-I	Intelligent Agents and Search Techniques					Periods:9		
Overview of AI, Problem space-Heuristic search Algorithms. –uninformed search algorithms- informed search algorithms – search algorithms for games- constraint satisfaction problem – means and ends analysis–Intelligent agents: Agents and environment– structure of agents and its functions								CO1, CO3
UNIT-II	Knowledge representation					Periods:9		
Knowledge Representation Issues – Approaches for Knowledge Representation: Simple Relational Knowledge – Inherited Knowledge – Semantic Nets – Frames – Semantic Web – Ontology- Expert System								CO2, CO3
UNIT-III	Meta Heuristics					Periods:9		
Genetic Algorithm – Ant Colony Optimization Algorithm Tabu search – Adversarial search – game tree- Minmax game playing algorithm - Adding alpha-beta cutoff.								CO3
UNIT-IV	Machine learning -Supervised Learning					Periods:9		
Machine Learning – Types of Machine Learning -Supervised Learning- Linear Regression- Logistic Regression-Decision Trees-Support Vector Machines (SVM)-k-Nearest Neighbours (k-NN)- Naive Bayes- Ensemble Learning-Random Forest-Boosting Algorithms								CO4, CO5
UNIT-V	Unsupervised and Reinforcement Learning					Periods:9		
Clustering -k-means- hierarchical- dimensionality reduction (PCA)- Association Rule- Apriori algorithm- Reinforcement Learning-Model-Based Methods-Model-Free Methods-Policy-based Methods								CO4, CO5
Lecture Periods:45		Tutorial Periods:		Practical Periods:-		Total Periods:45		
Reference Books:								
1. R. Panneerselvam, “Artificial Intelligence”, Vijay Nicole Imprints Private Limited, 2024. 2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence - A Modern Approach”, Third Edition, McGraw Hill Education, 2017. 3. Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, IV edition, 2022. 4. S.Sridhar and M.vijayalakshmi, “Machine Learning”, Oxford University Press, I edition, 2021 5. Hui Jiang, ” Machine Learning Fundamentals: A Concise Introduction”, Cambridge University Press, 2021.								

CO-PO /PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	3	3	3	2						3	2	2
CO2	3	3	3	3	2						3	2	2
CO3	3	3	3	3	3						3	3	3
CO4	3	3	3	3	3						3	3	3
CO5	3	3	3	3	3						3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech.				
Semester : VI				CourseCategory Code: PCC			SemesterExamType: LB	
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC125	Data mining and Data Analytics Lab	-	-	3	1.5	40	60	100
Prerequisite	ITUC117 -Database Management Systems							
Course Outcome	CO1	Understand the basic concepts of Multidimensional data to apply practically						
	CO2	Apply cleaning and pre processing tools & techniques.						
	CO3	Apply Data mining techniques like Association Rule mining, Classification, clustering for appropriate domain.						
	CO4	Simulate with cloud for various heterogeneous real time data						
	CO5	Apply prediction and preventive measures for real time application						
<div>1. Implement the following Multidimensional data model<ul style="list-style-type: none">Star SchemaSnowflake SchemaFact Constellation</div> <div>2. With online UCI Repository Dataset or any dataset do case study for ALL stages of KDD</div> <div>3. Perform Data Preprocessing using Weka</div> <div>4.Implement Apriori Algorithm</div> <div>5.Implement Classification Algorithm<ul style="list-style-type: none">Decision Tree InductionKNNPerform Classification using Weka</div> <div>6. Implement Clustering Algorithm<ul style="list-style-type: none">K –Means.K - Median</div> <div>7.Design and develop Real Time Datamining using R Programming Mini Project</div>								CO1
								CO2
								CO3
								CO4
								CO5
								CO1, CO2, CO3, CO4, CO5
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45		Total Periods: 45		
Reference Books								

1. <https://www.geeksforgeeks.org/data-mining-in-r/>
2. <https://www.rdatamining.com/>
3. <https://www.rdatamining.com/>
4. <https://www.tutorialspoint.com/>
5. <https://www.w3schools.com/>

CO-PO /PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	-	-	-	-	-	-	-	1	1	3	3
C02	2	3	-	-	-	-	-	-	2	3	3	2	3
C03	2	3	3	-	1	3	2	-	2	3	2	2	3
C04	2	3	3	-	3	3	1	3	3	3	3	3	2
C05	2	3	1	-	2	3	3	3	3	3	3	2	3

Department: IT		Programme: B.Tech.						
Semester : VI		SubjectCategory: PCC			SemesterExamType: LB			
Course Code	Course Name	Periods / Week			Credit	MaximumMarks		
		L	T	P		CA	SE	TM
ITUC126	Artificial Intelligence and Machine Learning Lab	-	-	3	1.5	40	60	100
Prerequisite								
Course Outcome	CO1	Apply heuristic concepts to design efficient algorithms using Python.						
	CO2	Implement game playing algorithms in python and learn to handle the conditions technically. Single Player – Win / Lose Condition; Two Player – Win / Opponent Win Condition.						
	CO3	Develop an Expert System for Medical Diagnosis using Python.						
	CO4	Understand various Machine Learning algorithms and the way to evaluate performance of the Machine Learning algorithms.						
	CO5	Apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms as well as discover the Unsupervised Learning paradigms of Machine Learning						
To develop following programs in Python								
1. Implement Breadth First Search(for 8 puzzle problem) 2. Implement Depth First Search(for Water Jug problem) 3. Implement A*algorithm 4. To implement AO*Algorithms								CO1
5. Implement Single Player Game(Using Heuristic Function) 6. Implement Two Player Game(Using Heuristic Function) 7. To implement constraint satisfaction technique 8. Develop an Expert system for Medical diagnosis.								CO1, CO3
9. Write a Python program to implement Simple Linear Regression and plot the graph. 10. Write a program to demonstrate the working of the decision tree based ID3 algorithm by considering a dataset 11. Consider a dataset; use Random Forest to predict the output class. Vary the number of trees as follows and compare the results: i. 20 ii. 50 iii. 100 iv. 200 v. 500								CO4
12. Build KNN Classification model for a given dataset. Vary the number of k values as follows and compare the results: i. 1 ii. 3 iii. 5 iv. 7 v. 11 13. 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. 14. Implement Support Vector Machine for a dataset and compare the accuracy by applying the following kernel functions: i. Linear ii. Polynomial iii. RBF 15. Write a python program to implement K-Means clustering Algorithm. Vary the								CO4,CO5

number of k values as follows and compare the results: i. 1 ii. 3 iii. 5				
Lecture Periods:-	Tutorial Periods:-	Practical Periods:45	Total Periods:45	
RREFERENCE S				
1. Ashok Choppadandi, Jagbir Kaur , Pradeep Kumar Chenchala, “ Artificial intelligence machine learning data science engineering - usage and challenges”, 1 st edition, Vinsa Publisher 2024				
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence - A Modern Approach”, Third Edition McGraw Hill Education, 2017.				
3. Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, IV edition,2022.				
4. S.Sridhar and M.vijayalakshmi, “Machine Learning”, Oxford University Press, I edition, 2021				
5. https://zitniklab.hms.harvard.edu/software/				
6. https://www.ml.informatik.tu-darmstadt.de/				
7. https://ai.engineering.columbia.edu/ai-vs-machine-learning/				

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	3	3	3	3	3	2			3		3	2	2
CO2	3	3	3	3	3	2			3		3	2	2
CO3	3	3	3	3	3	3			3		3	3	3
CO4	3	3	3	3	3	3			3		3	3	3
CO5	3	3	3	3	3	3			3		3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech.						
Semester : VI		CourseCategoryCode: PCC				SemesterExamType: LB		
Course Code	Course Name	Periods/Week			Credit	Maximum Marks 100		
		L	T	P		CA	SE	TM
ITUC127	Data Visualization Lab	-	-	3	1.5	40	60	100
Prerequisite		-						
Course Outcome	CO1	Understand the fundamentals of Tableau and Power BI including interfaces, Terminologies and basic functionalities						
	CO2	Connect and import data from various sources, to create basic charts and graphs demonstrating proficiency in data integration using Tableau and Power BI						
	CO3	Develop the solution for the given real-world problem						
	CO4	Analyse the results and produce substantial written documentation						
1. Getting Started -Tableau Workspace, Tableau terminologies, basic functionalities.								CO1
2. Connecting to Data Source -Connecting to Database, Different types of Tableau Joins.								CO2
3. Creating a View -formatting charts, adding filters, creating calculated fields and defining parameters.								CO4
4. Introducing Power BI -Components and the flow of work. PowerBI Desktop Interface the Report has Five main areas.								CO1, CO2
5. Querying Data from CSV -Query Editor, Connecting the data from the Excel Source, Clean, Transform the data.								CO3
6. Creating Reports & Visualizations -Different types of charts, Formatting charts with Title, Colors.								CO3
7. Dashboards -Filters in Power BI, Formatting dashboards.								CO3, CO4
8. Analysis of revenue in sales dataset: i) Create a choropleth map (fill the map) to spot the special trends to show the state which has the highest revenue. ii) Create a line chart to show the revenue based on the month of the year. iii) Create a bin of size 10 for the age measure to create a new dimension to show the revenue. iv) Create a donut chart view to show the percentage of revenue per region by creating zero access in the calculated field. v) Create a butterfly chart by reversing the bar chart to compare female & male revenue based on product category. vi) Create a calculated field to show the average revenue per state& display profitable & non-profitable state. vii) Build a dashboard.								CO3, CO4
9. Analysis of GDP dataset: i) Visualize the countries data given in the data set with respect to attitude and longitude along with country name using symbol maps. ii) Create a bar graph to compare GDP of Belgium between 2006-2026. iii) Using pie chart, visualize the GDP of India, Nepal, Romania, South Asia, Singapore by the year 2010. iv) Visualize the countries Bhutan & Costa Rica competing in terms of GDP. v) Create a scatter plot or circle views of GDP of Mexico, Algeria, Fiji, Estonia from 2004 to 2006. vi) Build an interactive dashboard								CO2, CO3 CO4

10-. Analysis of HR Dataset: i) Create KPI to show employee count, attrition count, attrition rate, attrition count, active employees, and average age. ii) Create a Lollipop Chart to show the attrition rate based on gender category. iii) Create a pie chart to show the attrition percentage based on Department Category-Drag department into colours and change automatic to pie. Entire view, Drag attrition count to angle. Label attrition count, change to percent, add total also, edit label. iv) Create a bar chart to display the number of employees by Age group v) Create a highlight able to show the Job Satisfaction Rating for each job role based on employee count. vi) Create a horizontal bar chart to show the attrition count for each Education field Education field wise attrition -drag education field to rows, sum attrition count to col, vii) Create multiple donut charts to show the Attrition Rate by Gender for different Age group.				CO3,CO4	
11. Analysis of Amazon Prime Dataset: i) Create a Donut chart to show the percentage of movie and tv shows ii) Create a area chart to shows by release year and type iii) Create a horizontal bar chart to show Top 10 game iv) Create a map to display total shows by country v) Create a text sheet to show the description of any movie/movies. Build an interactive Dashboard.				CO3,CO4	
LecturePeriods: -		TutorialPeriods: -		PracticalPeriods: 45	
ReferenceBooks				TotalPeriods: 45	
1. Visualization Analysis & Design by Tamara Munzner (2014) 2. Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017) 3. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018 4. Dr. ArpanaChaturvedi, Prof. Praveen Malik, Mastering Data Visualization with Tableau, BPB Publications, India, 2024. 5. Nisal Mihiranga, “Power Bi Data Modeling Build Interactive Visualizations, Learn Dax, Power Query and Develop Bi Model”, BPB Publications, India, 2022.					

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	2	2	2	2	1	-	-	-	3	-	-	2	-
CO2	2	2	2	2	1	-	-	-	3	-	-	2	-
CO3	2	2	1	2	2	-	-	-	3	-	-	2	-
CO4	2	3	3	3	2	-	-	-	3	-	-	2	-

Score: 3 – High; 2 – Medium; 1 – Low

Department :IT				Programme: B.Tech.				
Semester : VI				Course Category Code: PCC		Semester Exam Type: -		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUC128	Internship				2	100		100
Prerequisite:		-						
Course Outcome: Periods / Week	CO1	Apply theoretical knowledge gained during coursework to real-world projects and tasks.						
	CO2	Develop soft skills such as communication, teamwork, problem-solving, and time management.						
	CO3	Demonstrate proficiency in relevant industry technologies or platforms.						
	CO4	Handle the demands and challenges of a professional setting						
	CO5	Prepare reports and deliver presentations effectively on internship work.						
The student is required to undergo 'internship' in industry / research laboratory / higher learning institution for a period of at least 4 weeks in a maximum of 2 spells during vacations. Each spell of internship shall be for a period of not less than 2 weeks. The main purpose of internship is to enhance the general professional outlook and capability of the student to advance his chances of improving the career opportunities. The student should get prior approval from the Head of the Department before undertaking the internship and submit a detailed report after completion for the purpose of assessment. A departmental committee shall evaluate the performance of the students.								CO1, CO2, CO3, CO4, CO5

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	3	1							1	
CO2												1	2
CO3	2	3	2	2	3							2	2
CO4						2	1	3	1	1		2	2
CO5									2	2	3		3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech						
Semester :VII				CourseCategoryCode:PCC			SemesterExamType: TY			
ITUC129	Full Stack Web Development			Periods/Week		Credit	MaximumMarks 100			
				L	T	P	C	CA	SE	TM
				3			3	40	60	100
Prerequisite:	ITUC118-Web essentials ITUC117-Database management system ITUC111-Computer networks									
Course Outcome	CO1	Understand the various stacks available for web application development								
	CO2	Implement interactive web application design using React JS								
	CO3	Build simple web applications using AngularJS framework.								
	CO4	Understand the basic concepts of Node.js & Express.js Framework.								
	CO5	Familiarize with the different back-end design using MySQL, MongoDB								
UNIT-I	Basics of Full Stack						Periods:9			
Understanding the Basic Web Development Framework -User -Browser –Webserver -Backend Services – MVC Architecture -Understanding the different stacks –The role of Express –Angular –Node –Mongo DB – React										CO1
UNIT-II	React JS Framework						Periods:9			
Basic React applications – React Components – React State – Express REST APIs – Modularization and Web pack – Routing with React Router – Server-side rendering										CO1,CO2
UNIT-III	Angular JS Framework						Periods:9			
Overview of JavaScript frameworks: MEAN stack frameworks - Introduction to Angular JS - Binding and Expression – Directives – Controllers – Filters – Modules – Services – Scopes – Tables & forms – AngularJS DOM – Animations – Simple application.										CO1,CO3
UNIT-IV	Express JS andNode JS Framework						Periods:9			
Introduction to Node.js – Node.js Architecture - NPM(Node Packaging Manager) -Installing NPM module - Creating and locating modules - Creating a simple HTTP server - Overview of Express.js framework – Simple Express application – Routing – MVC in Express – middleware – templates – Error handling – Debugging – using process managers										CO1, CO4
UNIT-V	MongoDB Framework						Periods:9			
Introduction to MySQL with Node.js– Basic DDL & DML Operations, NoSQL Database -Basic CRUD Operations – Indexing –Aggregation -Data Modelling concepts - Connecting MongoDB using Mongoose										CO1,CO5
Lecture Periods:45			Tutorial Periods:0			Practical Periods:0			Total Periods:45	
ReferenceBooks:										
1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and Angular Web Development”, Addison-Wesley, Second Edition, 2018 2. Vasan Subramanian, “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node”, Apress, 2nd Edition, 2019. 3. Chris Northwood, “The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer”, Apress; 1st edition, 2018. 4. KirupaChinnathambi, “Learning React: A Hands-On Guide to Building Web Applications Using React and Redux”, Addison-Wesley Professional, 2nd edition, 2018 5. Martin Krause, “The Complete Developer Master the Full Stack with TypeScript, React, Next.js, MongoDB, and Docker”, No Starch Press,2024.										

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	2	2	2	----	3	-	-	-	-	-	3	3	-
CO2	2	3	3	2	3	-	-	-	-	-	3	3	-
CO3	2	3	3	--	3	-	-	-	-	-	3	3	-
CO4	2	3	3	3	3	-	-	-	-	-	3	3	-
CO5	2	3	3	1	3	-	-	-	-	-	3	3	-

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech.						
Semester : VII		CourseCategoryCode: PCC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC130	Deep Learning	3	-	-	3	40	60	100
Prerequisite:	ITUC125 – Artificial Intelligence and Machine Learning							
Course Outcome	CO1	Learn the basics of deep learning architectures - remember						
	CO2	Understand the basic layers of deep learning architectures, GAN and auto encoders - understand						
	CO3	Understand the working of convolutional, recurrent and reinforcement learning - understand						
	CO4	Compare various deep learning architectures with discrete and continuous data sets. - analyse						
	CO5	Apply various deep learning algorithms in multi-disciplinary fields - apply						
UNIT-I	Introduction to Deep Learning				Periods: 9			
Overview: tensors – input layer – output layer – deep learning layer survey: fully-connected layer – activation functions – dropout – batch normalization – convolution – pooling layers – recurrent layers – utility layers – layer and symbol summary - building a deep learner.								CO1
UNIT-II	Convolutional Neural Networks (CNN)				Periods: 9			
Introduction – depth – sum of scaled values – weighted sharing – local receptive field – kernel; convolution – filters – hierarchies of filters – padding – stride; high-dimensional convolution – filters with multiple channels – striding for hierarchies – 1D convolution – 1x1 convolution – convolution layer – transposed convolution – CNN Architectures: LeNet, AlexNet, VGG16, GoogLenet, ResNet, DenseNet.								CO3, CO4
UNIT-III	Recurrent Neural Networks (RNN)				Periods: 9			
Introduction – state - structure of an RNN Cell – organizing inputs – training an RNN – Long Short Term Memory – RNN structures – Deep RNN – Bidirectional RNN – Deep Bidirectional RNN. Autoencoders: introduction – the simplest autoencoder – convolutional autoencoders – de-noising – variationalautoencoders.								CO2, CO3, CO4
UNIT-IV	Reinforcement Learning (RL)				Periods: 9			
Introduction - Structure of RL - Immediate rewards – delayed rewards – Exploration – Exploitation – Markov Decision Process – Model based / free learning – Q learning; structure of RL – flippers – Lousy learning – Quality learning – SARSA – applications; Generative Adversarial Networks (GAN): Metaphor – Implementing GANs – Deep Convolutional GANs.								CO2, CO3, CO4
UNIT-V	Recent trends in Deep learning				Periods: 9			
Review of NLP models – Vision Transformers – Self-Supervised Learning - Large Language Models – Gen AI – Explainable AI - Applications: ChatGPT – Meta AI – Copilot – Deepseek - Speech recognition - Visual object recognition – Face detection – Pedestrian detection – Drug detection – Deep genomics – Handwritten Digit Recognition – Object Recognition in Photographs – Predict sentiment from movie reviews – Sequence classification of movie reviews – Text generation.								CO5
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -		Total Periods: 45		
Reference Books:								
1. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing Company, 2020. 2. Aston Zhang, Zachary C. Lipton, Mu Li and Alexander J. Smola, Dive into Deep Learning, Open Source Book, 2020. 3. Vivienne Sze, Yu-Hsin Chen, Tien-Ju Yang and Joel S. Emer, “Efficient Processing of Deep Neural Networks”, Morgan and Claypool, California, 2020. 4. Francois Chollet, Deep Learning with Python, 2 nd edition, Manning Publications, Shelter Island, 2021. 5. Andrew Glassner, Deep Learning: From Basics to Practice, Volume 2, The Imaginary Institute, Seattle, WA, 2018. 6. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2017. 7. Richard Sutton and Andrew Barto, Reinforcement Learning: An Introduction, 2 nd edition, MIT Press, 2015.								

CO-PO / PSO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT				Programme: B. Tech.				
Semester : VII				Course Category Code: PCC		Semester Exam Type: TY		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P		CA	SE	TM
ITUC131	Automata and Compiler Design	3		2	4	40	60	100
Prerequisite								
Course Outcome	CO1	Employ finite state machines and Turing Machines to solve problems in computing and classify machines by their power to recognize languages.						
	CO2	Construct parse trees and Push down automata for CFG and able to minimize and find equivalence of automata						
	CO3	Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.						
	CO4	Apply the code optimization techniques to improve the space and time complexity of programs while programming						
	CO5	Ability to design a compiler for a concise programming language.						
UNIT-I	Introduction to Automata					Periods: 9		
Introduction to Finite Automata- Deterministic and Non-Deterministic Finite Automata, Finite Automata with ϵ -moves – two-way finite automata, minimization of finite automata, Finite automata and regular expressions, Arden's theorem, construction of Finite automata equivalent to regular expression, Equivalence of two finite automata, Pumping lemma for regular languages, Applications of pumping lemma, Closure properties of Regular Languages.							CO1	
UNIT-II	Context Free Grammars					Periods: 9		
Context free grammars and languages, Derivation trees, Leftmost and rightmost derivation of strings and Sentential forms, Ambiguity, left recursion and left factoring in context free grammars, Minimization of context free grammars, Normal forms for context free grammars, Chomsky normal form, Greibach normal form, Pumping Lemma for Context free Languages, Closure and decision properties of context free languages.							CO2	
UNIT-III	Pushdown Automata & Turing Machine					Periods: 9		
Pushdown Automata: Introduction to Pushdown automata, Acceptance of context free languages, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of context free grammars and pushdown automata. Turing Machine: Introduction to Turing Machine, Design of Turing machines, Types of Turingmachines							CO1, CO2	
UNIT-IV	Introduction To Compiler					Periods: 9		
Overview of Compilers- Phases of a Compiler. Lexical Analysis: The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A language for specifying Lexical Analyzers(LEX).Syntax Analysis: The role of the Parser, First and Follow, Predictive Parsing, LR Parsers-SLR, Canonical LR, LALR, Parser Generator(YACC).							CO3, CO5	
UNIT-V	Syntax-Directed Translation& Intermediate Code Generation					Periods: 9		
Syntax-Directed Translation: Syntax-Directed Definition, S-Attributed SDD, L-Attributed SDD, Translation Schemes.Intermediate Code Generation: Intermediate Languages- Graphical Representations, Three address code, Implementations							CO4, CO5	
Lab Exercises:						Periods: 30		
1. Write a C Program to Scan and Count the number of characters, words, and lines in a file.								
2. Write a C Program to implement NFAs that recognize identifiers, constants, and operators of the mini language								

3. Design a lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines, comments etc.	CO3, CO4, CO5		
4. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.			
5. Implementation of SLR Parser			
6. Design Predictive Parser for the given language			
7. Implementation of Recursive Descent Parser			
Lecture Periods: 45	Tutorial Periods:	Practical Periods: 30	Total Periods: 75
Reference Books:			
1. ArunAnoop M , “Automata Theory and Computability”, Shanlax Publications, Edition: I, 2024			
2. Peter Linz, “ An introduction to Formal Languages and Automata”, 6th Edition, Jones & Bartlett, 2016			
3. V.Raghavan, “Principles of Compiler Design”,1stEdition,McGrawHillEducation,2017			
4. Hopcroft H.E. and Ullman J.D, “.Introduction to Automata Theory Languages and Computation”, , Pearson Education, 2009.			
5. A.V Aho and J D Ullman, “Principles of Compiler Design”, Pearson Education.2002			

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	3	2	3	3	3						2	3	2
CO2	3	2	3	3	3						2	3	3
CO3	2	3	3	3	3						2	3	3
CO4	3	2	3	3	3						2	2	2
CO5	2	2	3	3	3						2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT			Programme: B.Tech.					
Semester : VII			Course Category Code: PCC			Semester Exam Type: -		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P		CA	SE	TM
ITUC132	Mini Project			4	2	100		100
Prerequisite:								
Course Outcome: At the end of the course the student will be able to	CO1	Carry out literature survey, understand state of art techniques.						
	CO2	Identify and apply appropriate tools to solve a problem.						
	CO3	Transform knowledge into an algorithmic/experimental process.						
	CO4	Prepare and present reports on the project work.						
The objective of this course is to enable the students to carry out the mini-project in a group. The topic shall be chosen in consultation with the Faculty coordinators. Each group of students is expected to make a detailed review of the literature, formulate the problem, carry out the mini project and prepare a report on the work done. The mini project can be a small project work or it can be a part of the work planned for the main project. The students should present the results of the work in the review committee meetings. A departmental committee shall evaluate the performance of the students.								CO1, CO2, CO3, CO4

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	2	2	3	3	3	3	3	2
CO2	3	2	1	1	1	2	2	3	3	3	3	3	2
CO3	3	2	1	1	1	2	2	3	3	3	3	3	2
CO4	3	2	1	1	1	2	2	3	3	3	3	3	2
CO5	3	2	1	1	1	2	2	3	3	3	3	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department :IT			Programme: B.Tech.					
Semester : VII			Course Category Code: PCC			Semester Exam Type: LB		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks 100		
		L	T	P	C	CA	SE	TM
ITUC133	Full Stack Web Development Lab			4	2	40	60	100
Prerequisite:								
Course Outcome	CO1	Design flexible and responsive Web applications using Node JS, React, Express and Angular.						
	CO2	Perform CRUD operations with MongoDB on huge amount of data.						
	CO3	Develop real time applications using react components.						
	CO4	Use various full stack modules to handle http requests and responses.						
Design Full stack responsive Web applications using Node JS, React, Express and Angular with MongoDB in the back end for any of the following domains. i. Personal Profile ii. Food Delivery iii. E-commerce Website iv. Inventory management system v. Microblogging platform, similar to Twitter, where users can post content that is visible to their followers. vi. Dashboard for Project management vii. Online survey and report generation viii.								CO1, CO2, CO3,CO4
Lecture Periods:		Tutorial Periods: -		Practical Periods:60		Total Periods: 60		
Reference Books:								
1.		Vasan Subramanian, ‘Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React’, and Node, 2nd Edition, A Press,2019.						
2.		Brad Dayley, Brendan Dayley, Caleb Dayley., ‘Node.js, MongoDB and Angular Web Development’, 2nd Edition, Addison-Wesley, 2019.						
3.		Mark Tielens Thomas, ‘React in Action’, 1st Edition, Manning Publications.2018.						

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	-	3	-	-	-	-	-	-	2	2
CO2	2	2	3	-	3	-	-	-	-	-	-	2	2
CO3	2	3	3	-	3	-	-	-	-	-	-	2	2
CO4	2	3	3	-	3	-	-	-	-	-	-	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : Information Technology			Programme: B. Tech.					
Semester : VII			SubjectCategory: PCC			SemesterExamType:-		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P		CA	SE	TM
ITUC134	Comprehensive Viva	-	-	-	1	100	-	100
Prerequisite		-						
Course Outcome	CO1	Recall and Refresh fundamental concepts learnt in different subjects.						
	CO2	To get familiar with the placement tests conducted for the campus recruitment						
	CO3	To Enhance interview facing skills.						
	CO4	To become competent in competitive examinations.						
Comprehensive viva is an oral examination conducted to evaluate the critical thinking, analytical abilities, and how well a student can discuss and apply concepts learned throughout their studies. A committee comprising of five faculty members will conduct the comprehensive viva examination and evaluate the students. Experts from the industry may also be included in this committee. The Head of the Department shall constitute this committee								CO1, CO2, CO3, CO4
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 45			Total Periods: 45	

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	2	3	2								2	
CO2	2	2										2	
CO3	2											2	2
CO4	3	2									2	2	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech.				
Semester : VIII				SubjectCategory: PCC			SemesterExamType: PR	
Course Code	Course Name	Hours /Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUC135	Project Work	-	-	16	8	60	40	100
Prerequisite								
Course Outcome	CO1	Identify and formulate an IT related solutions for an engineering problem						
	CO2	Analyze and review research literature related to the problem						
	CO3	Apply mathematical knowledge for design a solution for the problem						
	CO4	Implement IT enabled solutions						
	CO5	Communicate, demonstrate and document the work as a member and leader in a team						
<div>The project group is required to do the following<ul style="list-style-type: none">Literature Survey,Problem formulationForming a methodology of arriving at the solution of the problem.Documentation of each stepMaster a programming language or software tool used for implementationTest the project and compare it with benchmark standardsPrepare Project ReportDevelop Presentation skillsDevelop ability to work in a Group</div> <div>Rigorous review by the committee will be carried out in the process to ascertain whether the work qualifies as a suitable project at the graduate level. Each team is expected to present their work at national/International conferences or at the students’ technical symposiums. Team that has come out with novel contribution will be encouraged to publish their work in any referred journals.</div>								
Lecture Periods:-		Tutorial Periods:-		PracticalPeriods:230		TotalPeriods:230		

CO-PO/PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	2	2	3	3	3	3	3	2
CO2	3	2	1	1	1	2	2	3	3	3	3	3	2
CO3	3	2	1	1	1	2	2	3	3	3	3	3	2
CO4	3	2	1	1	1	2	2	3	3	3	3	3	2
CO5	3	2	1	1	1	2	2	3	3	3	3	3	2

Score: 3 – High; 2 – Medium; 1 – Low

PROFESSIONAL ELECTIVE COURSES

Department:IT			Programme: B.Tech					
Semester :V			CourseCategoryCode:PEC			SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUE101	Internet of Things	3	1	-	4	40	60	100
Prerequisite:	Computer Networks							
Course Outcome	CO1	Describe the IoT architecture, infrastructure and constraints of Internet of Things						
	CO2	Explore the design methodologies for various IoT applications						
	CO3	Apply the IoT protocols for local and global connectivity						
	CO4	Explore the principles of data analytics and cloud in the context of IoT						
	CO5	Design and develop simple IoT Systems using Arduino and Raspberry Pi.						
UNIT-I	Introduction to Internet of Things				Periods:12			
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT –Logical design of IoT - IoT enabling Technologies – IoT Levels and Deployment Templates. Domain Specific IoTs: Home Automation – Cities.-IoT& M2M: M2M – Difference between M2M &IoT – Software defined networks & Network function virtualization for IoT -							CO1	
UNIT-II	IoT system Management and IoT platforms Design Methodology				Periods:12			
IoT System Management with NETCONF-YANG – SNMP – Network Operator Requirements – IoT Systems Management with NETCONFIG-YANG - IoT design Methodology – IoT physical Devices &Endpoints: Introduction to Arduino and Raspberry Pi – Installation, Interfaces (serial, SPI, I2C)-Raspberry Pi Interfaces – Programming Raspberry Pi with python – Other IoT devices.							CO2,C05	
UNIT-III	IoT Network and Application Layer Protocols				Periods:12			
IoT Access Technologies: IEEE 802.15.4. IP as IoT network layer – Adoption or adaption of IP – Need for optimization – Optimizing IP for IoT. IoT Application Transport Methods: Non-Application Layer – SCADA – Web Based Protocols – IoT Application Layer Protocols: CoAP and MQTT.							CO1,C03	
UNIT-IV	IoT Physical Servers & Cloud offerings				Periods:12			
Introduction to Cloud storage models and Communication APIs – WAMP – AutoBahn for IoT – Xively cloud for IoT – Python web application Framework – Django – Designing a RESTful Web API – Amazon Web services for IoT – Skynet IoT Messaging Platform, Case Studies illustrating IoT Design: Home Automation – Agriculture.							CO4,C05	
UNIT-V	Data Analytics for IoT				Periods: 12			
Data Analytics for IoT - Apache Hadoop – Using Hadoop MapReduce for Batch Data analysis – Apache Oozie – Apache Spark – Apache Storm – Using Apache Storm for Real-time Data Analysis							CO4	
Lecture Periods: 45		Tutorial Periods:15		Practical Periods: -		TotalPeriods:60		
ReferenceBooks:								

1. ArshdeepBahga and Vijay Madiseti, "Internet of Things – A Hands-on Approach", 1st Edition, University Press, 2015.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st Edition, CRC Press, 2012.
4. MadhusankaLiyanage, An Braeken, Pradeep Kumar, Mika Ylianttila, "IoT Security: Advances in Authentication", Wiley Publications, 2020.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PS02
CO1	2	2	2								1	1	
CO2	2	2	3	2	3						1	1	3
CO3	2	3	2	2							2	1	3
CO4	2	2	2	2	3						2	3	3
CO5	2	2	3	2	3						2	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT		Programme: B.Tech					
Semester :V		CourseCategoryCode:PEC			SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks	
		L	T	P	C	CA	TM
ITUE102	Object Oriented Analysis and Design	3	1	-	4	40	100
Prerequisite:	ITUC104 – Object oriented programming using C++ and Java						
Course Outcome	CO1	Learn the processes in object oriented system development and its life cycle					
	CO2	Use various modelling techniques to do Object oriented analysis for applications					
	CO3	Employ object oriented design approach for applications					
	CO4	Develop Object oriented systems using UML for the given requirements					
UNIT-I	Introduction to Unified Approach				Periods:12		
Overview of Object Oriented System Development: Introduction – Object Oriented System Development Methodology – Overview of Unified Approach – Object Basics – Systems Development Life Cycle-Unified Approach.							CO1
UNIT-II	OMT and Booch Methodology					Periods:12	
Methodology and Modelling: Introduction –Rumbaugh et al.’s Object Modelling Technique - Booch Methodology – Jacobson et al. Methodologies – Patterns –Framework – Unified approach – Unified Modelling Language.							CO1 CO2
UNIT-III	Object Oriented Analysis				Periods:12		
Object Oriented analysis: Use Case Driven Object Oriented Analysis Object Oriented Analysis: Classification Noun Phrase Approach – Common Class Patterns Approach – Object Relationship analysis.							CO1 CO2
UNIT-IV	Object Oriented Design				Periods:12		
Object Oriented Design: Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Defining Attributes and methods –Object Store and Access layer – Designing the View Layer Classes.							CO1 CO3
UNIT-V	Applications				Periods:12		
Applications: Data Acquisition: Weather Monitoring Station – Frameworks: Foundation Class library – Client/Server Computing: Inventory Tracking.							CO1, CO2 CO3, CO4
Lecture Periods: 45		Tutorial Periods:-15		Practical Periods:-		Total Periods: 60	
Reference Books:							
1. Brahma Dathan and SarnathRamnath,Object-Oriented Analysis, Design and Implementation: An Integrated Approach, Universities Press, Third edition, 2024							
2. A.Mummoorthy, A.Saraswathi, D.Rajagopal and E.Pavithra, Object oriented analysis and design, Notion press, 2021							
3. Ali Bahrami, “Object oriented systems development using the unified modelling language”, Tata McGraw Hill, 1st Edition 2008.							
4. Grady Booch, "Object Oriented Analysis and Design with Applications”, Pearson Education, Inc, Second Edition, 2008.							
5. John Deacon, “Object Oriented Analysis and Design”, Addison Wesley, 1st Edition,2005.							
6. Pinson L. and Wiener R., "Application of Object Oriented Programming", Addison Wesley Publishing Company, 1990.							
7. Taylor D., "Object Oriented Information Systems", John Wiley and Sons, 1992.							

CO-PO / PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	3	1		1								2	1
CO2	3	3	1	1							1	2	1
CO3	3	1	2	2							1	2	1
CO4	3		1	2							1	2	1

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech						
Semester : V			CourseCategoryCode: PEC			SemesterExamType: TY			
Course Code	Course Name		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUE103	Business Intelligence		3	1	-	4	40	60	100
Prerequisite:		-							
Course Outcome	CO1	Understand Business Intelligence Components							
	CO2	Recognize the importance of Data Integration							
	CO3	Model the data in different dimensions							
	CO4	Forecast trends of data							
	CO5	Provide insights from data							
UNIT-I	Business Intelligence and Its Components					Periods:12			
Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), Business Intelligence Definitions and Concepts, Business Intelligence Framework-Data Warehousing Concepts and Its Role in Business Intelligence; Business Intelligence Infrastructure Components - Business Intelligence Process, Business Intelligence Technology, Business Intelligence Roles and Responsibilities, Business Applications of Business Intelligence, Business Intelligence Best Practices								CO1	
UNIT-II	Basics of Data Integration (Extraction Transformation Loading)					Periods:12			
Concepts of Data Integration , Needs and Advantages of using Data Integration , Introduction to Common Data Integration Approaches ; Meta Data – Types and Sources , Introduction to Data Quality , Data Profiling Concepts and Applications, Introduction to ETL								CO2	
UNIT-III	Multi-Dimensional Data Modelling					Periods:12			
Data Modelling Basics-Types of Data Model-Data Modelling Techniques-Fact Table-Dimension Table-Dimensional Models-Dimensional Modelling Lifecycle and Design- Creating Cubes using Microsoft Excel. Introduction to Business Metrics -Fact-Based Decision Making and KPIs-KPIs Applications								CO1,CO3	
UNIT-IV	Prediction Models for Business Intelligence					Periods:12			
Simple Linear Regression Model – Least Squares Method – Multiple Regression Model – Multiple Regression using Excel – Time Series Analysis: Time Series Patterns – Forecast Accuracy – Moving averages and Exponential Smoothing – Regression Analysis for Forecasting: Linear Trend Projection – Seasonality – Seasonality without Trend – Seasonality with Trend.								CO2,CO4	
UNIT-V	Basics of Enterprise Reporting					Periods: 12			
A Typical Enterprise, Malcolm Bridge – Quality Performance Framework, Reporting Perspectives – Report Standardization and Best Practices - Balanced Scorecard, Enterprise Dashboard, Balanced Scorecard vs. Enterprise Dashboard- Funnel Analysis, Enterprise Reporting using MS Access / MS Excel								CO5	
LecturePeriods: 45			TutorialPeriods:15		PracticalPeriods:		TotalPeriods:60		
ReferenceBooks:									
1. RN Prasad and Seema Acharya, “Fundamentals of Business Analytics”, Wiley India, 2016.									
2. The book "Essentials of Business Analytics," published by Cengage Learning in 2016, is authored byJeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Dennis J.Sweeney, and Thomas A. Williams.									
3. James R. Evans, “Business Analytics”, 3rd edition, Pearson, 2019.									
4. David Loshin , “Business Intelligence” , Second Edition ,Elsevier Science and Technology,2012.									

CO-PO/PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	3	2	2	2	2							3	2
CO2	3	3	3	2								3	1
CO3	3	3	1	1	1							3	2
CO4	3	2	2									3	2
CO5	2				1							3	1

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester : V		CourseCategory Code: PEC				SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUE104	Soft Computing	3	1		4	40	60	100
Prerequisite -								
Course Outcome	CO1	Identify and describe soft computing techniques and their roles in building intelligent machines.						
	CO2	Recognize the feasibility of applying a soft computing methodology for a particular problem						
	CO3	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.						
	CO4	Apply genetic algorithms to optimization problems						
	CO5	Design neural networks for pattern classification and regression problems.						
UNIT-I	Fuzzy Computing					Periods:12		
Basic Concepts of Fuzzy Logic – Fuzzy Sets and Crisp Sets – Fuzzy Set Theory and Operations – Properties of Fuzzy Sets – Fuzzy and Crisp Relations – Fuzzy to Crisp Conversion – Membership Functions – Interference in Fuzzy Logic – Fuzzy If-Then Rules, Fuzzy-Implications and Fuzzy Algorithms – Fuzzifications and Defuzzificataions – Fuzzy Controller – Industrial Applications.								CO1, CO3
UNIT-II	Fundamentals of Neural Networks					Periods:12		
Neuron, Nerve Structure and Synapse – Artificial Neuron and its Model – Activation Functions – Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks – Various Learning Techniques: Perception and Convergence Rule, Auto-Associative and Hetero-Associative Memory.								CO2, CO5
UNIT-III	Back Propagation Networks					Periods:12		
Back Propagation Networks Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model – Back Propagation Learning Methods – Effect of Learning Rule Co-Efficient – Factors Affecting Back Propagation Training – Applications								CO2, CO5
UNIT-IV	Competitive Neural Networks					Periods:12		
Kohenen’s Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization, Learning by LVQ – Adaptive Resonance Theory – Learning procedure – Applications								CO2, CO5
UNIT-V	Genetic Algorithm					Periods:12		
Basic Concepts – Working Principle – Procedures of GA – Flow Chart of GA – Genetic Representation: (Encoding) Initialization and Selection – Genetic Operators: Mutation, Generational Cycle – Applications.								CO4
LecturePeriods:45		TutorialPeriods:15		PracticalPeriods:-		TotalPeriods:60		
ReferenceBooks:								
1. Samir Roy , “Introduction To Soft Computing: Neuro-Fuzzy And Genetic Algorithms”, Pearson, 2022								
2. SarojKaushik, SunitaTiwari , “Soft Computing- Fundamentals, Techniques and Applications”, Wiley 1st Edition 2018								
3. S. N. Sivanandam and S. N. Deepa, “Principles of Soft Computing“,Wiley Publisher, 3 rd edition, 2016.								
4. Timothy Ross, “Fuzzy Logic with Engineering Applications”, Wiley Publications, 2016.								
5. Satish Kumar, Neural Networks: A Classroom Approach, McGraw Hill Education, 2 nd edition, 2017								

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PS02
C01	2	2	3	3	3						3	2	2
C02	2	2	3	3	3						3	2	2
C03	3	3	3	3	3						3	3	3
C04	3	3	3	3	3						3	3	3
C05	3	3	3	3	3						3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech						
Semester : V			Course Category Code: PEC			Semester ExamType: TY			
Course Code	Course Name		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
ITUE105	Wireless Networking and Mobile Communication		3	1	-	4	40	60	100
Prerequisite:	ITUC11 Computer Networks								
Course Outcome	CO1	Learn new trends in mobile/wireless communications networks and multiple radio access techniques							
	CO2	Describe the functionality of Mobile IP and Transport Layer							
	CO3	Interpret and explain 5G architecture, its components and functional criteria.							
	CO4	Analyze various protocols of all layers for mobile and ad hoc wireless communication networks							
	CO5	Understand the major concepts involved in wireless wide-area networks and its architecture.							
UNIT-I	Introduction					Periods:12			
Wireless Comes of Age -The Global Cellular Network -The Mobile Device Revolution- Future Trends-The Trouble With Wireless. Wireless LAN Technology: IEEE 802 Architecture - IEEE 802.11 Architecture and Services- IEEE 802.11 Medium Access Control- IEEE 802.11 Physical Layer - Gigabit Wi-Fi - Other IEEE 802.11 Standards- IEEE 802.11 Wireless LAN Security.								CO1	
UNIT-II	Wireless Mobile Networks and Applications					Periods:12			
Cellular Wireless Networks: Principles of Cellular Networks- First-Generation Analog - Second-Generation TDMA - Second-Generation CDMA - Third-Generation Systems. Fourth Generation Systems and LTE-Advanced: Purpose, Motivation, and Approach to 4G - LTE Architecture. Long Range Communications: Satellite Parameters and Configurations - Satellite Capacity Allocation - Satellite Applications - Fixed Broadband Wireless Access - WiMAX/IEEE 802.16								CO1,CO5	
UNIT-IV	5 G Networks					Periods:12			
Historical background-Rationale of 5G – 5G architecture:Introduction - NFV and SDN - Basics about RAN architecture- High-level requirements- Functional architecture and 5G flexibility Functional split criteria-alternatives-Functional optimization- Integration of LTE and new air interface- Enhanced Multi-RAT coordination features- Physical architecture and 5G deployment								CO3	
UNIT-V	Mobile Network and Trasport Layer					Periods:12			
Mobile IP- Goals and requirements, Entities, IP packet delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse Tunneling, IP micro-mobility support- DHCP -Traditional TCP- Congestion Control, Slow start, Fast retransmit/fast recovery, Implications of mobility, Classical TCP- Indirect TCP, snooping TCP, Mobile TCP, Transmission/time out freezing and advancements								CO2,CO4	
UNIT-V	Mobile Ad hoc Networks					Periods: 12			
Bluetooth: User scenarios- Architecture-Radio layer- Baseband layer - Link manager protocol- L2CAP – Security- Profiles- IEEE 802.15– ZigBee. Routing protocols: Destination sequence distance vector- Dynamic source routing - Alternative metrics-Overview ad-hoc routing protocols.								CO4,CO5	
Lecture Periods: 45			Tutorial Periods:15		Practical Periods: -		Total Periods:60		
ReferenceBooks:									

1. Cory Beard, William Stallings, "Wireless Communications Networks and Systems" Pearson Education, 2016
2. Schiller J., "Mobile Communication", 2nd Edition, Pearson Education, New Delhi, 2014
3. AfifOsseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", 1st Edition, Cambridge University Press, 2016
4. Raj Kamal, "Mobile Computing", 3rd edition, Oxford University PressInc. New Delhi, 2019.
5. Asoke K Talukder,HasanAhmed,Roopa R Yavagal, "Mobile Computing Technology, applications and Service Creation", 2nd Edition , McGraw Hill Education Private Ltd,2018.
6. William Stallings, "Wireless Communications and Networks" 2nd Edition, Pearson Education,2005

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	-									3	2	
C02	2	1										2	
C03	2	-										2	2
C04	2	2	2	2								3	2
C05	2	2	2	2							2	3	2

Department: IT				Programme: B.Tech						
Semester : VI				CourseCategoryCode: PEC			SemesterExamType: TY			
ITUE106	Cloud Computing			Periods/Week			Credit	MaximumMarks 100		
				L	T	P	C	CA	SE	TM
				3	1		4	40	60	100
Prerequisite:	ITUC105-Operating systems, ITUC118- Web essentials ITUC11- computer networks									
Course Outcome	CO1	Understand the architecture and underlying principles of cloud computing.								
	CO2	Explain and apply need, types and tools of Virtualization for cloud.								
	CO3	Analyze Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.								
	CO4	Analyze security, standards and applications of cloud technologies.								
	CO5	Create the various types of cloud services.								
UNIT-I	Introduction						Periods:12			
Introduction to Cloud Computing –Definition of Cloud –Evolution of Cloud Computing –Underlying Principles of Parallel and Distributed Computing –Cloud Characteristics –Elasticity in Cloud –On-demand Provisioning.										CO1
UNIT-II	Cloud Enabling Technologies						Periods:12			
Service Oriented Architecture – RESTful Systems – Web Services – Publish- Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.										CO1,CO2
UNIT-III	Cloud Architecture, Services and Storage						Periods:12			
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.										CO1, CO3
UNIT-IV	Resource Management and Security in Cloud						Periods:12			
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.										CO3, CO4, CO5
UNIT-V	Cloud Technologies and Advancements						Periods:12			
Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.										CO3, CO5
Lecture Periods:45			Tutorial Periods:15			Practical Periods: -		Total Periods:60		
ReferenceBooks:										
1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012										
2. Ritting house, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.										
3. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata McGraw Hill, 2013.										
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing -A Practical Approach”, Tata McGraw Hill, 2009.										
5. Douglas Comer, "The Cloud Computing Book: The Future of Computing Explained”, Chapman and Hall/CRC, 2023.										
6. MehulMahrishi Kamal Kant Hiran, RuchiDoshi, Dr.FagbolaTemitayo, “Cloud Computing”, BPB Publications, First Edition,2019.										

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	2	----	3	-	-	-	-	-	3	3	-
C02	2	3	3	2	3	-	-	-	-	-	3	3	-
C03	2	3	3	2	3	-	-	-	-	-	3	3	-
C04	2	3	3	2	3	-	-	-	-	-	3	3	-
C05	2	3	3	3	3	-	-	-	-	-	3	3	-

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech					
Semester :VI				CourseCategoryCode:PEC			SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks			
		L	T	P	C	CA	SE	TM	
ITUE107	DEVOPS	3	1	-	4	40	60	100	
Prerequisite:									
Course Outcome	CO1	Understand different actions performed through Version control tools like Git							
	CO2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven &Gradle							
	CO3	Ability to Perform Automated Continuous Deployment							
	CO4	Ability to do configuration management using Ansible							
	CO5	Understand to leverage Cloud-based DevOps tools using Azure DevOps							
UNIT-I	Introduction to DevOps, SDLC, and Agile methodology						Periods: 12		
Definition of DevOps –The need for DevOps – Key concepts and principles of DevOps – Overview of SDLC – Phases of SDLC (Planning,Analysis,Design,Development,Testing,Deployment,Maintenance) – Overview of Agile methodology – Agile principles and values – Agile practices (Scrum, Kanban, Lean) – Role of DevOps in SDLC – Continuous Integration and Continuous Deployment (CI/CD) – Virtualization vs containerization-Overview of virtualization technologies (VMware,VirtualBox) - Setting up version control with Git and creating a simple Git repository.							CO1		
UNIT-II	Compile and Build using Maven and Gradle				Periods:12				
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle							CO1, CO5		
UNIT-IV	Continuous Integration using Jenkins				Periods:12				
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace							CO3		
UNIT-V	Configuration Management using Ansible				Periods:12				
Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in Ansible							CO2, CO4		
UNIT-V	Building Devops Pipelines using Azure				Periods: 12				
Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file							CO4, CO5		
Lecture Periods: 45		Tutorial Periods:15		Practical Periods: -			Total Periods:60		
Reference Books:									

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014
3. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
4. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
5. MariotTsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019
6. <https://www.jenkins.io/user-handbook.pdf>
7. <https://maven.apache.org/guides/getting-started/>

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2									3	2	
CO2	3	2										2	
CO3	3	2										2	2
CO4	2	2	2	2								3	2
CO5	2	2	2	2							2	3	2

Department: IT			Programme: B.Tech					
Semester : VI			CourseCategoryCode: PEC			SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P		C	CA	SE
ITUE108	IT Operations and Management	3	1	-	4	40	60	100
Prerequisite:								
Course Outcome	CO1	Explain the essential roles of the system administrator in administrating IT Infrastructure						
	CO2	Use appropriate shell commands to manage users, files and devices in the Linux system						
	CO3	Make use of bash scripting to implement system administration tasks.						
	CO4	Configure and monitor various server roles such as DNS server, Web server and Mail server on windows server.						
	CO5	Implement group policy settings and manage resources using Active Directory in Windows Server						
UNIT-I	System Administration				Periods:12			
System Administration basics – Essential Duties and Roles of a system administrator – Datacenter Overview – Data center Infrastructure Management						CO1		
UNIT-II	Linux Administration				Periods:12			
Linux Administration – Boot Process – System daemons: init and systemd – GRUB Configurations and Commands – Rootly powers – Access Control – File privileges – User Management – Process control – File System – Types, mounting, fsck, repair, User and group quotas - Network File system – Logs – Cron jobs - Linux Troubleshooting						CO1,CO5		
UNIT-IV	Scripting for Administration				Periods:12			
Scripting for Administration – Bash scripting: Redirections and Pipelines - Arithmetic operations – functions – Command Line arguments – Control Flow – Loops.						CO3		
UNIT-V	Windows Administration				Periods:12			
Windows Administration – Server Roles and Features - User accounts – Group Policy - Active directory- Network policies- Remote access- Managing File services						CO2,CO4		
UNIT-V	Server Administration				Periods: 12			
Server Configuration and Monitoring – Web Server – Mail Server – DNS server — Configuration and Management on Linux and Windows.Evolving arenas for System Admins – Devops – pipelining CI and CD, MLOps, Serverless Infrastructure.						CO4,CO5		
Lecture Periods: 45		Tutorial Periods:15		Practical Periods: -		Total Periods:60		
ReferenceBooks:								
1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben whaley, Dan Mackin, Unix and Linux System Administration Handbook, Pearson Education, Fifth Edition, 2018.								
2. Windows Server Management - https://learn.microsoft.com/en-us/windows-server/administration/manage-windows-server .								
3. Linux commands and Bash Scripting - https://linuxhint.com/								
4. Windows Server Administration https://en.wikiversity.org/wiki/Windows_Server_Administration Course Contents and Lecture Schedule								

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2									3	2	
C02	3	2										2	
C03	3	-										2	2
C04	2	2	2	2								3	2
C05	2	2	2	2							2	3	2

Department: IT				Programme: B.Tech							
Semester : VI				Course CategoryCode: PEC			SemesterExamType: TY				
ITUE109	UI &UX Design			Periods/Week			Credit		MaximumMarks 100		
				L	T	P	C	CA	SE	TM	
				3		1	4	40	60	100	
Prerequisite:	ITUC118 -web essentials										
Course Outcome	CO1	Explain design thinking concept									
	CO2	Interpret user requirements									
	CO3	Select appropriate visual design for given problem									
	CO4	Create interactions using design tool.									
	CO5	Create innovative design prototype for given applications.									
UNIT-I	Design Thinking Fundamentals						Periods:12				
Introduction to Design thinking – Concept, Purpose, 5 stages of design thinking – Empathize, Define, Ideate, Prototype, Test . Introduction to User Interface / User Experience (UI/UX) – Definition of Design with respect to digital media, User Interface, User experience, Difference between UI and UX. History of UX. Need of UI and UX.										CO1, CO2	
UNIT-II	User Requirements and its Analysis						Periods:12				
Introduction to research and analysis tool (freeware) such as FigJam. User requirements – Definition, Types of user research - Qualitative research, Quantitative research. Tools to collect user requirements – personal observation, interviews, questionnaire, User/ Expert reviews. User requirement analysis - Understanding target audience and client requirements, Competitive analysis, Affinity mapping, Defining User Persona.										CO1,CO2, CO3	
UNIT-III	User Interface Design						Periods:12				
Storyboarding, User journey mapping - Gestalt principles of design - Aesthetics in UI design - Using Light, Colour and Contrast Effectively in UI Design: Introduction to any freeware design tool such as Figma: Visual Communication Design - effective visual communication for graphical user interface										CO3,CO4	
UNIT-IV	User Experience Design Tool						Periods:12				
Introduction to User Experience design -UX design open source tool such as - Figma features – Navigations, interactions, Buttons Creating Library Gamification, micro-animation Creating visual identity of the project – design system, design theme										CO3,CO4,C O5	
UNIT-V	Prototyping and Testing						Periods:12				
Introduction to Wireframing - Purpose of wireframing, Types – low fidelity, medium fidelity, high fidelity Basics of sketching, Creating low fidelity wireframes, medium fidelity and high fidelity in FigmaBasic considerations in wireframing – device, size, behavior, interaction- Elements used in wireframing – visual design, high fidelity elements - Prototyping and Testing.										CO3,CO4,C O5	
LecturePeriods:45			Tutorial Periods:15			Practical Periods: -			Total Periods:60		
ReferenceBooks:											
1. Jesse James Garrett, " The Elements of User Experience: User-Centred Design for the Web and Beyond ", New Riders Publishing, 2022.											
2. Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, “Design Thinking: The Handbook”, World Scientific Publishing Co Pte Ltd, 2020.											
3. Fabio Staiano, “Designing and Prototyping Interfaces with Figma”, Packt Publishing Ltd, 2020.											
4. Kilian Langenfeld, " Design Thinking for Beginners”, Personal Growth Hackers, 2019.											

CO-PO/PSO MAPPING

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

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech				
Semester : VI				Course Category Code: PEC			Semester Exam Type: TY	
Course Code	Course Name	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUE110	Privacy and Security in Online Social Media	3	1	-	4	40	60	100
Prerequisite								
Course Outcome	On successful completion of this course, the students will be able to:							
	CO1	Understand the concept of online social networks.						
	CO2	Develop and manage trust related issues.						
	CO3	Analyze approaches to control information sharing in online social networks.						
	CO4	Apply knowledge of identity management.						
	CO5	Analyze various privacy issues associated with popular social media.						
UNIT-I	Introduction					Periods:12		
Introduction to Social Networks, From offline to Online Communities, Evolution of OSNs, Analysis and Properties, Security Issues, Trust Management, Controlled Information Sharing, Identity and Access Management, Data Collection from Social Media, Challenges, Opportunities, and Pitfalls in Online Social Networks, APIs.						CO1		
UNIT-II	Trust Management					Periods:12		
Trust and Policies, Trust and Reputation Systems, Trust in Online Social, Trust Properties, Trust Components, Social Trust and Capital, Trust Evaluation Models, Trust Credibility and Reputations in Social Systems; Online social media and Policing, Information Privacy Disclosure, Revelation and its Effects in OSM and OSNs; Phishing in OSM & Identifying Fraudulent Entities in OSNs.						CO2		
UNIT-III	Controlled Information Sharing					Periods:12		
Access Control Models, Access Control in Online Social Networks, Relationship-Based Access Control, Privacy Settings in Commercial Online Social Networks, Existing Access Control Approaches.						CO2,CO3		
UNIT-IV	Identity Management					Periods:12		
Identity Management, Digital Identity, Identity Management Models: From Identity 1.0 to Identity 2.0, Identity Management in Online Social Networks, Identity as Self-Presentation, Identity Thefts, Open Security Issues in Online Social Networks.						CO3,CO4		
UNIT-V	Case Study					Periods:12		
Privacy and Security Issues associated with Various Social Media such as Facebook, Instagram, Twitter, LinkedIn etc.						CO5		
Lecture Periods:45		Tutorial Periods:-15		Practical Periods:-		Total Periods:60		
Reference Books:								
1. Barbara Carminati, Elena Ferrari, Marco Viviani, “Security and Trust in Online Social Networks”, Morgan & Claypool Publishers, Dec 2013.								
2.Simone Fischer-Hübner, FarzanehKaregar, “The Curious Case of Usable Privacy -Challenges, Solutions, and Prospects”, Springer, 2024, ISBN 978-3-031-54158-2, https://doi.org/10.1007/978-3-031-54158-2 .								
3.YanivAltshuler, Yuval Elovici, Armin B. Cremers, NadavAharony, Alex Pentland, “Security and Privacy in Social Networks”, Springer, 2013.								
4. Richard Chbeir, Bechara Al Bouna, “Security and Privacy Preserving in Social Networks”, Lecture Notes in Social Networks, Springer, 2013.								
5. Michael Cross, “Social Media Security: Leveraging Social Networking While Mitigating Risk”, SYNGRESS, Elsevier, 2014.								
6. https://link.springer.com/chapter/10.1007/978-3-031-61463-7_14?fromPaywallRec=true								
7. https://www.scribd.com/document/668768820/Privacy-And-Security-In-Online-Social-Media								
8. https://www.himt.ac.in/assets/pdf/syllabus/MCA%204th%20sem.pdf								

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	0	2	-	2	2	3	2	-	-	2	2	2
C02	2	2	2	-	3	2	3	2	-	-	2	2	2
C03	2	3	2	-	2	2	3	2	-	-	2	3	3
C04	2	2	2	-	3	2	3	2	-	-	3	2	2
C05	3	3	3	-	3	3	3	3	-	-	3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT			Programme: B.Tech.					
Semester : VII			Course Category Code: PEC			Semester Exam Type: TY		
Course Code	Course Name	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUE111	Ethical Hacking	3	1	-	4	40	60	100
Prerequisite:	ITUC111-Computer Networks							
Course Outcome	CO1	Explain the terminologies associated with Penetration testing, vulnerability assessment and various information security standards						
	CO2	Use network scanning, enumeration and foot printing for gathering information about host, network and people related to an organization, search engines, web servers, DNS and social networking sites.						
	CO3	Provide security solutions for protection against evading of firewalls and Intrusion Detection Systems						
	CO4	Deploy measures for protecting computer systems against password cracking, key loggers, Spywares and Root kits						
	CO5	Use appropriate tools and techniques to identify various vulnerabilities in system, network, web server & websites and perform web application testing for prevention against OWASP application risks.						
UNIT-I	Introduction to Ethical Hacking and Information Security Laws & Standards				Periods:15			
Ethical Hacking Introduction: Scope and Limitations of Ethical Hacking, Types of Penetration, Phases of Penetration Testing, Security Testing Methodology, Comparing Security Audit, Vulnerability Assessment, and Penetration Testing, Case Studies								CO1 CO5
Information Security Laws and Standards: Payment Card Industry Data Security Standard (PCI-DSS), ISO/IEC 27001:2013, Health Insurance Portability and Accountability Act (HIPAA), Sarbanes Oxley Act (SOX), The Digital Millennium Copyright Act (DMCA), Federal Information Security Management Act (FISMA)								
UNIT-II	Foot printing and Scanning Networks				Periods:10			
Foot printing: Foot printing through Search Engines and Web Services, Social Networking Sites, Website Footprinting, Email Footprinting, Network Footprinting, Foot printing through Social Engineering								CO1 CO2 CO5
Scanning Networks: Check for live systems and live sports, Scanning beyond IDS, Banner Grabbing, Scan for vulnerability, Scanning Pen Testing								
UNIT-III	System Hacking				Periods:10			
Cracking Passwords, Types of Password Attacks, Sniffing and Spoofing, Escalating Privileges, Key loggers and Anti Key loggers, Spywares and Anti Spywares, Rootkits and Anti Rootkits								CO1 CO4 CO5
UNIT-IV	Web Hacking				Periods:15			
Web Server Hacking, Web Server Attacks, Web Server Password Cracking, Web Server Penetration Testing, Injection Flaws, Broken Authentication, XML External Entity (XXE), Broken Access Control, Cross-Site Scripting (XSS) Attacks, Insecure Deserialization, Using components with known vulnerabilities, Insufficient Logging and Monitoring								CO1 CO5
UNIT-V	IDS and Firewall Evasion Techniques				Periods: 10			
IDS Evasion Techniques: Insertion Attack, Evasion, Denial-of-Service Attack (DoS), Session Splicing, Unicode Evasion, Fragmentation Attack								CO1 CO3
Firewall Evasion Techniques: IP Address Spoofing, Bypass a Firewall, Tunnelling Method, Protection against Firewall Evasion								CO5
Lecture Periods: 45		Tutorial Periods:15		Practical Periods: -		Total Periods:60		
Reference Books:								

1. Robert S. Wilson, Michael T. Simpson, Nicholas Antill, Hands-On Ethical Hacking and Network Defence, Cengage Learning, Inc, 2022
2. EC-Council iary morrison, Ethical hacking: A Comprehensive Beginner's to Learn and Master Ethical Hacking, Create Space Independent Publishing Platform 2018
3. RafayBaloch, Ethical Hacking and Penetration Testing Guide||, CRC Press, 2015
4. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	2	-	-	-	-	-	2	-	-	-	1	2	2
CO2	-	-	-	2	3	-	2	-	-	-	2	2	2
CO3	1	1	2	2	2	-	3	-	-	-	2	2	2
CO4	2	-	-	2	2	-	3	-	-	-	2	2	2
CO5	-	-	-	2	3	-	3	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT				Programme : B.Tech				
Semester : VII				Subject Category: PEC			Semester Exam Type: TY	
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUE112	Generative AI	3	1		4	40	60	100
Prerequisite:	ITUC126 – Artificial Intelligence and Machine Learning ITUC115- Python Programming							
Outcome:	CO1	Understand the fundamental principles, evolution, and scope of Generative AI						
	CO2	Apply LLMs and prompt engineering for text generation and intelligent assistance						
	CO3	Explore multimodal generation tools for images, video, and audio content						
	CO4	Integrate AI tools and APIs into automated workflows for real-world applications						
	CO5	Analyze ethical, societal, and legal challenges of generative systems						
UNIT-I	Introduction						Periods: 12	
Overview of Generative AI and traditional AI- History and evolution: Rule-based systems to generative models- High-level model categories: LLMs, diffusion models, audio generators Applications in engineering, media, healthcare, education, and business-Fundamentals of prompt engineering								CO1
UNIT-II	Text Generation and Language Tools						Periods: 12	
Introduction to LLMs (GPT, Claude, Gemini, Mistral – conceptual only)- Transformer and Large Language Model (LLM) -Intermediate prompt engineering techniques: role-based, zero/few-shot Learning Applications: content generation, summarization, chatbot’s, assistants- Tools: ChatGPT, Jasper, Notion AI, GrammarlyGO Hands-on: Build a chatbot using prompt flows								CO2, CO3
UNIT-III	Image, Video & Audio Generation						Periods: 12	
Introduction to image generation tools: DALL-E, Mid journey, Generative Adversarial Networks (GAN) for image generation-Auto Encoders-Stable Diffusion- Text-to-video models: Runway ML, Sora -Music and audio generation: Eleven Labs, Suno, Music Gen- Prompt crafting for visual styles and control- Hands-on: Generate theme-based media content - Customizing LLM for own data								CO2, CO3
UNIT-IV	APIs and AI Automation						Periods: 12	
Working with APIs: OpenAI, Hugging Face Inference API, Replicate- No-code/low-code platforms: Zapier, Canva AI, Microsoft Copilot- Use cases: content pipelines, document creation, coding assistants -GPTs and custom assistants: use, creation, deployment -Hands-on: Automate a multi-modal content workflow								CO3, CO4
UNIT-V	Ethics, Bias and Future of Generative AI						Periods: 12	
Bias in training data and model behavior-Deep fakes, misinformation, and ethical use of generated content-Copyright, plagiarism, and AI content ownership-Emerging trends: open-source LLMs, multimodal AI, regulatory frameworks-Case study: Deep fake misuse & detection tools								CO4, CO5
Total contact Hours: 45		Total Tutorials: 15			Total Practical Classes:-		Total Hours: 60	
Reference Books:								

1. Karthikeyan Sabesan, Sivagamisundari , Nilip Dutta, “ Generative AI for Everyone: Deep learning, NLP, and LLMs for creative and practical applications”, BPB Publications 2025
2. Altaf Rehmani, “Generative AI for everyone”, Bluerose Publishers Pvt. Ltd.2024
3. [Martin Musiol](#), “Generative Ai: Navigating the Course to the Artificial General Intelligence Future”, John Wiley & Sons Inc; 1st edition 2024
4. [Tanmoy Chakraborty](#), “Introduction to Large Language Models Generative AI for Text”, Wiley Publisher 2024
5. [Yattish Ramhorry](#), “Building Intelligent Applications with Generative AI: Explore the potential of AI for next gen applications”, BPB Publications 2024
6. Hunaidkhan Pathan, Nayankumar Gajjar, “Mastering LLM Applications with LangChain and Hugging Face: Practical insights into LLM deployment and use cases” , BPB Publications 2024

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	3	2	1	2	2						3	2	2
CO2	3	3	2	2	3						3	2	2
CO3	3	3	3	3	3						3	3	3
CO4	3	3	3	3	3						3	3	3
CO5	3	3	3	3	3						3	3	3

Department:IT		Programme:B.Tech.(IT)						
Semester : VII		CourseCategoryCode:PEC				SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUE113	Big Data Analytics	3	1		4	40	60	100
Prerequisite		Database Management System						
Course Outcome	CO1	Understand the need for Big Data in Evolving Era						
	CO2	Analyse HDFS components with its Applications						
	CO3	Apply Hadoop Map reduce technique in real-time projects.						
	CO4	Design and implement real time dynamic Big Data Analytic Projects.						
	CO5	Implement with latest frame work tools for predictive and preventive measures.						
UNIT-I	Introduction To Big Data Architecture				Periods:12			
Introduction : Evolution of Big Data, definition of big data, Big Data and its Importance– Four V’s of Big Data–Drivers for Big Data– Data Storage and Analysis - Characteristics of Big Data - Typical Analytical Architecture – Requirement for new analytical architecture – Challenges in Big Data Analytics – BigData Analytics Applications								CO1
UNIT-II	Processing Big Data				Periods:12			
Coexistence of Big Data and Data Warehouse , Mapping Data to Programming Framework- Connecting and Extracting Data from Storage - Transforming Data for Processing - Subdividing Data in Preparation for Hadoop Map Reduce								CO1, CO2
NoSQL: Types of No SQL Databases, advantages of NoSQL, SQL vs NoSQL								
UNIT-III	Hadoop Map Reduce				Periods:12			
Hadoop: Introduction to map reduce programming, mapper, reducer, Features of Hadoop, Creating Components of Hadoop Map Reduce Jobs–Executing Hadoop Map Reduce Jobs - Monitoring Progress of Job Flows –The Building Blocks of Hadoop Map Reduce- Hadoop1 vs Hadoop2- Key advantages of Hadoop.								CO2, CO3
Map Reduce Programming: I/O formats, Map side join, Reduce Side Join, Secondary sorting, Pipelining Map Reduce jobs-Hadoop’s Parallel World								
UNIT-IV	Advanced Database for Big Data				Periods:12			
Installing and Running Pig–Comparison with Databases–Installing and Running Hive– Hive SQL – Tables – Querying Data –Oracle Big Data-Postgre SQL, Pig- Apache Cassandra, alongside cloud-based solutions like Amazon Redshift and Google Big Query								CO3, CO4
Scripting language: Handling Big Data using Pig, Streaming- HIVE SQL								
UNIT-V	Big Data Case study with latest Tools				Periods:12			
Real-Time Sentiment Analysis for social media big data: Build a real-time sentiment analysis system to fetch tweets dynamically.								CO5
Distributed Web Scraping with Python: Develop a distributed web scraping system that can scrape large amounts of data from multiple websites using Python and multiprocessing or asyncio for parallelism.								
Clustering Large Dataset using K-means and Python: Implement a clustering algorithm (like K-means, K-Median) to segment a large dataset into clusters with Scikit - Apache Cassandra - Amazon Redshift and Google BigQuery for any latest Domain								
Lecture Periods: 45		Tutorial Periods: 15		Practical Periods:-		Total Periods:60		
Reference Books								
1. Chandramouli Subramanian, Ash A George, C R Rene Robin, D Doreen Hephzibaz Miriam, J Jasmine Christina Magdalene, “ Big Data Analytics” University Press Private Limited, 2024								
2. Arvind Sathi, “Big Data Analytics: Disruptive Technologies for Changing the Game”, IBM Corporation MC Press, Edition 2013ISBN: 978-1-58347-380-1								
3. Ms. Namrata Bhatt , Ms. Nikita Verma, Ms. Jagriti Singh Thakur& Ms. Garima Jain , “BIG DATA ANALYTICS FOR BEGINNERS “Chenour Publishing House, January 2024								
4. DeyNilanjan, “Big Data Analytics for Intelligent Healthcare Management (Advances in ubiquitous sensing								

applications for healthcare) ISBN 13: **9780128181461**, Academic Press . 2019

5. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.
6. TomWhite,"Hadoop:TheDefinitiveGuide",O'Reilly,4thEdition,2015.
7. Nick Pentreath, Machine Learning with Spark, PacktPublishing,2015.
8. Mohammed Guller, Big Data Analytics with Spark, Apress,2015
9. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012
10. <https://cloud.google.com/bigquery/docs/migration/redshift-overview>
11. <https://neontri.com/blog/apache-cassandra-use-cases>

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	1	3	1	3	3	0	1	0	1	2	2	2	2
C02	3	3	2	3	3	0	2	3	3	3	3	3	3
C03	3	3	3	3	3	2	3	3	3	3	3	3	3
C04	3	3	3	3	3	3	3	3	3	3	3	3	3
C05	3	3	2	3	3	3	3	3	3	3	3	3	3

Department : IT			Programme : B.Tech					
Semester : VII			Subject Category: PEC			SemesterExamType: TY		
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUE114	Cognitive Science	3	1		4	40	60	100
Prerequisite:	ITUE104 -Soft Computing							
Outcome:	CO1	Understand the underlying theory behind cognition.						
	CO2	Connect to the cognition elements computationally						
	CO3	Develop a cognitive inference model.						
	CO4	Develop a cognitive learning model.						
	CO5	Explore the recent trends in cognitive computing.						
UNIT-I	Philosophy, Psychology and Neuroscience				Hours: 12			
Philosophy: Mental-physical Relation – From Materialism to Mental Science – Detour before the naturalistic turn – The Philosophy of Science – The Mind in Cognitive Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing – Neurosciences: Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.								CO1
UNIT-II	Computational Intelligence				Hours: 12			
Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making – Decision making under Uncertainty – Learning – Language – Vision – Robotics								CO2, CO3
UNIT-III	Probabilistic Programming Language				Hours: 12			
WebPPL Language – Syntax – Using JavaScript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration – Other basic computation.								CO2, CO3
UNIT-IV	Implementing the Inference Models of Cognition				Hours: 12			
Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference								CO3, CO4
UNIT-V	Implementing the Learning Models of Cognition				Hours: 12			
Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models – Occam’s Razor – Learning (Deep) Continuous Functions – Mixture Models.								CO4, CO5
Total contact Hours: 45		Total Tutorials: 15		Total Practical Classes:-		Total Hours: 60		
Reference Books:								
1. José Luis Bermúdez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, 2020								
2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 1999.								
3. Noah D. Goodman, Andreas Stuhlmuller, "The Design and Implementation of Probabilistic Programming Languages", Electronic version of book, https://dippl.org/ .								
4. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, https://probmods.org/ .								

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO4	PO 5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
C01	3	2	1	2	2						3	2	2
C02	3	3	2	2	3						3	2	2
C03	3	3	3	3	3						3	3	3
C04	3	3	3	3	3						3	3	3
C05	3	3	3	3	3						3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT				Programme: B.Tech						
Semester :VII				CourseCategoryCode:PEC			SemesterExamType: TY			
Course Code	Course Name			Periods/Week			Credit	MaximumMarks		
				L	T	P	C	CA	SE	TM
ITUE115	Block chain Technologies			3	1	-	4	40	60	100
Prerequisite:	Data Structures, DAA, Computer Networks, DBMS									
Course Outcome	CO1	Understand the significance of blocks, proof-of-work, and consensus building in blockchain.								
	CO2	Demonstrate the functional/operational aspects of trading and mining using crypto currencies.								
	CO3	Apply smart contracts to code business logic in Solidity								
	CO4	Develop decentralized applications for web 3.0 using Ethereum block chain								
	CO5	Analyze the impact and challenges in Blockchain implementation in various domains like finance, Health care etc.								
UNIT-I	Introduction to Block chain and Cryptographic Primitives						Periods: 10			
Block chain Technology -Architecture, Transactions and Blocks,P2PSystems,Types of Block chain, Applications of Collison- resistant hash functions –SHA256,Digitalsignature - ECDSA, Public key cryptosystems for Authentication, zero-knowledge proof systems									CO1	
UNIT-II	Bitcoin Operation						Periods: 15			
Transactions in Bitcoin, Distributed Consensus atomic broadcast, Byzantine fault-tolerant consensus methods, Merkle Patricia Tree, Anonymity, Mining Mechanism – Proof of Work, Energy efficiency, Reward, Chain Policy, 51% Attack, Life of Blockchain application, Crypto currency as application of blockchain technology									CO1 CO2	
UNIT-III	Ethereum						Periods: 15			
Introduction to Ethereum, Consensus Mechanisms, Meta Mask Setup, Ethereum Accounts, Transactions, Receiving Ethers.Develop Smart Contracts using Solidity – Data types, looping and branching constructs, Function modifiers, Access Specifies, Inheritance and Polymorphism in smart contracts – Creating Crypto currencies and Non-Fungible Tokens									CO3 CO4	
UNIT-IV	Hyperledger						Periods: 10			
Permissioned and Private Block chains, Hyper ledger and its components Hyper ledger Fabric – Transactions life cycle, Deploying a chain code in test network									CO1	
UNIT-V	Blockchain–Use cases						Periods: 10			
Financial Services- KYC and Anti money Laundering, Trade finance, Cross-border Payments, Healthcare, Digital Rights Management, Identity Management, Tax Payment and Land Registry Records, Supply Chain									CO5	
LecturePeriods: 45			TutorialPeriods: 15			PracticalPeriods: -		TotalPeriods: 60		
ReferenceBooks:										
1. Imran Bashir, “Mastering Blockchain Inner Workings of Blockchain, from Cryptography and Decentralized Identities, to DeFi, NFTs and Web3”, Fourth Edition, Packet Publishing, 2023										
2. Lorne Lantz, Daniel Cawrey“ Mastering Blockchain: Unlocking the Power of Crypto currencies, Smart Contracts, and Decentralized Applications”, O’Reilly, 2020										
3. Kumar Saurabh, Ashutosh Saxena, “Blockchain Technology Concepts and Applications”, Wiley, 2020										
4. Elad Elrom, “The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and										

Securing Distributed Blockchain-based Projects”, A press, 2019

5. Andreas Antonopoulos, “MasteringBitcoin: Programming the open blockchain”, O’Reilly, Second Edition, 2021.
6. Melanie Swan, “Blockchain–Blueprint for New Economy”, O’Reilly, Second Edition, 2017
7. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, “Blockchain Technology: Cryptocurrency and Applications”, Oxford University Press, 2019.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	3	1	-	-	-	-	1	-	-	-	-	2	2
CO2	2	-	-	2	2	-	1	-	-	-	-	2	2
CO3	3	-	-	-	-	-	2	-	-	-	-	2	2
CO4	2	3	3	3	2	-	2	-	-	-	-	2	2
CO5	2	3	1	1	2	-	2	-	-	-	-	2	2

Score: 3 – High; 2 – Medium; 1 – Low

HONORS COURSES

Department: IT			Programme: B.Tech						
Semester :IV			CourseCategoryCode:HNC			SemesterExamType: TY			
CourseCode	CourseName		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUH101	Foundations of Data Science		3	1	-	4	40	60	100
Prerequisite:									
Course Outcome	CO1	Describe the need for data science and data preparation process							
	CO2	Develop Python programs for data preprocessing							
	CO3	Apply statistical techniques to analyze data and interpret various statistical inference							
	CO4	Demonstrate the techniques for handling large volume of data							
	CO5	Understand the data visualization techniques							
UNIT-I	Introduction To Data Science					Periods:12			
Introduction: Need for data science – Benefits and uses –Facets of data – Big data ecosystem – Data science process: Retrieving data – Cleansing, integrating, and transforming data – Data analysis – Build the models – Presenting findings and building application								C01	
UNIT-II	Data Preprocessing					Periods:12			
Introduction to Python; Fundamental Python Libraries for Data Scientists: Numpy – Scipy – Scikit Learn – Pandas – Matplotlib; IDE; Data manipulation: Reading and selection – Filtering missing data – Sorting – Grouping – Ranking and plotting; Data Manipulation with Pandas; Sample programs to pre-process and visualize data.								C02	
UNIT-III	Data Analysis					Periods:12			
Descriptive Statistics: Introduction – Data Preparation –: Data summarization – Data distribution – Outlier Treatment – Measuring asymmetry – Continuous Distribution; Estimation: Mean – Variance – Sampling – Covariance – Correlation. Statstical Inference: Introduction – Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing: Using confidence intervals – Using p-values.								C01,C03	
UNIT-IV	Handling Large data					Periods:12			
Handling large data on a single computer: General techniques for handling large volume of data, General programming tips for dealing with large data sets, Case study: Predicting malicious URLs, Building a recommender system inside a database.								C01, C04	
UNIT-V	Graph database and Data visualization					Periods: 12			
Introducing connected data and graph databases- Introducing Neo4j: a graph database - Connected data example: a recipe recommendation engine. Data visualization to the end user: Data visualization options- Crossfilter, the JavaScript MapReduce library- Creating an interactive dashboard with dc.js - Dashboard development tools.								C05	
LecturePeriods: 45		TutorialPeriods:15		PracticalPeriods: -			TotalPeriods:60		
ReferenceBooks:									

1. Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science – Big data, Machine Learning, and more using Python tools", Manning Publications Co, 2016.
2. Laura Igual, Santi Segua, "Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications", Springer Nature, 2017
3. Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly Media, 2016
4. Dr. B. Srikanth, Dr.Swarajya Lakshmi V, Dr.Papineni Syed Khasim, "Fundamentals of Data Science" , Walnut Publications, 2022.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO2
CO1	2	2	2								3	3	
CO2	2	2	2									3	2
CO3	2		2									2	1
CO4	2	2	2	2								2	2
CO5	2	2	3	2							2	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT				Programme: B.Tech							
Semester : V				CourseCategoryCode:HNC			SemesterExamType: TY				
ITUH102	Data Engineering Principles			Periods/Week			Credit	MaximumMarks 100			
				L	T	P	C	CA	SE	TM	
				3	1		4	40	60	100	
Prerequisite:		ITUC104 -Object Oriented Programming using C++and Java									
CourseOutcome	CO1	Describe a concise overview of the entire data engineering landscape									
	CO2	Apply the data engineering lifecycle to design and build a robust architecture									
	CO3	Assess data engineering problems using an end-to-end framework of best practices									
	CO4	Illustrate Cut through marketing hype when choosing data technologies, architecture and processes									
	CO5	Incorporate data governance and security across the data engineering lifecycle									
UNIT-I		Data Engineering Building Blocks					Periods:12				
		Data Engineering Described: Data Engineering Defined - The Data Engineering Lifecycle-Evolution of the Data Engineer -Data Engineering and Data Science. Data Engineering Skills andActivities: Data Maturity and the Data Engineer -The Background and Skills of a Data Engineer -Business Responsibilities - Technical Responsibilities- The Continuum of Data Engineering Roles,from A to B Data Engineering Lifecycle : Data Engineering Lifecycle - The Data Lifecycle Versusthe Data Engineering Lifecycle : Generation: Source Systems - Storage - Ingestion – Transformation- Serving Data -Data Management - DataOps - Data Architecture - Orchestration – SoftwareEngineering.								CO1,CO2	
UNIT-II		Designing Good Data Architecture					Periods:12				
		Enterprise Architecture Defined -Data Architecture Defined - Principles of Good Data Architecture:Choose Common Components Wisely Plan for Failure - Architect for Scalability - Architecture IsLeadership: Build Loosely Coupled Systems - Make Reversible Decisions - Prioritize Security -Embrace FinOps - Major Architecture Concepts : Domains and Services - Distributed Systems,Scalability, and Designing for Failure - Tight Versus Loose Coupling: Tiers, Monoliths, and Microservices - User Access: Single Versus Multitenant - Event-Driven Architecture - Brownfield VersusGreenfield Projects :Examples and Types of Data Architecture - Data Warehouse - Data Lake -Lambda Architecture								CO2,CO3	
UNIT-III		Technologies Across the Data Engineering					Periods:12				
		Interoperability - Cost Optimization and Business Value: Total Cost of Ownership –TotalOpportunity Cost of Ownership - FinOps - Location: On Premises - Cloud - Hybrid Cloud -Multicloud -Decentralized: Blockchain and the Edge- Build Versus Buy: Open Source Software -Proprietary Walled Gardens. Monolith Versus Modular: Monolith - Modularity - The DistributedMonolith Pattern. Serverless Versus Servers: Serverless - Containers - Evaluate Server VersusServerless. Data Engineering Storage Abstractions : The Data Warehouse - The Data Lake – TheData Lakehouse - Data Platforms								CO3, CO4	
UNIT-IV		Queries, Modelling and Transformation					Periods:12				
		Queries - The Life of a Query - The Query Optimizer -Improving Query Performance - Queries onStreaming Data. Data Modeling : Data Model - Conceptual, Logical, and Physical Data Models -Normalization - Techniques for Modeling Batch Analytical Data - Modeling Streaming Data.Transformations :Batch Transformations - Materialized Views, Federation, and Query Virtualization -Streaming Transformations and Processing.								CO3, CO5	
UNIT-V		Security, Privacy, and the Future of Data Engineering					Periods:12				
		Security and Privacy : People - The Power of Negative Thinking - Always Be Paranoid Processes - Security Threat Versus Security Habit - Active Security - The Principle of Least Privilege – SharedResponsibility in the Cloud - Always Back Up Your Data. Security Policy - Technology - Patch andUpdate Systems - Encryption - Logging, Monitoring, and Alerting - Network Access - Security forLow-Level Data Engineering.								CO1,CO5	
Lecture Periods:45			Tutorial Periods:		Practical Periods:15			TotalPeriods:60			

Reference Books:

1. Reis, Joe, and Matt Housley. Fundamentals of Data Engineering: Plan and Build Robust Data Systems. O'Reilly Media, 2022.
2. Crickard, Paul, Data Engineering With Python: Work With Massive Datasets to Design Data Models and Automate Data Pipelines Using Python. Packt Publishing Ltd, 2020.
3. Haines, Scott. Modern Data Engineering With Apache Spark: A Hands-On Guide for Building Mission-Critical Streaming Applications. Apress, 2022.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PS02
CO1	3	1	-	-	-	-	-	-	-	-	-	3	-
CO2	2	-	-	2	2	-	-	-	-	-	-	3	-
CO3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	3	3	2	-	-	-	-	-	-	3	-
CO5	2	3	1	1	2	-	-	-	-	-	-	3	-

Department: IT			Programme: B.Tech.					
Semester : VI			CourseCategoryCode: HNC			SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUH103	Multi-Biometrics	3	1	-	4	40	60	100
Prerequisite:	Information Security							
Course Outcome	CO1	Learn the basics of biometric traits - understand						
	CO2	Understand the structure and representation of biometric traits feature						
	CO3	Analyse various components of biometric/multi-biometric systems						
	CO4	Analyse various fusion methods for multi-biometrics						
	CO5	Apply the multi-biometric traits in various real-time applications						
UNIT-I	Introduction				Periods: 12			
Introduction to Biometrics: Operation of a Biometric System – verification vs. identification – performance of a biometric system – biometrics characteristics –biometrics traits - application of biometrics.							CO1	
UNIT-II	Physiological traits				Periods: 12			
Fingerprint – Face – Iris – Hand geometry – Ear – palm print – knuckle print – Hand vascular – DNA traits – sensor models of every trait – feature extraction techniques – matching – performance evaluation – test databases – applications.							CO2, CO3	
UNIT-III	Behavioural and Soft traits				Periods: 12			
Key stroke – Signature – Voice – Gait – Driving Style – ECG – EEG - sensor models of every trait – feature extraction techniques – matching – performance evaluation – test databases – applications.							CO2, CO3	
UNIT-IV	Multi-biometrics				Periods: 12			
Limitations of Biometric System - Multi-biometrics System Design - Level of Fusion: Sensor Level - Feature Level - Rank Level - Decision Level.							CO3, CO4	
UNIT-V	Applications				Periods: 12			
National ID Card (UID), Voter Registration, Welfare Disbursement, Border Crossing. Forensic: Corpse Identification, Criminal Investigation, Parenthood Determination. Commercial: ATM, Access Control, Mobile Phone, Banking, E-Commerce, Smart Card.							CO5	
LecturePeriods: 45		TutorialPeriods: 15		PracticalPeriods: -		TotalPeriods: 60		
ReferenceBooks:								
1. Loris Nanni, Sheryl Berlin Brahnan, Biometric Systems, Sensors, 2021. 2. Arun A. Ross, KarthikNandakumar and Anil K. Jain, Introduction to Biometrics, Springer, 2014. 3. Arun A. Ross, KarthikNandakumar and Anil K. Jain, Handbook of Multibiometrics, Springer, 2011. 4. M.J. Burge and K.W. Bowyer, Handbook of Iris Recognition, Springer, 2013. 5. Anil K. Jain, Patrick Flynn and Arun A. Ross, Handbook of Biometrics, Springer, 2008. 6. Stan Z. Li and Anil K. Jain, Encyclopedia of Biometrics, Springer, 2009. 7. Ruud M. Bolle, SharathPankanti, Nalini K. Ratha, Andrew W. Senior and Jonathan H. Connell, Guide to Biometrics, Springer, 2009.								

CO-PO/PSO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester :VII		CourseCategoryCode:HNC				SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUH104	Software Defined Networks	3	1		4	40	60	100
Prerequisite:	Computer Networks							
Course Outcome	CO1	Identify the concepts of traditional networks and software defined networks						
	CO2	Explain the various components of SDN and their uses						
	CO3	Make use of SDN APIs and open-source tools						
	CO4	Utilize SDN in the data center						
	CO5	develop various applications of SDN						
UNIT-I	Introduction to SDN				Periods:12			
Basic packet switching terminology – The modern data center – Traditional switch architecture – Autonomous and dynamic forwarding table. Why SDN?: Evolution of switches and control planes – Cost-Data center innovation – Data center needs. The Genesis of SDN: The evolution of networking technology – Forerunners of SDN							CO1,C02	
UNIT-II	SDN and OpenFlow				Periods:12			
How SDN works: Fundamental characteristics of SDN – SDN operation – SDN devices – SDN controllers – Alternate SDN methods. The OpenFlow specification: OpenFlow overview – OpenFlow 1.0 and OpenFlow basics – OpenFlow 1.1, 1.2 &1.3 Additions – OpenFlow Limitations.							CO1,C02	
UNIT-III	SDN Definitions &open source				Periods:12			
Potential drawbacks of open SDN – SDN via APIs – SDN via hypervisor-based overlays – SDN via opening up the device – Network Functions virtualization – Alternatives overlap and ranking. SDN open source: Open source licensing issues – OpenFlow source code – Switch implementation – Controller implementations – Orchestration and Network virtualization – Simulation, Testing and Tools – OpenStack – Applying SDN open source							CO3	
UNIT-IV	SDN in Data Center				Periods:12			
Data center definition – Data center demands – Tunneling technologies for the data center- Path technologies in the data center – SDN and shortest path complexity – Ethernet fabrics in the data center – SDN use cases in the data center – Open SDN versus Overlays in the data center – Real-world data center implementation							CO1, C04	
UNIT-V	SDN Environments and Applications				Periods: 12			
SDN in other environment: Wide area networks – Service provider and carrier networks – Campus networks – Hospitality networks – Mobile networks – Optical networks. SDN Applications: Reactive versus Proactive applications – A simple reactive Java application – Creating network virtualization tunnels – offloading flows in the data center – Access control for the campus – Traffic engineering for the service providers.							CO5	
Lecture Periods: 45		Tutoria IPeriods:-15		Practical Periods: -		Total Periods:60		
ReferenceBooks:								
1. Paul Goransson, Chuck Black AND Timothy Culver, "Software Defined Networks: A Comprehensive Approach", 2nd Edition, Morgan kaufmann, 2017.								
2. Bruce Davie, "Software-Defined Networks ", 1st Edition, Systems Approach LLC, 2021								
3. Thomas D. Nadeau, Ken Gray, "SDN: Software Defined Networks", 1st Edition, O'Reilly Media, 2013								

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
C01	2	1	2	2							3	3	
C02	2	1										3	2
C03	2		2	2								2	1
C04	2	2	2	2								2	2
C05	2	2	2	2							2	3	2

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT			Programme: B. Tech.					
Semester : VIII			CourseCategoryCode: HNC			SemesterExamType:-		
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P		CA	SE	TM
ITUH105	Seminar	-	-	-	2	100	0	100
Prerequisite								
Course Outcome	CO1	Carry out literature survey, understand state of art techniques.						
	CO2	Apply theoretical knowledge to real-world scenarios or case studies						
	CO3	Take initiative in exploring topics beyond the curriculum and developing self-directed research habits						
	CO4	Present complex ideas concisely and clearly						
The objective of the seminar is to enable the students to present a seminar on any chosen topic related to their field of study. The topic shall be chosen in consultation with the Faculty coordinators. The student will present a Seminar on a topic in an emerging area in his/her discipline of Engineering. The student will make the presentation for duration of 20 to 25 minutes and also submit a brief report on the seminar topic for the purpose of evaluation. A departmental committee shall evaluate the performance of the students								CO1, CO2, CO3, CO4
Lecture Periods:		Tutorial Periods: -		Practical Periods: -		Total Periods:		

CO -PO/PSO MAPPING

CO/PO	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
CO1	2	2	3									2	2
CO2									3			2	3
CO3	2		3									2	2
CO4	3	3	3	3					2		2	2	3

Score: 3 – High; 2 – Medium; 1 – Low

Annexure II

Syllabi of the *Ancillary Stream Elective Courses* offered by the Department of Information Technology

**Ancillary stream title: Data Science (for Other
Department students)**

Department: IT			Programme: B.Tech						
Semester : IV			CourseCategoryCode: ANC			SemesterExamType: TY			
Course Code	Course Name		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUN101	Data structures and Algorithms		3	-	-	3	40	60	100
Prerequisite:									
Course Outcome	CO1	Learn to solve problems requiring sorting or searching using suitable algorithm							
	CO2	Design Linear data structures and their operations for known applications							
	CO3	Design Linear data structures and their operations for known applications							
	CO4	Learn the various algorithm design and time complexity analysis methods and employ suitable methods for applications							
UNIT– I	Sorting and SearchingTechniques					Periods:9			
Sorting algorithms – Insertion sort- selection sort – shell sort – bubble sort – quick sort – heap sort- merge sort – radix sort – searching – linear search – binary search.								CO1	
UNIT-II	Stacks and Queues					Periods:9			
Stack ADT – operations - implementation – application: expression evaluation Queue ADT – operations – implementation – application – priority queue								CO2	
UNIT-III	Trees and Graphs					Periods:9			
Binary tree – traversal methods – application – binary search tree-Graph – traversal methods – Dijkstra’s algorithm - application								CO3	
UNIT-IV	Algorithm analysis					Periods:9			
Introduction: Algorithm – efficiency of algorithms – best, worst and average case analysis – the order of – asymptotic notations –solving recurrences – homogeneous recurrences – inhomogeneous recurrences								CO4	
UNIT-V	Algorithm design					Periods:9			
Strassen’s Matrix multiplication –Greedy Knapsack problem solution – N queen’s problem – all pairs shortest path algorithm								CO4	
LecturePeriods:45		Tutorial Periods:-		Practical Periods:-		Total Periods:45			
ReferenceBooks:									
1. Sharika.T.R, WillsonJoseph.C and Reshma.M.R, A guide to data structures and algorithms, Notion Press, 2024									
2. Narasimha Karumanchi, Data Structures and Algorithms made easy, Career monk Publications, 2023									
3. Vijayalakshmipai G.A, —Data Structures and Algorithms: Concepts Techniques and Applications, McGraw Hill, 2009									
4. ReemaThareja, “Data Structures using C”, Oxford University Press, 2011.									
5. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, —Fundamentals of Computer Algorithms, Second Edition, Universities Press, 2011.									
6. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.									

CO-PO / PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	1	1	1	1									
CO2	2	1	1	1									
CO3	2	1	1	1									
CO4	2	1	1	1									

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT		Programme:B.Tech.						
Semester :V		CourseCategoryCode:ANC				SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
ITUN102	Database Systems	3	-	-	3	40	60	100
Prerequisite	Basics of Computers							
CO1	Understand the basic concepts database and its design principles							
CO2	Understand various Key Constraints and design ER diagram							
CO3	Formulate solutions to a broad range of query and data update problems using SQL							
CO4	Master in SQL queries using advanced operators and concepts							
CO5	Apply concurrency control & recovery mechanism for database problems							
UNIT-I	Introduction to Database				Periods:9			
Introduction to Database Systems: Overview – Difference between Data and Information, Database, Database Management System, Characteristics of Database Management System- Relational Database Management System, Components of DBMS- Data Models- Database System Architecture- Types of Database Architecture- Types of Database System Architectures								CO1
UNIT-II	Entity- Relationship Model				Periods:9			
Basic Concepts – Basic Concepts of ER Model in DBMS– Entity, Types of Attributes, Data Model Keys- Keys Constraints – Design Issues – Entity Relationship Diagram: Components of ER Diagram –Entity Relationship1:1, 1: N, N:1, N:M- Entity Sets – Design of E-R Database Schema.								CO2, CO3
Case study: ER Modelling for mini project								
UNIT-III	Introduction to SQL				Periods:9			
SQL: Data-Definition language SQL Command, DML: Data Manipulation Language, DCL: Data Control Language, TCL: Transaction Control Language, Basic Query Structure: Create Table Command, commonly used datatypes, INSERT, Alter, Drop, UPDATE, Rename, DELETE and Data manipulation.								CO2, CO3
Integrity Constraints: NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK and DEFAULT Column level constraints- Table level constraints.								
UNIT-IV	Advance SQL				Periods:9			
Create Table with Relationship –Select, Where Clause, Arithmetic Operators using WHERE clause, Behavior of Foreign Key Column on Delete-Set Operations using SQL, Aggregate Functions, String operation, Alias operation, Null Values – Nested Sub-Queries.								CO3, CO4
UNIT-V	Transaction Management and Concurrency				Periods:9			
Storage Management- Storage Structure – Transaction Management: Transaction Processing, ACID Properties–Concurrency Control- Failure Classification – Recovery System: Recovery and Atomicity.								CO4, CO5
Lecture Periods:45		Tutorial Periods:-		Practical Periods:-		Total Periods:45		
References								
1. AviSilberschatz, Henry F. Korth, S. Sudarshan “Database System Concepts”, 7th Edition, March 5, 2019.								
2. RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, Global Edition, 2016								
3. C.J. Date, “An Introduction to Database Systems”, 8thEdition,Jun 24, 2019								
4. Hugh Darwen, “Introduction to Relational Database Theory”, 3rd edition, 2012.								
5. Oracle Sql and PL/SQL User Manual 2024								

CO-PO / PSO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	0	-	0	0	-	0	0	1	1
CO2	2	3	0	-	0	0	-	0	2	3	2
CO3	2	3	3	-	1	3	2	0	2	3	2
CO4	2	3	3	-	3	3	1	3	3	3	3
CO5	2	3	1	-	2	3	3	3	3	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT				Programme: B.Tech						
Semester :VI				CourseCategoryCode:ANC			SemesterExamType: TY			
CourseCode	Course Name			Periods/Week			Credit		MaximumMarks	
				L	T	P	C	CA	SE	TM
ITUN103	Applied Data Science using Python			3	-	-	3	40	60	100
Prerequisite:		-								
Course Outcome	CO1	Apply Interactive Computing with Python								
	CO2	Utilize NumPy for Handling Structured Data								
	CO3	Handle Missing Data Effectively								
	CO4	Implement Statistical and Distribution-Based Visualizations								
	CO5	Implement Learning Algorithms								
UNIT-I		Essential Python &IPython					Periods: 9			
Introduction to Python for Data Science, Essential Python Libraries, Built-in Data Structures,Functions& File Handling in Python, Launching and Using Jupyter Notebook &IPythonShell,Help& Documentation in Python, Keyboard Shortcuts in Jupyter Notebook, IPython Magic Commands, Input & Output History, IPython& Shell Commands.										CO1
UNIT-II		Introduction to NumPy					Periods: 9			
Understanding Data Types in Python, NumPy Basics: Creating Arrays, Array Indexing, Slicing, Reshaping & Broadcasting, Computation on NumPy Arrays: Universal Functions (ufuncs), Aggregations: Min, Max, Mean, Standard Deviation, Element-wise Computation, Comparisons, Masks, and Boolean Logic in NumPy, Fancy Indexing & Sorting Arrays, Structured Data with NumPy Arrays.										CO2
UNIT-III		Data Manipulation with Pandas					Periods: 9			
Introduction to Pandas: DataFrames& Series, Data Indexing & Selection, Applying Functions & Operations on Data, Handling Missing Data: Filling, Interpolation, Dropping Null Values, Hierarchical Indexing, Combining Datasets: Concatenation & Append, Merge & Join Operations, Aggregation & Grouping, Pivot Tables &Vectorized String Operations.										CO3
UNIT-IV		Data visualization with Matplotlib & Seaborn					Periods: 9			
Introduction to Matplotlib: Line & Scatter Plots, Customizing Plots: Labels, Titles, and Annotations, Histograms, Binnings, and Density Plots, Bar Plots & Pie Charts, Heatmaps & Correlation Matrices, Customizing Legends &Colorbars, Multiple Subplots & Grid-Based Layouts, 3D Plotting in Matplotlib, Seaborn for Advanced Data Visualization.										CO4
UNIT-V		Introduction to Machine Learning with Scikit-Learn					Periods: 9			
Understanding the Machine Learning Workflow, Data Preprocessing & Feature Engineering, Hyperparameter Tuning & Model Validation, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Principal Component Analysis (PCA), Hands-on ML Projects & Case Studies.										CO5
LecturePeriods: 45			TutorialPeriods:-		PracticalPeriods:-			TotalPeriods:45		
ReferenceBooks:										

1. VanderPlas, Jake. Python Data Science Handbook: Tools and Techniques for Developers. 2nd ed. Sebastopol, CA: O'Reilly Media, 2022.
2. McKinney, Wes. Python for data analysis: Data wrangling with pandas, numpy, and jupyter. " O'Reilly Media, Inc.", 2022.
3. Harrison, Matt. Effective Pandas: Patterns for Data Manipulation. Matt Harrison, 2021.
4. Dale, K., 2022. Data Visualization with Python and JavaScript: Scrape, Clean, Explore, and Transform Your Data. " O'Reilly Media, Inc.".
5. Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: 3rd Edition. 3rd ed. O'Reilly Media, 2022.

CO-PO / PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	2	2	3	2	-	-	-	-	-	1	3	1
CO2	2	2	3	3	2	-	-	-	-	-	1	3	2
CO3	2	3	3	3	2	-	-	-	-	-	2	3	3
CO4	2	2	3	3	2	-	-	-	-	-	2	3	3
CO5	2	2	3	3	2	-	-	-	-	-	2	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT			Programme: B.Tech.						
Semester :VII			CourseCategoryCode:ANC			SemesterExamType: TY			
CourseCode	Course Name		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUN104	Introduction to Machine Learning		3	-	-	3	40	60	100
Prerequisite:			-						
Course Outcome	CO1	Learn the basics of artificial neurons, discrete and continuous data for machine learning-							
	CO2	Understand the working principles of ANN with its layers and activation functions -							
	CO3	Understand the working of supervised and unsupervised learning algorithms							
	CO4	Compare various machine learning algorithms with discrete and continuous data sets. -							
	CO5	Apply various machine learning algorithms in multi-disciplinary fields							
UNIT-I	Introduction					Periods: 9			
Introduction – Types of learning – Supervised Learning – Unsupervised Learning – Reinforcement Learning – Learning Bias - Learning performance – Designing a Learning System – Data – Feature Selection – Model Selection – Learning – Evaluation – Density Estimation.									CO1
UNIT-II	Feed-Forward Networks					Periods: 9			
Neural Network Graphs – weight initialization; activation functions: linear – stair-step – piecewise-linear – smooth functions; Back propagation - a tiny neural network – the learning rate; Optimizers: error as geometry – adjusting the learning rate – updating strategies – gradient descent variations.									CO2
UNIT-III	Supervised Learning					Periods: 9			
Regression – Linear Regression – Non-linear Regression - Logistic Regression - Gradient-descent – Decision Trees - Classification – k-Nearest Neighbours (KNN) – Support Vector Machines (SVMs) – Decision Trees: building trees – splitting nodes – controlling overfitting - Naïve Bayes - Discriminant Analysis.									CO3, CO4
UNIT-IV	Unsupervised Learning					Periods: 9			
Clustering – Similarity / Dissimilarity analysis - K-means – Hierarchical - Noise Reduction - Dimensionality Reduction – Principal Component Analysis – Gaussian Mixture - Hidden Markov Models - Ensemble methods: voting – bagging – random forests – extra trees – boosting – Adaboost.									CO3,CO4
UNIT-V	Recent trends in Machine Learning					Periods: 9			
Medical Imaging – Speech Recognition – Credit Scoring – Electricity load forecasting – Algorithmic trading – Gene sequence analysis – Market Research – Object Recognition – Gambling – IoT applications - Review of NLU – Introduction to Transformers – Large Language Models – Gen AI – Explainable AI - ChatGPT – Meta AI – Copilot – Deepseek.									CO5
LecturePeriods:45			TutorialPeriods: -		PracticalPeriods: -			TotalPeriods: 45	
ReferenceBooks:									
1. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing Company, 2020.									
2. Vivienne Sze, Yu-Hsin Chen, Tien-Ju Yang and Joel S. Emer, “Efficient Processing of Deep Neural Networks” Morgan and Claypool, California, 2020.									
3. Jason Brownlee, Machine Learning Mastery with Python, 2016.									
4. Andrew Glassner, Deep Learning: From Basics to Practice, Volume 1, The Imaginary Institute, Seattle, WA, 2018.									
5. Judith Hurwitz and Daniel Kirsch, Machine Learning, IBM Ltd. Edn., 2018.									

CO-PO / PSO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2

Score: 3 – High; 2 – Medium; 1 – Low

**Ancillary stream: Information Technology
Essentials
(for Other Department students)**

Department: IT			Programme: B.Tech					
Semester : IV			CourseCategoryCode:ANC			SemesterExamType: TY		
Course Code	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUN101	Data structures and Algorithms	3	-	-	3	40	60	100
Prerequisite:								
Course Outcome	CO1	Learn to solve problems requiring sorting or searching using suitable algorithm						
	CO2	Design Linear data structures and their operations for known applications						
	CO3	Design Linear data structures and their operations for known applications						
	CO4	Learn the various algorithm design and time complexity analysis methods and employ suitable methods for applications						
UNIT– I	Sorting and SearchingTechniques				Periods:9			
Sorting algorithms – Insertion sort- selection sort – shell sort – bubble sort – quick sort – heap sort- merge sort – radix sort – searching – linear search – binary search.					CO1 CO4			
UNIT-II	Stacks and Queues				Periods:9			
Stack ADT – operations - implementation – application: expression evaluation Queue ADT – operations – implementation – application – priority queue					CO2 CO4			
UNIT-III	Trees and Graphs				Periods:9			
Binary tree – traversal methods – application – binary search tree Graph – traversal methods – Dijkstra’s algorithm - application					CO3 CO4			
UNIT-IV	Algorithm analysis				Periods:9			
Introduction: Algorithm – efficiency of algorithms – best, worst and average case analysis – the order of – asymptotic notations –solving recurrences – homogeneous recurrences – inhomogeneous recurrences					CO4			
UNIT-V	Algorithm design				Periods:9			
Strassen’s Matrix multiplication –Greedy Knapsack problem solution – N queen’s problem – all pairs shortest path algorithm					CO4			
Lecture Periods:45		Tutorial Periods:-		Practical Periods:-		Total Periods:45		
ReferenceBooks:								
1. Sharika.T.R, WillsonJoseph.C and Reshma.M.R, A guide to data structures and algorithms, Notion Press, 2024 2. Narasimha Karumanchi, Data Structures and Algorithms made easy, Careermonk Publications, 2023 3. Vijayalakshmpai G.A, —Data Structures and Algorithms: Concepts Techniques and Applications, McGraw Hill, 2009 4. ReemaThareja, “Data Structures using C”, Oxford University Press, 2011. 5. Ellis Horowitz, Sartaj Sahni and Sangutheva rRajasekaran, —Fundamentals of Computer Algorithms, Second Edition, Universities Press, 2011. 6. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.								

CO-PO / PSO MAPPING

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	1	1	1	1									
CO2	2	1	1	1									
CO3	2	1	1	1									
CO4	2	1	1	1									

Score: 3 – High; 2 – Medium; 1 – Low

Department : IT			Programme :B.Tech.							
Semester : V			Course Category Code: ANC				Semester Exam Type: TY			
Course Code	Course Name	Periods / Week				Credit	Maximum Marks			
		L	T	P	C	CA	SE	TM		
ITUN105	Java and Internet Programming	3	-	-	3	40	60	100		
Prerequisite:										
Course Outcome	CO1	Understand the basics of Java Programming								
	CO2	Apply threads, packages and Interfaces in Object Oriented programming								
	CO3	Understand HTML programming and Java script								
	CO4	Apply Extended Web Programming								
	CO5	Learn Advanced Web Programming								
UNIT-I	Introduction to Java					Periods: 9				
Introduction to Object Oriented Programming – Java on the Internet – Multithreading and Persistence – Java keywords and flow control – Garbage collection – packages- Final declaration – Interfaces and inner classes – Java I/O classes – Run time type identification.							CO1			
UNIT-II	Threads, Interfaces and Packages					Periods: 9				
Concepts of Multithreading, differences between process and thread, thread life cycle ,creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups Creating and Accessing a Package, Understanding CLASSPATH, importing Packages. Interfaces: Multiple inheritance.							CO2			
UNIT-III	Introduction to HTML programming and Java script.					Periods: 9				
Foundations for Internet Programming: An overview of Internet Programming - WWW -HTML – forms – frames – tables – web page design - JavaScript introduction – control structures – functions – arrays – objects – simple web applications.							CO1,CO3			
UNIT-IV	Extended Web Programming					Periods: 9				
Dynamic HTML – introduction – cascading style sheets – object model and collections –event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data - XML.							CO4,CO5			
UNIT-V	Advanced Web Programming.					Periods: 9				
Servlets communication – Interactive Java Servlets – Deployment of simple servlets – web server (Java web server / Tomcat / Web logic) – HTTP GET and POST requests – session tracking – cookies – JDBC – simple web applications – multi-tier applications.							CO1,CO5			
Lecture Periods: 45		Tutorial Periods:		Practical Periods:			Total Periods:45			
Reference Books:										
1. Deitel, Deitel and Nieto, Internet and World Wide Web – How to program , Pearson Education Publishers, 2012.										
2. E. Balagurusamy , “Programming with Java”, 7th Edition , Paperback, 12 November 2023										
3. R. Krishnamoorthy& S.Prabhu, “Internet and Java Programming , New Age International Publishers, 2012.										
4. Thomno A. Powell, The Complete Reference HTML and XHTML, fourth edition, Tata McGraw Hill, 2003.										
5. Naughton, The Complete Reference – Java2, Tata McGraw-Hill, 3rd edition, 1999.										

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PS02
CO1	2	2	2	3							1	3	2
CO2	2	3	3	3							1	3	1
CO3	2	2	2	3							2	2	3
CO4	2	2	2	3							2	2	2
CO5	2	2	2	3							2	2	2

Department:IT			Programme: B.Tech						
Semester :VI			CourseCategoryCode: ANC			SemesterExamType: TY			
CourseCode	CourseName		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CA	SE	TM
ITUN106	IoT and Python Programming		3	-	-	3	40	60	100
Prerequisite:									
Course Outcome	CO1	Understand the basics of IoT							
	CO2	Apply Data Analytics tools in various IoT applications							
	CO3	Develop Python programs for simple to complex problems							
	CO4	Apply Python modules and packages for IoT solutions							
	CO5	Develop Python programs using advanced constructs and files with exception handling							
UNIT-I	IoT Concepts					Periods:9			
Definition, Architecture of IoT , Enabling technologies: Sensors - Actuators - WSN - Embedded Systems - Cloud computing –Bigdata analytics, IoTPrototyping platforms: Arduino - Raspberry Pi - Nodemcu, Applications of IoT.								CO1 CO4	
UNIT-II	IoT Data Analytics and Security					Periods:9			
Role of Data analytics in IoT, Challenges, Data retrieval and visualization, Tools: Thingspeak— Datadog Security:Threats-Vulnerability—Risks-IoTAttacksandCountermeasures-Attacktrees-Faulttrees-CPSattacks								CO1 CO2	
UNIT-III	Introduction to Python					Periods:9			
Data types- variables, expressions, statements, tuple assignment, precedence of operators- Conditionals:Booleanvaluesandoperators,conditional(if),alternative(if-else),chainedconditional(if-elif-else);Iteration:state,while,for,break,continue,pass;Fruitfulfunctions:returnvalues,parameters,localandglobalscope,functioncomposition,recursion								CO3 CO5	
UNIT-IV	Advanced Constructs					Periods:9			
Strings: stringslices, immutability, string functions and methods, stringmodule; 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 listprocessing- list comprehension Lists as arrays.								CO5	
UNIT-V	Files and Exception Handling					Periods: 9			
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules,packages								CO5	
Lecture Periods: 45			Tutorial Periods: -		Practical Periods: -		Total Periods: 45		
Reference ooks:									
1. RajKamal,“Internet of Things: Architecture and Design Principles”,2 nd Edition, McGrawHill Education, 2022									
2. PethuruRaj and Anupama C.Raman, "The Internet of Things: Enabling Technologies, Platforms, and UseCases", CRC Press, United States, 2017.									
3. Arshdeep Bahga and Vijay Madiseti, " Internet of Things: A Hands- on Approach", Universities Press(India), Hyderabad, 2014.									
4. Rob Mastrodomenico, “The Python Book”, Wiley, 2022.									
5. Martin C.Brown,Python: The Complete Reference, Fourth edition, McGrawHill, USA,2018.									
6. Ashok NamdevKamthane and Amit Ashok Kamthane, Programming and problem solving with python, Mc Graw Hill, 2018.									

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	-	-	-	1	-	-	-	-	-	-	-
CO2	2	3	1	3	2	-	-	-	-	-	-
CO3	3	3	1	3	-	-	-	-	-	-	-
CO4	2	3	1	3	-	-	-	-	-	-	-
CO5	3	2	1	2	-	-	-	-	-	-	-

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT			Programme: B.Tech						
Semester :VII			CourseCategoryCode: ANC				SemesterExamType : TY		
Course Code	Course Name		Periods/Week			Credit	MaximumMarks 100		
			L	T	P	C	CA	SE	TM
ITUN107	Web Design and Development		3	-	-	3	40	60	100
Prerequisite:			-						
Course Outcome	CO1	Understand the Website basics and its technologies							
	CO2	Learn to design client side using HTML and Javascript							
	CO3	Compare Servlets and Javascript for designing web tier							
	CO4	Familiarize with the different back-end designs							
	CO5	Design and deploy simple web-applications.							
UNIT-I	Website Basics					Periods:9			
Internet Overview - Fundamental computer network concepts - Web Protocols -URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-sidescripting.								CO1	
UNIT-II	Web Designing					Periods:9			
HTML – Form Elements - Input types and Media elements - CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.								CO1,CO2	
UNIT-III	Client Side Processing and Scripting					Periods:9			
JavaScript Introduction – Variables and Data Types-Statements – Operators - Literals-Functions - Objects- Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Validation - JavaScript Debuggers.								CO1,CO5	
UNIT-IV	Servlets					Periods:9			
Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions -Sessions – Cookies								CO1, CO3,CO5	
UNIT-V	Database Connectivity					Periods:9			
Database connectivity – JDBC - Creation of simple interactive applications - Simple database applications.								CO1,CO4,	
LecturePeriods:45		TutorialPeriods:		PracticalPeriods:				TotalPeriods:45	
ReferenceBooks:									
1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reillypublishers, 2014.									
2. Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet & World Wide Web - How to Program”, 5 th edition, Pearson Education, 2012.									
3. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.									
4. Nicky Huys, “Web Design for Beginners”, Sixth Edition, Google ebook,2024.									
5. Fritz Schneider, Thomas Powell, “JavaScript – The Complete Reference”, 3rd Edition, McGraw HillPublishers, 2017.									
6. Bates, “Developing Web Applications”, Wiley Publishers, 2006									

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	2	2	2	----	3	-	-	-	-	-	3	-	-
CO2	2	3	3	----	3	-	-	-	-	-	3	-	-
CO3	2	3	3	----	3	-	-	-	-	-	3	-	-
CO4	2	3	3	----	3	-	-	-	-	-	3	-	-
CO5	2	3	3	----	3	-	-	-	-	-	3	-	-

Score: 3 – High; 2 – Medium; 1 – Low

**Ancillary stream title: Business Analytics
(Inter Departmental Electives - for IT Department
students)**

Department:IT		Programme: B.Tech						
Semester :IV		CourseCategoryCode:ANC				SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUI101	Digital Marketing	3	-	-	3	40	60	100
Prerequisite:		-						
Course Outcome	CO1	Assess the Benefits and Opportunities of Digital Marketing						
	CO2	Analyze the Importance of SEO for Business Websites						
	CO3	Develop and Implement Effective Email Marketing Campaigns:						
	CO4	Optimize Business Profiles on Various Social Media Platforms:						
	CO5	Evaluate Emerging Trends in Digital Marketing						
UNIT-I	Introduction to Digital Marketing				Periods: 9			
What is Digital Marketing, Types of Digital Marketing, Differences Between Traditional and Digital Marketing, Importance & Scope of Digital Marketing, Elements of Marketing, Benefits & Opportunities, Content Marketing Overview,Application in Various Sectors.							CO1	
UNIT-II	Search Engine Marketing (SEM)&Search Engine Optimization (SEO)				Periods: 9			
Introduction to SEM& SEO, Importance of SEO for Business Websites, SEO Key Concepts, SEO Advantages & Disadvantages, Search Engine Marketing (SEM).							CO2	
UNIT-III	Email Marketing & Content Marketing				Periods: 9			
Introduction to Email Marketing & Content Marketing,Email Marketing Elements, Content Marketing Strategies,Introduction to Digital Display Advertising,Overview of Google Ads & Programmatic Advertising							CO3	
UNIT-IV	Social Media Marketing (SMM) & Social Media Optimisation				Periods: 9			
Understanding Different Social Media Setting Up Business Profiles & Pages, Content Strategy for Social Media, Impact of Social Media on SEO, Importance of Landing Pages & Conversion Optimization, Social Media Advertising.							CO4	
UNIT-V	Design Essentials & E-Commerce Management				Periods: 9			
Overview of Design Elements in Digital Marketing,Tools for Branding & Visual Desig,Introduction to E-Commerce &Marketplaces,Design Principles & Cultural Differences in Online Marketing, Marketing Automation & CRM Tools,Emerging Trends in Digital Marketing.							CO5	
Lecture Periods: 45		Tutorial Periods:		Practical Periods:		Total Periods: 45		
Reference Books:								
1. Ryan Deiss & Russ Henneberry – Digital Marketing for Dummies, 3rd Edition (2020)John Wiley & Sons, Inc.								
2. Adam Clarke – SEO 2023: Learn Search Engine Optimization with Smart Internet Marketing Strategies (2023)								
3. Brad Geddes – Advanced Google AdWords, 3rd Edition (2018)								
4. Ann Handley – Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content, 2nd Edition (2022)								
5. Chad S. White – Email Marketing Rules: A Step-by-Step Guide to the Best Practices that Power Email Marketing Success (2023)								
6. Neal Schaffer – The Age of Influence: The Power of Influencers to Elevate Your Brand (2020)								
7. Gary Vaynerchuk – Jab, Jab, Jab, Right Hook: How to Tell Your Story in a Noisy Social World (2018)								
8. Robert W. Bly – The Content Marketing Handbook (2021)								
9. Jason Miles – Instagram Power: Build Your Brand and Reach More Customers with the Power of Pictures, 2nd Edition (2019)								
10. Pradeep Kumar Thondapu – “The Bebinner’sGuige to SEO: Boost Four Website’s Visibility”. Kindle Edition 12 th Feb. 2024.								

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1		2	3	3	3			2	2	2		3	3
CO2		3	2	2	3			1	1			3	1
CO3		3	2	2	3			1	1			3	1
CO4		2	2	2	3			1	1	2		3	2
CO5		3	1	3	3			2	2	2		3	1

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester: V		CourseCategoryCode: ANC				SemesterExamType: TY		
CourseCode	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUI102	Business Process	3	-	-	3	40	60	100
Prerequisite:		-						
Course Outcome	CO1	Understand the importance of Business Process						
	CO2	Understand Business Process Platforms						
	CO3	Model Business Process						
	CO4	Organize Life Cycle of Business Process						
UNIT-I	Introduction				Periods: 9			
Introduction – Definition of Business Process- Need and Importance of Business Process – Examples of Business Process - Business Process Excellence.							CO1	
UNIT-II	Business Process Platforms				Periods: 9			
Business Process Platforms – Specification and Modeling of Business Process – Integration of Business and Production Process – Integration of Business Process and Business Intelligence.							CO1, CO2	
UNIT-III	Process Modeling				Periods: 9			
Global View of Business Process – Local View of Business Process – Business Process Modelling – Events in Business Process Modeling – Semantics of Events.							CO2	
UNIT-IV	Business Process Tools				Periods: 9			
Decomposing Business Process – Motivation – Seamless Business Process – Business Process Specification – Tools for Process Specific							CO3	
UNIT-V	Life Cycle of Business Process				Periods: 9			
Life Cycle of Business Process– Classification of Business Process - Workflow Management – Business Process Management –Definition – Application- Life Cycle of Business Process Management.							CO1, CO4	
Lecture Periods:45		Tutorial Periods:-		Practical Periods: -		Total Periods:45		
ReferenceBooks:								
1. Dumas, M.,LaRosa,M.,Mendling,J.,Reijers,“Fundamentals of Business Process”,2018. 2. Stiehl,Volker, “Process-Driven Applications with BPMN”,2014. 3. Brocke and Rosemann, Hand book on Business Process Management2Strategic Alignment, Governance, People and Culture, Springer, 2012								

CO-PO/PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	2	2	3	2	2	2	-	2	2
CO2	2	2	3	3	2	2	2	3	2	2	2	-	2	2
CO3	2	3	3	3	3	3	2	3	3	3	3	-	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	-	3	3

Score: 3 – High; 2 – Medium; 1 – Low

Department: IT		Programme: B.Tech						
Semester :VI		CourseCategoryCode:ANC				SemesterExamType: TY		
CourseCode	Course Name	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITUI103	Social Network analysis	3	-	-	3	40	60	100
Prerequisite:	-							
Course Outcome	CO1	Understand the Evolution and Development of the Semantic Web:						
	CO2	Analyze Ontological Representations of Social Entities and Relationships:.						
	CO3	Analyze the Evolution of Web Communities:						
	CO4	Assess Privacy Concerns in Online Social Networks:						
	CO5	Employ Visualization Techniques for Social Networks						
UNIT-I	Introduction				Periods: 9			
Introduction to Semantic Web- Development of Semantic Web - Statistical Properties of Social Networks- Definitions-Data Descriptions-Static Properties- Dynamic Properties- Development of Social Network Analysis –Electronic Sources for Network Analysis: Electronic Discussion Networks –Applications of Social Network Analysis.								CO1
UNIT-II	Modelling and knowledge representation				Periods: 9			
Ontology and its importance in Semantic Web: Ontology-based knowledge Representation - Ontology languages for Semantic Web: Resource Description Framework –Modelling social network data: Network Data Representation - Ontological Representation of Social Individuals-Ontological Representation of Social Relationships.								CO2
UNIT-III	Extraction and Mining communities in web Social networks				Periods: 9			
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures – Decentralizedonlinesocialnetworks-Multi-Relationalcharacterizationofdynamicsocial network communities.								CO3
UNIT-IV	Predicting Human Behaviour and Privacy Issues				Periods: 9			
Understanding human behaviour for social communities - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivityanalysis-Combiningtrustandreputation-Attackspectrumandcountermeasures.								CO4
UNIT-V	Visualization and applications of Social Networks				Periods: 9			
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations-MatrixandNode-LinkDiagrams-Collaborationnetworks-Co-Citationnetworks-Random Walk based Proximity Measures - Clustering with random walk based measures-Algorithms for Computing Personalized Page Rank and SimRank— Application-Computer Vision - Text Analysis -Collaborative Filtering								CO5
Lecture Periods: 45		Tutorial Periods:		Practical Periods:		Total Periods: 45		

Reference Books:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
3. Charu C. Aggarwal, "Social Network Data Analytics", Second Edition, Springer 2014.
4. David Camacho, Angel Gema Bello and Antonio, "The Four Dimensions of 55555555: An Overview of Research Methods, Applications, and Software Tools" Feb 2020.
5. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking — Techniques and applications", First Edition, Springer, 2011.
6. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

CO-PO/PSO MAPPING

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS01	PSO 2
CO1	2	2	2	3	2	-	-	-	-	-	1	3	1
CO2	2	2	3	3	2	-	-	-	-	-	1	2	1
CO3	2	3	3	3	2	-	-	-	-	-	2	3	1
CO4	2	2	3	3	2	-	-	-	-	-	2	3	1
CO5	2	2	3	3	2	-	-	-	-	-	2	3	1

Score: 3 – High; 2 – Medium; 1 – Low

Department:IT		Programme: B.Tech						
Semester :VII		CourseCategoryCode:ANC				SemesterExamType: TY		
CourseCode	CourseName	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CA	SE	TM
ITU104	Industry 4.0 with Industrial IoT	3	-	-	3	40	60	100
Prerequisite:	Computer Networks							
Course Outcome	CO1	Explore the basics of Industrial Internet of things						
	CO2	Understand various IoT Layers and their relative importance						
	CO3	Impart the knowledge of IIoT security layers						
	CO4	Realize the importance of Data analytics and Middleware protocols in IoT						
	CO5	Apply IIoT in real time Industrial applications						
UNIT-I	Introduction to Industrial IoT and Industry 4.0				Periods:9			
Introduction: Key IIoT Technologies- Intelligent Devices – Industrial Internet Use cases – Health care –Oil and Gas Industry– IoT Innovations in Retail. Industry 4.0: Defining Industry 4.0- Four Main Characteristics of Industry 4.0 - Industry 4.0 Design Principles - Building Blocks of Industry 4.0								CO1
UNIT-II	Technical and Business Innovators of Industrial Internet				Periods:9			
Miniaturization – Cyber Physical Systems – Wireless technology – IP Mobility – Network Functionality Virtualization – Cloud and Fog - Big Data and Analytics – M2M Learning and Artificial Intelligence								CO1, CO4
UNIT-III	Industrial IoT Reference Architecture				Periods:9			
IIoT Reference Architecture – Industrial Internet Architecture Framework – Five Functional domains – Three tier architecture topology – Connectivity: Key system characteristics, Connectivity security and functional characteristics – Functions of communication layer – Data Management								CO1,CO2
UNIT-IV	Designing Industrial Internet Systems and Middleware Software Patterns				Periods:9			
Concept of the IIoT -Proximity Network – WSN Edge Node – Legacy Industrial Protocols – Modern Communication Protocols – Wireless communication Technologies - Industrial Ethernet – Industrial Gateways								CO4
UNIT-V	Middleware Transport Protocols				Periods: 9			
TCP/IP, UDP, RTP, CoAP –Middleware Software patterns –Software Design patterns : MQTT-XMPP-AMQP-DDS – Delay tolerant Networks– Middleware IIoT platforms. Industrial IoT Security and Governance: Introduction – Security threats and vulnerabilities of IoT –Industrial IoT security architecture: IIoT architecture patterns – four Tier IIoT security model- Management risks with IIoT								CO3,CO4
LecturePeriods: 45		TutorialPeriods:-		PracticalPeriods: -		TotalPeriods:45		
ReferenceBooks:								
1. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things”, (Apress), 2017								
2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat“Industrial Internet of Things: Cyber manufacturing Systems” Springer, 2017								
3. Giacomo Veneri, Antonio Capasso, Packt “Hands-On Industrial Internet of Things: Create a powerful Industrial IoT” , 2018								

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1		1							2	2	2
CO2	3	2	1	2								3	3
CO3	3	2	1	2								3	3
CO4	2	1		1								2	2
CO5	3	2	1	2							2	3	3

Score: 3 – High; 2 – Medium; 1 – Low