

Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

NBA Accredited, NAAC Accredited with A+ Grade, ISO 21001:2018



DEPARTMENT OF INFORMATION TECHNOLOGY

Curriculum Structure and Syllabus of S.Y. B. Tech. – Information Technology

**(With effect from - Academic Year 2026 - 27)
(2025 Pattern)**

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
 - To imbibe the research culture for addressing industry and societal needs.
 - To inculcate social attitude through community engagement initiatives.
 - To provide conducive environment for building the entrepreneurial skills.

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VISION:

To nurture the wisdom of young minds through modern, qualitative and Interdisciplinary research-oriented education to become a successful IT Professional.

MISSION:

- M1:** Advancing knowledge through fundamental and applied research.
- M2:** To encourage students for Innovative development and higher studies.
- M3:** To motivate the crux of learners towards real time solutions.
- M4:** To prepare skillful engineers for industry to cater best in IT Enabled Services.
- M5:** To nourish a student's leadership skills by inculcating personal touch and respect in professional relationships.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- PEO1:** Graduates will develop a strong foundation in mathematics, science, and engineering Principles, enabling them to solve real-world technological problems in the field of Information Technology.
- PEO2:** Graduates will acquire the knowledge and technical skills necessary to design and Implement innovative IT solutions, fostering adaptability, analytical thinking, and entrepreneurial spirit.
- PEO3:** Graduates will demonstrate ethical responsibility, effective communication, teamwork and a commitment to continuous learning, enabling them to contribute meaningfully to Society and perform effectively in a global professional environment.

PROGRAM OUTCOMES (POs):

- 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 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, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

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- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling 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 (PSOs):

- PSO1:** Apply theoretical and practical knowledge of Information Technology to design, develop, and manage efficient information systems and interdisciplinary applications
- PSO2:** Analyze real-world problems, identify system requirements, and design appropriate IT infrastructure and solutions, particularly for large-scale and enterprise computing systems.
- PSO3:** Demonstrate understanding of professional, ethical, legal, and societal responsibilities in IT practices, along with business and security processes.
- PSO4:** Exhibit effective communication, teamwork, and decision-making skills using modern tools and technologies to perform responsibly in professional environments.

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LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Program Core Course
PEC	Program Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TW	Term Work
OR	Oral
PR	Project

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Second Year B. Tech. – Information Technology: Semester - III

Semester-III															
Course Code	Course Type	Course Name	Teaching Scheme (hrs./Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
25ITPC302	PCC	Data Structures	3	-	-	3	3	-	3	40	60	-	-	-	100
25ITPC302P	PCC	Data Structures Laboratory	-	4	-	4	-	2	2	-	-	-	25	-	25
25ITPC303	PCC	Operating Systems	2	-	-	2	2	-	2	40	60	-	-	-	100
25ITPC303P	PCC	Operating Systems Laboratory	-	2	-	2	-	1	1	-	-	-	-	25	25
25ITPC304	PCC	Object Oriented Programming	2	-	-	2	2	-	2	40	60	-	-	-	100
25ITMD301	MDM	Applied Mathematics	3	-	-	3	3	-	3	40	60	-	-	-	100
25ALOE301	OE	Open Elective - I #	2	-	-	2	2	-	2	-	-	50	-	50	100
25ITMC301	HSSM-MC	Digital Marketing and Social Media	1	-	1	2	1	1	2	-	-	25	-	-	25
25ITVS303	VSEC	Programming Lab-I	-	4	-	4	-	2	2	-	-	25	25	-	50
25ITCE301	CEP	Mini Project	-	2	-	2	-	1	1	-	-	25	-	-	25
25ITCC305	CC	Liberal Learning - III	-	2	-	2	-	1	1	-	-	25	-	-	25
25ITIN301	ELC - INT	Internship - I*	4 Weeks			-	-	2	2	-	-	25	-	-	25
Total			13	14	1	28	13	10	23	160	240	175	50	75	700

*After Sem II during vacation and evaluation is in sem III

Bhaugule

BoS Chairman



Adhikari

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Second Year B. Tech. – Information Technology: Semester - III

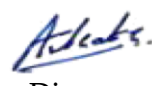
# - Select any one course from the given Open Elective Courses		
Course Code	Course Type	Open Elective - I
25ALOE301A	OEC	Digital Literacy and Applications
25ALOE301B		Environmental Studies
25ALOE301C		Green Energy and Sustainability
25ALOE301D		Basics of Consumer Electronics
25ALOE301E		Renewable Energy Systems

*** Liberal Learning – III: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25ITCC305A	Guitar	6.	25ITCC305F	Basketball
2.	25ITCC305B	Singing	7.	25ITCC305G	Cricket
3.	25ITCC305C	Cinematography	8.	25ITCC305H	Rifle and Pistol Shooting
4.	25ITCC305D	Dance	9.	25ITCC305I	Volleyball
5.	25ITCC305E	Synthesizer	10.	25ITCC305J	Football


BoS Chairman




Director
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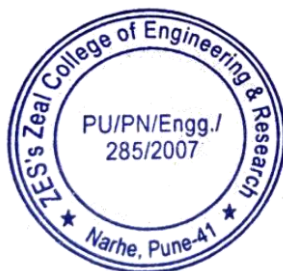
Second Year B. Tech. – Information Technology: Semester – IV

Semester-IV															
Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
25ITPC405	PCC	Database Management Systems	3	-	-	3	3	-	3	40	60	-	-	-	100
25ITPC405P	PCC	Database Management Systems Laboratory	-	2	-	2	-	1	1	-	-	-	25	-	25
25ITPC406	PCC	Software Engineering	3	-	-	3	3	-	3	40	60	-	-	-	100
25ITPC407	PCC	Computer Organization	2	-	-	2	2	-	2	40	60	-	-	-	100
25ITPC407P	PCC	Computer Organization Laboratory	-	2	-	2	-	1	1	-	-	-	-	25	25
25ITMD402	MDM	Discrete Mathematics	3	-	-	3	3	-	3	40	60	-	-	-	100
25ALOE402	OE	Open Elective - II #	2	-	-	2	2	-	2	-	-	50	-	50	100
25ITMC402	HSSM-MC	E-Commerce	1	-	1	2	1	1	2	-	-	25	-	-	25
25ITAE402	AEC	Quantitative Reasoning & Analysis	-	2	-	2	-	1	1	-	-	25	-	-	25
25ITVS404	VSEC	Programming Lab-II	-	4	-	4	-	2	2	-	-	25	25	-	50
25ITCC406	CC	Liberal Learning - IV	-	2	-	2	-	1	1	-	-	25	-	-	25
25ITIN402	ELC - INT	Internship - II*	4 Weeks				-	2	2	-	-	25	-	-	25
Total			14	12	1	27	14	09	23	160	240	175	50	75	700

*After Sem III during vacation and evaluation is in sem IV



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- Select any one course from the given Open Elective Courses

Course Code	Course Type	Open Elective - II
25ALOE402A	OEC	Cyber Security and Laws
25ALOE402B		Sustainability and Climate Change
25ALOE402C		Energy Audit and Electrical Safety
25ALOE402D		Digital Marketing
25ALOE402E		Entrepreneurship and Innovations

* Liberal Learning – IV: Choose any one from the following:

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25ITCC406A	Guitar	6.	25ITCC406F	Basketball
2.	25ITCC406B	Singing	7.	25ITCC406G	Cricket
3.	25ITCC406C	Cinematography	8.	25ITCC406H	Rifle and Pistol Shooting
4.	25ITCC406D	Dance	9.	25ITCC406I	Volleyball
5.	25ITCC406E	Synthesizer	10.	25ITCC406J	Football



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8	25ITMC402	E-Commerce	94
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SYLLABUS
SEMESTER - III

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Program: B. Tech. (Information Technology)							Semester: III		
Course: Data Structures							Code: 25ITPC302		
Teaching Scheme (Hrs./week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic knowledge of programming (preferably in C/C++), Understanding of control structures and functions									
Course Objectives:									
1. To understand and implement fundamental data structures and algorithms. 2. To develop problem-solving skills and algorithmic thinking. 3. To analyze time and space complexity for efficient code design. 4. To apply appropriate data structures for real-life applications.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand the basic concepts of data structures and algorithm design.								
CO2	Implement linear and nonlinear data structures using programming techniques.								
CO3	Apply stack, queue, linked list, and tree structures in various applications.								
CO4	Analyze and compare various searching and sorting algorithms.								
CO5	Design efficient algorithms using appropriate data structures.								
CO6	Evaluate the performance and complexity of algorithms.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Data Structures and Algorithms: Need and importance of data structures in problem-solving. Characteristics of a good algorithm. Difference between data types and data structures. Classification of data structures – linear and non-linear. Static vs dynamic data structures. Overview of Abstract Data Types (ADT) – List, Stack, Queue. Comparison between recursive and iterative approaches.								06
2.	Arrays and Linked Lists: Concept and representation of arrays, operations – insertion, deletion, traversal, and searching. Static vs dynamic memory allocation. Linked Lists – Singly, Doubly, and Circular. Implementation of linked lists, Applications of linked lists.								06

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Unit	Description	Duration (Hrs.)
3.	Stacks and Queues: Stack definition and operations – push, pop, peek. Implementation using arrays and linked lists. Applications – expression conversion, expression evaluation, and recursion handling. Queue definition and types – Simple Queue, Circular Queue, Priority Queue, Double-Ended Queue (Deque). Queue operations and their real-life applications like CPU scheduling and buffering.	07
4.	Trees: Basic terminology and representation of trees. Binary Tree – creation and traversals (inorder, preorder, postorder). Binary Search Tree – insertion, deletion, and search. Introduction to AVL Trees – need and rotations. Heap – Min Heap, Max Heap and Heap Sort. Applications of trees – expression trees, Huffman coding.	07
5.	Graphs: Introduction to graphs – definitions and terminologies. Representations – adjacency matrix and adjacency list. Graph traversal techniques – BFS and DFS. Minimum Spanning Tree – Prim's and Kruskal's algorithms. Dijkstra's algorithm for shortest path. Applications of graphs – routing, social networks, topological sorting.	07
6.	Introduction to Algorithms: Searching techniques – Linear and Binary Search (recursive and iterative). Sorting techniques – Bubble, Selection, Insertion, Merge, Quick, and Heap Sort. Comparison of sorting algorithms based on time and space complexity. Real-world usage of searching and sorting in databases and data processing.	06
TOTAL		39
Text Books:		
1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publications. 2. Reema Thareja, "Data Structures using C", Oxford University Press.		
Reference Books:		
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education. 2. Seymour Lipschutz, "Data Structures", Schaum's Outline Series.		
E-Resources:		
1. NPTEL Online Courses: https://nptel.ac.in 2. GeeksforGeeks: https://www.geeksforgeeks.org 3. Coursera – Data Structures: https://www.coursera.org		

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Program: B. Tech. (Information Technology)							Semester: III		
Course: Data Structures Laboratory							Code: 25ITPC302P		
Teaching Scheme (Hrs./week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	04	-	02	-	-	-	-	25	25
Prerequisites:									
Basic knowledge of programming (preferably in C/C++), Understanding of control structures and functions									
Course Objectives:									
1. To develop a fundamental understanding of the key concepts, principles, and techniques related to the course. 2. To enable students to apply the learned concepts and methods for solving practical and real-world problems. 3. To develop analytical, problem-solving, and critical-thinking skills through appropriate applications and case studies.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Implement fundamental data structures using C, C++, or Java.								
CO2	Apply data structures and algorithms to solve computational problems.								
CO3	Analyze the time and space complexity of algorithms.								
CO4	Implement searching, sorting, graph, tree, and heap algorithms.								
CO5	Develop interactive programs using appropriate data structures.								
CO6	Apply data structures and algorithms to develop a real-world mini project.								
List of Assignments: - (Perform Any 10 Practical's)									
1. Implement insertion, deletion, searching, and traversal on one-dimensional and two-dimensional arrays using C, C++, or Java. Accept dynamic input and provide user-friendly menus. Analyze time complexity for each operation. 2. Develop programs for singly, doubly, and circular linked lists. Perform insertion and deletion at various positions. Display elements and handle edge cases like underflow and overflow. 3. Implement stack using arrays and linked lists. Perform infix to postfix conversion and evaluate postfix expressions. Use stack to check balanced parentheses in expressions. 4. Implement simple queue, circular queue, and priority queue using arrays. Include operations for enqueue, dequeue, peek, and display. Simulate a basic scheduling system using queue. 5. Construct a BST and perform insertion, deletion, and traversal (inorder, preorder, postorder). Display the tree in a structured format. Highlight applications in searching and sorting systems. 6. Implement max heap and min heap. Perform heap sort using heapify and demonstrate sorting steps. Explain the role of heaps in priority-based task handling. 7. Use adjacency matrix or list to represent graphs. Implement BFS and DFS traversal. Provide input for directed and undirected graphs and display the visited sequence clearly.									

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8. Implement Dijkstra's algorithm to find the shortest path in a weighted graph. Accept graph input from the user and display step-wise output with distance table.
9. Implement and compare sorting algorithms: Bubble, Insertion, Merge, Quick, and Heap sort. Analyze and tabulate their performance based on time and number of comparisons for various inputs.
10. Implement linear and binary search algorithms (iterative and recursive). Perform complexity analysis. Accept unsorted and sorted input lists and demonstrate difference in performance.
11. **Choose any one case:**
 - a) Railway reservation system using linked list and queue
 - b) Syntax checker using stack
 - c) Graph-based social network connection mapApply one or more data structures to build a simplified prototype and document usage with code and explanation.
12. **Mini Project**

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education.
2. Seymour Lipschutz, "Data Structures", Schaum's Outline Series.

E-Resources:

1. NPTEL Online Courses: <https://nptel.ac.in>
2. GeeksforGeeks: <https://www.geeksforgeeks.org>
3. Coursera – Data Structures: <https://www.coursera.org>

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Program: B. Tech. (Information Technology)							Semester: III		
Course: Operating Systems							Code: 25ITPC303		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100
Prerequisites:									
1. Fundamentals of Computer Systems 2. Basic knowledge of C programming 3. Familiarity with command-line interfaces (optional but desirable)									
Course Objectives:									
1. To understand the fundamental concepts and design principles of operating systems. 2. To apply OS concepts practically through the Linux operating system. 3. To develop skills in Linux commands, shell scripting, and process handling. 4. To explore memory management, file systems, and system calls using Linux. 5. To gain hands-on experience with real-world Linux environments.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Describe the structure and functionalities of modern operating systems.								
CO2	Use Linux commands and shell scripts for performing system-level tasks.								
CO3	Apply concepts of process management and inter-process communication in Linux.								
CO4	Analyze and apply memory and file management strategies using Linux tools.								
CO5	Develop simple system-level programs using Linux APIs and system calls.								
CO6	Demonstrate practical skills in Linux system administration and automation.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Operating Systems and Linux: Types of operating systems and structures, Functions of an Operating System, Overview of Linux and its architecture, Linux installation, booting process, Basic Linux shell and command-line interface System Calls, Types of System Calls								04
2.	Commands and Shell Scripting: File handling, process commands, filters, Bash shell scripting: variables, loops, functions, Cron jobs, script automation, Text processing with awk, sed, grep								04

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3.	Process Management: Process Concept, Process states, Process control, Threads, Uniprocessor Scheduling: Types of scheduling: Pre-emptive, Non pre-emptive, Scheduling algorithms: FCFS, SJF, RR, Priority.	05
4.	Memory Management: Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, Virtual Memory, Paging. Segmentation, Demand paging and Page replacement policies. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection	04
5.	File System: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance, comparison of UNIX and windows.	05
6.	Input/output Management: Principles of I/O Hardware: I/O devices, Device controllers, Direct memory access. Principles of I/O Software: Goals of I/O Software, Interrupt handlers, Device drivers. Disks: Disk Hardware, RAID, Disk Arm Scheduling Algorithm.	04
TOTAL		26
Text Books:		
1. Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, "Operating System Concepts", Wiley 2. Richard Blum and Christine Bresnahan, "Linux Command Line and Shell Scripting Bible", Wiley		
Reference Books:		
1. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson 2. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", O'Reilly 3. W. Richard Stevens, "Advanced Programming in the UNIX Environment", Addison-Wesley		
E-Resources:		
1. https://linuxjourney.com – Free Linux learning platform 2. https://explainshell.com – Shell command explanations 3. https://man7.org – Linux manual and system programming guides 4. YouTube: "Linux Essentials" by The Linux Foundation 5. NPTEL Course: "Operating System Fundamentals" – by Prof. P. K. Biswas (IIT Kharagpur)		

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Program: B. Tech. (Information Technology)							Semester: III		
Course: Operating Systems Laboratory							Code: 25ITPC303P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Basic knowledge of C programming, computer fundamentals, and operating system concepts.									
Course Objectives:									
1. To develop practical knowledge of Linux operating system commands, file systems, permissions, and shell scripting. 2. To enable students to implement and analyze process, thread, memory, file, and inter-process communication concepts using C and Linux system calls. 3. To develop system administration and automation skills through shell scripts, process management, scheduling, monitoring, and practical Linux utilities.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Use Linux commands, file systems, permissions, and system utilities effectively.								
CO2	Develop shell scripts for automation, file management, backup, and system administration.								
CO3	Implement process creation, execution, signals, and inter-process communication using C and Linux system calls.								
CO4	Develop multithreaded programs using synchronization mechanisms such as mutexes and condition variables.								
CO5	Analyze and monitor Linux memory, processes, files, and system resources using appropriate utilities.								
CO6	Apply Linux programming and system administration concepts to automate and solve practical computing problems.								
List of Assignments: (Perform any 10 practical)									
1. Execute and demonstrate at least 20 basic Linux commands related to file handling, directory navigation, and user interaction. Include commands like ls, pwd, cd, mkdir, rm, cat, touch, chmod, chown, whoami, passwd, df, and du. 2. Explore and analyze the Linux file system hierarchy. Use ls -l, chmod, and stat to inspect and modify file permissions. Demonstrate effects for user, group, and others with examples. 3. Write shell scripts to: a) Calculate the factorial of a number using loops b) Display system information such as hostname, uptime, logged-in users, and disk usage 4. Create a shell script to back up a directory into a .tar.gz file. Schedule the task using cron jobs. Validate scheduled execution with timestamps or logs. 5. Use awk, sed, and grep for text processing: a) Extract valid email IDs from a file b) Replace specific text c) Filter logs with keywords like “error” or “warning”									

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6. Write a C program using fork (), exec(), and wait() to create a child process that runs a different program. Display parent and child process information.
7. Develop a multithreaded C program using pthread to simulate a producer-consumer problem with shared buffer. Use mutex locks and condition variables.
8. Write a C program to set up a custom signal handler for SIGINT or SIGTERM. On signal receipt, display a custom message and exit gracefully.
9. Write a program using shared memory (shmget(), shmat(), shmdt()) or mmap() to allow data exchange between processes. Demonstrate both read and write.
10. Analyze memory usage using /proc/meminfo, top, free, and vmstat. Capture observations under different system conditions.
11. Write a C program to copy file contents using system calls (open (), read (), write (), close ()). Also show how to modify file permissions and create symbolic and hard links.
12. Write automation shell scripts for basic system admin tasks:
 - a) Create multiple users and groups
 - b) Install packages using apt or rpm
 - c) Monitor disk usage and services using df, systemctl, journalctl

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson
2. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", O'Reilly
3. W. Richard Stevens, "Advanced Programming in the UNIX Environment", Addison-Wesley

E-Resources:

1. <https://linuxjourney.com> – Free Linux learning platform
2. <https://explainshell.com> – Shell command explanations
3. <https://man7.org> – Linux manual and system programming guides
4. YouTube: "Linux Essentials" by The Linux Foundation
5. NPTEL Course: "Operating System Fundamentals" – by Prof. P. K. Biswas (IIT Kharagpur)

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: III		
Course: Object Oriented Programming							Code: 25ITPC304		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic understanding of programming concepts, Familiarity with C or C++ programming languages									
Course Objectives:									
1. To understand the fundamental concepts of Object-Oriented Programming (OOP) and Java syntax									
2. To develop object-oriented applications using Java classes, inheritance, and polymorphism									
3. To implement exception handling, file I/O, and collections in Java									
4. To demonstrate the use of threads, GUI programming, and event handling									
5. To promote good design practices and modular programming									
Course Outcomes: After completion of this course, students will able to -									
CO1	Explain the principles and pillars of object-oriented programming in the context of Java								
CO2	Develop Java programs using classes, objects, constructors, and methods								
CO3	Apply concepts of inheritance, interfaces, and polymorphism to create reusable code								
CO4	Implement exception handling, multithreading, and file I/O in Java programs								
CO5	Utilize collections, generics, and packages for efficient program structure								
CO6	Design basic GUI applications using Java AWT and Swing components								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to OOP and Java Basics: Concept of object-oriented programming: abstraction, encapsulation, inheritance, and polymorphism. Introduction to Java: features, JVM, JDK, JRE. Java program structure, data types, variables, operators, control structures, arrays, and string handling.								06
2.	Encapsulation, Abstraction, and Boxing Concepts: Access specifiers and encapsulation in Java. Use of getter and setter methods. Concept of abstraction using abstract classes and interfaces. Differences between abstraction and encapsulation. Wrapper classes and the concept of boxing and unboxing in Java. Autoboxing with collections and method calls.								06
3.	Classes, Objects, and Constructors: Creating and using classes and objects. Method definition and overloading. Constructors and constructor overloading. Use of 'this' keyword, static members, static blocks and methods, memory management, garbage collection, finalize ().								07

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4.	Inheritance and Polymorphism: Types of inheritance (single, multilevel, hierarchical), method overriding, super keyword, dynamic method dispatch, use of final keyword. Interfaces and their implementation. Abstract classes vs interfaces. Polymorphism: compile-time and runtime.	07
5.	Exception Handling and File I/O: Types of exceptions – checked and unchecked. Try-catch-finally block, throw and throws keyword, custom exceptions. File handling using java.io and java.nio packages – reading/writing characters, bytes, and buffered streams.	07
6.	Multithreading, Collections, and GUI Programming: Multithreading: Thread class, thread lifecycle, thread methods, synchronization. Java Collections: List, Set, Map, Iterator, generics. GUI using AWT/Swing: Components, Layouts, Event handling, Adapter classes, simple GUI applications.	06
TOTAL		39
Text Books:		
1. Herbert Schildt, “Java: The Complete Reference”, McGraw Hill Education 2. E. Balagurusamy, “Programming with Java”, McGraw Hill Education		
Reference Books:		
1. Paul Deitel & Harvey Deitel, “Java: How to Program”, Pearson Education 2. Cay S. Horstmann, “Core Java Volume I–Fundamentals”, Pearson Education		
E-Resources:		
1. NPTEL Java Programming: https://nptel.ac.in/courses/106/105/106105191/ 2. Oracle Java Tutorials: https://docs.oracle.com/javase/tutorial/ 3. GeeksforGeeks – Java: https://www.geeksforgeeks.org/java/java/		

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: S.Y. B.Tech. (Information Technology)							Semester: III		
Course: Applied Mathematics							Code: 25ITMD301		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Calculus (differentiation, integration), basic ordinary differential equations of first order, fundamental algebra including an introductory probability and statistics concepts.									
Course Objectives:									
1.To familiarize the students with concepts and techniques in Ordinary differential equations, Statistical techniques, Probability theory, and transforms. 2.To equip them with the techniques to understand advanced-level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Solve higher order linear differential equation using appropriate techniques for modeling and analyzing the real-world problems raised in information Technology.								
CO2	Apply Fourier transform in image processing.								
CO3	Analyze the discrete signals using z-transform transform.								
CO4	Summarize and analyze the data using statistical tools like Moments, Skewness and Kurtosis, Correlation, Regression and Curve fitting.								
CO5	Use the concepts of Probability theory for analysis and prediction of a given data as applied to machine intelligence.								
CO6	Test the assumption using sampling theory and hypothesis testing.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Linear Differential Equations (LDE): Linear differential equation of nth order with constant coefficients, Method of Variation of Parameters, Applications of differential equations in Information Technology.								06
2.	Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their Inverses.								06
3.	Z - Transform (ZT): Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Solution of difference equations.								07

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4.	Statistics: Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Curve fitting by the method of least squares	07
5.	Probability: Definition and Theorems on Probability, Conditional Probability and Baye's Theorem, Mathematical Expectation, Discrete and Continuous probability distributions: Binomial, Poisson distribution, Normal (Gaussian) distribution	07
6.	Sampling Theory and Hypothesis Testing: Population and Sample, Sampling methods, Population parameters, Sample statistic, Central limit theorem, point estimate and Interval Estimates, confidence interval, standard error, Mean error. Hypothesis testing: Null and Alternate hypothesis, test of hypothesis, Type I and Type II errors, level of significance, p-value, chi- square test, t- test.	06
TOTAL		39
Text Books:		
1. B.S. Grewal, "Higher engineering Mathematics", Khanna publishers, Delhi (40th edition). 2. P. N. Wartikar & J. N. Wartikar, "Applied Mathematics". Volume I and II, Pune Vidyarthi Griha Prakashan, Pune. 3. B.V. Ramana, "Engineering Mathematics", Tata Mc Graw-Hill. 4. H. K. Das, "Higher Engineering Mathematics", S. Chand Publication.		
Reference Books:		
1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley Publications, 2015. 2. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning. 3. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier Academic Press 4. Miller & Freund's Probability and Statistics for Engineers by Richard A. Johnson.		
E-Resources:		
NPTEL Online Courses: 1. https://onlinecourses.nptel.ac.in/noc25_ma85 2. https://onlinecourses.nptel.ac.in/noc25_ma90		

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OPEN ELECTIVE - I
(Select any one course from the given Open
Elective Courses)

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)						Semester: III			
Course: Open Elective – I (Digital Literacy and Applications)						Code: 25ALOE301A			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Basic computer knowledge, Familiarity with using internet and mobile devices									
Course Objectives:									
1. To introduce students to fundamental digital skills and online applications. 2. To enhance understanding of modern information and communication technologies (ICT). 3. To develop practical skills in digital tools, online collaboration, and data management. 4. To promote safe, ethical, and effective use of technology in professional and personal life.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Demonstrate proficiency in using essential digital tools for everyday tasks.								
CO2	Apply safe and secure practices while using the internet and online services.								
CO3	Utilize online collaboration platforms for communication and teamwork.								
CO4	Develop simple digital content (documents, presentations, basic websites).								
CO5	Leverage emerging digital applications for academic, professional, and social needs.								
CO6	Create a simple web application and explain emerging technologies in everyday life.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Digital Literacy: Evolution of Digital Technology – Role of ICT in modern life – Hardware and Software basics – Overview of digital devices (Computers, Smartphones, Tablets) – Operating Systems and Applications.								04
2.	Internet and Web Fundamentals: Basics of Internet – Web Browsers – Search Engines – Online Communication Tools (Email, Chat, Video Conferencing) – Netiquette – Cloud Storage and File Sharing.								04
3.	Digital Tools for Productivity: Word Processing (MS Word/Google Docs) – Spreadsheet Fundamentals (MS Excel/Google Sheets) – Presentation Tools (PowerPoint/Canva) – Templates and Online Collaboration (Google Workspace, MS Teams).								05
4.	Cyber Safety and Digital Ethics: Online Security Threats – Password Management – Safe Browsing – Data Privacy – Cyberbullying – Digital Footprint – Intellectual Property Rights in the digital era.								05
5.	Social media and Online Applications: Role of social media in Communication – Online Professional Networking (LinkedIn) – Blogging and Content Sharing Platforms – Basics of Digital Marketing – E-Governance and Online Services (Banking, Payments, Education Portals).								04

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6.	Introduction to Web and Mobile Applications: Creating a Simple Blog/Portfolio Website (Using WordPress/Wix) – Overview of Mobile Apps for Education and Productivity – Emerging Technologies (Cloud Computing, IoT, AI) in everyday life.	04
TOTAL		26
Text Books:		
1. Pradeep K. Sinha, Priti Sinha, “Computer Fundamentals”, BPB Publications. 2. Rajaraman, “Fundamentals of Computers”, PHI Learning.		
Reference Books:		
1. Alan Evans, Kendall Martin, Mary Anne Poatsy, “Technology in Action”, Pearson Education. 2. Daniel Scott, “Digital Literacy Unpacked”, Facet Publishing.		
E-Resources:		
1. NPTEL: https://nptel.ac.in 2. Digital Literacy Course, Google: https://learndigital.withgoogle.com 3. Microsoft Learn: https://learn.microsoft.com 4. W3Schools Basics: https://www.w3schools.com		

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Environmental Studies)							Code: 25ALOE301B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Course Objectives:									
1. To understand the structure and functions of ecosystems and the importance of biodiversity. 2. To study advanced energy systems and their role in sustainable development. 3. To learn concepts of natural resource management and disaster management through case studies. 4. To understand sources, impacts, and control measures of environmental pollution and waste management. 5. To create awareness about global environmental issues and environmental toxicology. 6. To gain knowledge of environmental assessment, management systems, and pollution control tools.									
Course Outcomes: After the completion of course, students will be able to									
CO1	Understand the structure and functions of major ecosystems and the significance of biodiversity conservation								
CO2	Evaluate various advanced energy systems in terms of their merits, demerits, and global applications								
CO3	Apply concepts of natural resource management and disaster management using relevant case studies.								
CO4	Analyse the sources, impacts, and control measures of environmental pollution and waste management practices.								
CO5	Assess global environmental concerns and suggest sustainable solutions for issues like climate change and groundwater depletion.								
CO6	Utilize environmental management tools and prepare environmental impact assessments following legislative guidelines.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value, Hot-spots, Threats and Conservation of biodiversity, Forest Wealth and Deforestation.								05
2.	Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable mining, case studies, and Carbon Trading.								04
3.	Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Groundwater Pollution, Noise pollution, Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes, Solid waste, Hazardous wastes, E-wastes, Industrial and Municipal Sludge.								05

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4.	Global Environmental Concerns (Concept, policies and case studies): Groundwater depletion/recharging, Climate Change, Acid Rain, Ozone Depletion, Radon and Fluoride problem in drinking water, Resettlement and rehabilitation of people, Environmental Toxicology.	03
5.	Latest Developments in Environmental Pollution Mitigation Tools (Concept and applications): G.I.S. & Remote Sensing, Environmental Management Systems, ISO14001, Environmental Stewardship- NGOs.	04
6.	Environmental Assessment, Management and Legislation Aims and objectives of Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS). EIA Guidelines, Impact Assessment Methodologies, Procedure for reviewing EIA of developmental project, Life-cycle analysis, cost benefit analysis, Guidelines for Environmental Audit.	05
TOTAL		26
Text Books:		
1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., "Environmental Encyclopedia", Jaico Publications House, 1 st edition, 2000. 2. Agarwal, K.C, "Environmental Biology", Nidhi Publishers, 2 nd edition, 2008.		
Reference Books:		
1. Erach Bharucha, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., 1st Edition, 2002. 2. Brendan Gleeson and Nicholas Low (Eds.), "Global Ethics and Environment", Routledge, London, 1999. 3. Peter H. Gleick, "Water in Crisis", Pacific Institute for Studies in Development, Environment & Security, Stockholm Environment Institute, Oxford University Press, 1993. 4. Martha J. Groom, Gary K. Meffe, and Carl Ronald Carroll, "Principles of Conservation Biology", Sinauer Associates, Sunderland, 2006. 5. R. Edward Grumbine and M. K. Pandit, "Threats from India's Himalaya Dams", Science, Vol. 339, pp. 36–37, 2013. 6. Patrick McCully, "Rivers No More: The Environmental Effects of Dams", pp. 29–64, Zed Books, 1996.		
E-Resources:		
1. NPTEL video lecture on Environmental Impact Assessment :https://www.youtube.com/watch?v=iLdyhgFv1U 2. Sustainability Concepts - Innovations and Challenges : https://www.youtube.com/watch?v=A9PGRnkLubE&list=PLbRMhDVUMngd2-jPdQSk3QNBTF2n7FxXU&index=2 3. Natural Resources Management : https://www.youtube.com/watch?v=vsXv3anIBSU&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08 4. Biodiversity & conservation :https://www.youtube.com/watch?v=eJBfZGEzUfA&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08&index=9		

Course: Open Elective – II DEPARTMENT OF INFORMATION TECHNOLOGY 10023ALOE301C									
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Renewable energy, power generation technology									
Course Objectives:									
1. To study cleaner production and life cycle assessment. 2. To understand green fuels. 3. To learn green technology and green engineering. 4. To learn waste management. 5. To study sustainable technologies.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand green technology principles, green chemistry, and process intensification for sustainable industries.								
CO2	Evaluate the benefits, challenges, and environmental impact of green fuels compared to conventional fossil fuels.								
CO3	Apply cleaner production principles and life cycle assessment for sustainability.								
CO4	Assess waste types, audits, and management strategies with focus on health and environmental impact.								
CO5	Explain sustainable technologies considering ecological, economic, and social dimensions.								
CO6	Analyze practical challenges, case studies, and laws in implementing green technologies.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Principles of Green Technology and Green Engineering: Processes and products for green safe and economically acceptable to the society, green chemistry and Process intensification. Green Industrial Processes: Pollution statistics from various industries. A greener approach towards all these industries.								05
2.	Green Fuels: Definition of Green Fuels, their benefits and challenges, comparison of green fuels with conventional fossil fuels with reference to environmental, economic and social impacts, public policies and market driven initiatives, Biomass energy: Concept of biomass energy utilization, types of biomass.								05
3.	Cleaner Production: Definition, Importance, Principles of Cleaner Production and its Benefits, Role of industry, Clean development mechanism, Reuse, Recovery, Recycle, Raw material substitution- Wealth from waste. Role of CP in Achieving Sustainability, Benefits, Role of Industry, Government and Institutions, Environmental Management, Pollution Prevention and Cleaner Production								04

	Awareness Plan, Environmental Statement, Carbon credit, Carbon trading.	
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Introduction to Life Cycle Assessment (LCA) and Elements of LCA DEPARTMENT OF INFORMATION TECHNOLOGY		
	Waste Management:	
4.	Waste stream assessment (WSA), Waste generation and composition, Waste characteristics (physical and chemical), Waste audit, Health and Environmental effects (public health and environmental), Comparative assessment of waste generation and Composition of developing and developed nations, a case study results from an Indian city, Handouts on solid waste compositions. E-waste generation.	04
5.	Sustainable Technology: Understand the Sustainable Technology, Three principle dimensions: the ecological, the economic and the social dimension, including intergenerational justice; use a systems perspective, to describe sustainability challenges and possibilities for major technical systems and for their transformation to meet sustainability requirements.	04
6	Challenges and Practical Implementation: Responsibilities and potentials of companies for action. Green Productivity and emerging technologies. Implementation of the practical applications of Green emerging technologies and sustainable development. Case studies in Green Technology. Green laws compliance.	04
TOTAL		26
Text Books:		
1. Matlack A.S., “Introduction to Green Chemistry”, Marcel Dekker Publication. 2. Modak P., Visvanathan C. and Parasnis M., “Cleaner Production Audit Environmental System Reviews”, Asian Institute of Technology Publication. 3. Anastas P.T. and Warner J.C., “Green Chemistry: Theory and Practice”, Oxford University Press. 4. Bishop P. L., “Pollution Prevention: Fundamentals and Practice”, McGraw-Hill Publication, Boston. 5. Clark J.H. and Macquarie D.J., “Handbook of Green Chemistry and Technology”, Wiley Blackwell Publication.		
Reference Books:		
1. Sawyer C.N, McCarty P.L and Parkin G.F., “Chemistry for Environmental Engineering and Science”, 5 th ed. McGraw-Hill Professional Publication. 2. Paul L Bishop, “Pollution Prevention: Fundamentals and practice”, McGraw-Hill International Publication. 3. Das A. K, “Environmental Chemistry with Green Chemistry”, Books and Allied (P) Ltd. Publication. 4. V.K. Ahluwalia, “Green Chemistry Environmentally Benign Reactions”, springer publication. 5. V.K. Ahluwalia, Ane. “Green Chemistry: Environmentally Benign Reactions”, springer publication. 6. Mike Lancaster, “Green Chemistry: An Introductory Text”, Royal Society of Chemistry publication.		

E-Resources:

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| DEPARTMENT OF INFORMATION TECHNOLOGY |
| 1. NPTEL Course on “Energy Resources, Economics and Sustainability”, By Prof. Pratham Arora, IIT Roorkee, |

https://onlinecourses.nptel.ac.in/noc25_hs86/preview

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| 2. NPTEL Course on “Sustainable Energy Technology”, By Prof. Sayak Banerjee, IIT Hyderabad.
https://onlinecourses.nptel.ac.in/noc23_me138/preview |
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DEPARTMENT OF INFORMATION TECHNOLOGY							Semester: III		
Program: B. Tech in Information Technology									
Course: Open Elective – I (Basics of Consumer Electronics)							Code: 25ALOE301D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Basic understanding current, voltage, and electronics components									
Course Objectives:									
1. Understand principles and components of audio, video, and communication systems.									
2. Develop practical skills in installation, operation, and maintenance of electronics.									
3. Prepare students for technical roles in electronics service and support industry.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand the working principles and components of basic audio systems and home theatre setups.								
CO2	Explain the functioning of modern video display technologies and remote-control operations.								
CO3	Identify and describe the types, specifications, and working of projectors and CCTV systems.								
CO4	Describe satellite communication principles and DTH system setup and components.								
CO5	Explain the construction, working, and common issues in basic household appliances like washing machines, mixers, and induction cooktops.								
CO6	Understand the operation and features of kitchen and office equipment such as microwave ovens, printers, and scanners.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Audio Systems: Introduction to audio systems, Audio amplifier, Microphone, Loudspeaker, Public address system, DJ system: concept and components, Audio as Data and Signal, Digital Audio Processes: Time Compression & Expansion, Block diagram and working of home theatre system								05
2.	Video Systems and Display Technologies: Elements of TV communication system, Scanning process and its necessity, Comparison: CRT, LCD, and LED TVs, LCD and LED TV: principles and section-wise working, 3D TV: Basic working principle, IPS panels and features, Interfaces: HDMI, USB, RGB, etc., TV remote control: types, IR code transmission/reception, functions, faults								05
3.	Projectors and Surveillance Systems: LCD vs. LED Projectors: differences and specs, Working principle and faults in LED projectors, CCTV Cameras: types and specifications, CCTV setup and components, Digital Video Recorders: types and working								04

DEPARTMENT OF INFORMATION TECHNOLOGY		
	Satellite Communication and DTH Technology:	
4.	Basics of satellite communication, Merits, demerits, and applications, Satellite types, orbits, frequency bands, Components of DTH: PDA, LNBC, satellite receiver, dish alignment, Cable types, impedance, MDU design, Set Top Box: block diagram, features, I/O ports, Cable modem termination system, software, CPE	04
5.	Domestic Appliances – Part I: Washing Machines: types, parts, block diagrams, timers, motors, Vacuum Cleaner: block diagram, working, features, motors, circuits, Mixer/Grinder: parts, speed control, auto overload protection, Electric Iron & Steam Iron: principle, thermostat, parts, Water Purifiers: RO/UV principles, components, faults, Immersion Heater: working, insulation, Induction Cooktop: principle, tubes, heat sinking, fault identification	04
6.	Domestic Appliances – Part II and Office Equipment: Microwave Oven: types, block & wiring diagram, microwave generation, Food Processors: parts and working, Printers: dot matrix, inkjet, laser; advantages, disadvantages, connectivity, Digital Electronic Lock, Xerox Machine, Scanner, Fax Machine	04
TOTAL		26
Text Books:		
1. S. P. Bali, "Consumer Electronics", 1st Edition, Paperback, English. 2. B. R. Gupta, "Consumer Electronics", Paperback, English. 3. Dr. J. S. Chitode, "Consumer Electronics – A Conceptual Approach". 4. Douglas Kinney, "A Beginner's Guide to Consumer Electronics Repair: Handbook and Tutorial". 5. Anand, "Consumer Electronics". 6. H. Davidson, "Troubleshooting Consumer Electronics Audio Circuits".		
Reference Books:		
1. Dennis Roddy, "Satellite Communications", McGraw Hill. 2. R. G. Gupta, "Audio Video Systems – Principles, Maintenance and Troubleshooting", Tata McGraw-Hill. 3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press. 4. S. P. Sharma, "Appliance Servicing and Repair Guide", Katson Books		
E-Resources:		
1. Audio System Engineering (IIT Kharagpur), Course page: https://nptel.ac.in/courses/117/105/117105133 2. Satellite Communication & DTH NOC: Satellite Communication Systems (IIT Kharagpur) Course page: https://archive.nptel.ac.in/courses/117/105/117105131/		

Program: B. Tech. (Common to all Programs)						Semester: III			
Course: Open Elective – I (Renewable Energy Systems)						Code: 25ALOE301E			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Fundamentals of Mechanical Engineering, Physics, Thermodynamics									
Course Objectives:									
1. Discuss the global and national energy scenarios and environmental impacts and sustainability concerns associated with fossil fuel use. 2. Identify and explain the working principles of solar radiation measuring instruments including pyrheliometers, pyrometers, and sunshine recorders. 3. Classify various types of wind-mills and describe their structural components. 4. Introduce biomass as an energy source and describe biomass conversion technologies. 5. Describe the construction, working, and applications of various renewable energy sources.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Identify and describe the main types of renewable energy sources and their respective limitations.								
CO2	Compare various types of solar collectors based on design and performance.								
CO3	Identify and explain factors affecting wind characteristics and wind energy generation.								
CO4	Interpret the advantages and limitations of biomass energy in comparison with other renewable sources.								
CO5	Apply energy conversion principles to assess the feasibility of alternative energy systems.								
CO6	Compare the suitability of renewable energy technologies (like fuel cells) for specific applications.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Renewable Energy: Environmental consequence of fossil fuel, Limits Of Fossil Fuel, Energy Scenario, Classification of Energy Sources, types of renewable energy sources, limitations.								04
2.	Solar Energy: Environmental impacts of solar energy, Solar radiation measurements, Solar constant, Solar Radiation Measuring Instruments (Radiometers): Pyrheliometers, Pyranometers, Sunshine recorder, classification of solar collectors								05
3.	Wind Energy: Factors affecting the wind, Classification of Wind-mills, Main Components of a wind-mill, wind speed prediction, Advantages of Fixed and variable speed systems,								04
4.	Biomass Energy: Introduction, Biomass Conversion, Types of biogas plants: Floating dome type, Fixed dome type, Biodiesel, Significance of biodiesel								04

5.	Other Forms of Renewable Energy Sources: Introduction, hydro energy, geothermal energy, wave & tidal energy, Energy Conversion Principles, Environmental considerations	04
6.	Applications of Renewable Energy Sources: Photovoltaic (PV) cell, Solar water heater, Crop And Grain Drying, Space And Water Heating, Solar Energy Applications for Agriculture, Fuel Cell	05
TOTAL		26
Text Books:		
1. S. P. Sukhatme and J. K. Nayak, "Solar Energy: Principles of Thermal Collection and Storage", 3rd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008. 2. J. Twidell and Tony Weir, "Renewable Energy Resources", 2nd Edition, Taylor & Francis, 2006. 3. B. H. Khan, "Non-Conventional Energy Resources", 2nd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2009. 4. Prabir Basu, "Biomass Gasification, Pyrolysis and Torrefaction", Academic Press, Elsevier, 2013.		
Reference Books:		
1. O. P. Gupta, "Energy Technology", Khanna Book Publishing, New Delhi. 2. V. V. N. Kishore, "Renewable Energy Engineering and Technology: Principles and Practice", Routledge, 1st Edition, 2019. 3. N. Jenkins and J. Ekanayake, "Renewable Energy Engineering", Cambridge University Press, 1st Edition, 2017. 4. G. Boyle, "Renewable Energy", OUP Oxford, 2nd Edition, 2009.		
E-Resources:		
1. https://onlinecourses.nptel.ac.in/noc22_ph44/preview 2. https://nptel.ac.in/courses/103103206 3. https://onlinecourses.swayam2.ac.in/nou22_ge71/preview 4. https://www.coursera.org/specializations/renewable-energy 5. https://www.coursera.org/learn/exploring-renewable-energy 6. https://www.youtube.com/watch?v=VfowJHJz6-s		

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: III		
Course: Digital Marketing and Social Media							Code: 25ITMC301		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
01	-	01	02	-	-	25	-	-	25
Prerequisites:									
1. Basic knowledge of internet usage and browsing. 2. Familiarity with communication tools such as email, blogs, or websites. 3. Interest in business, branding, or marketing principles.									
Course Objectives:									
1. To provide fundamental knowledge of digital marketing strategies and tools. 2. To familiarize students with social media platforms and their business applications. 3. To introduce concepts of SEO, SEM, email marketing, and analytics. 4. To enable the design and execution of basic digital marketing campaigns. 5. To explore ethical practices and emerging trends in online marketing.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand the core concepts of digital marketing and its advantages over traditional marketing.								
CO2	Apply SEO and SEM techniques to enhance online visibility.								
CO3	Design social media strategies for different platforms (Facebook, Instagram, LinkedIn, etc.).								
CO4	Create and manage email marketing and content marketing campaigns.								
CO5	Use tools like Google Analytics to measure marketing effectiveness.								
CO6	Analyze case studies to understand trends and challenges in the digital space.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Digital Marketing: Definition, need and importance; Comparison with traditional marketing; Types of digital marketing; Digital marketing ecosystem; Buyer’s journey and conversion funnel.								02
2.	Search Engine Optimization (SEO): On-page and off-page SEO; Keywords, backlinks, meta tags; Tools: Google Search Console, SEMrush, Moz; SEO performance metrics.								02
3.	Search Engine Marketing (SEM) and Paid Ads: Google Ads, Bing Ads; Ad formats, keyword research, bidding strategies, PPC campaigns; Landing page design and optimization.								03

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4.	Social Media Marketing (SMM): Overview of platforms (Facebook, Instagram, Twitter, LinkedIn); Creating content calendars, running ad campaigns, influencer marketing; Engagement metrics and KPIs.	02
5.	Email and Content Marketing: Email campaign creation, tools like Mailchimp; Email list building, segmentation; Blogging, video marketing, storytelling; Content writing tips and tools.	02
6.	Analytics and Trends in Digital Marketing: Web analytics, Google Analytics basics; Conversion tracking, ROI measurement; Current trends: AI in marketing, chatbots, voice search, privacy laws (GDPR, etc.).	02
TOTAL		13

List of Assignments: - (Perform Any 10 Practical's)

- SEO Audit Using Free Tools:** Perform an SEO audit of a website using tools like Uber suggest, Screaming Frog, or Google Search Console. Identify technical issues, keywords, and backlink data.
- Keyword Research and Content Optimization:** Use Google Keyword Planner or Ubersuggest to find keywords for a blog topic. Optimize sample content using SEO-friendly titles, meta tags, and keywords.
- Create and Simulate Google Ads Campaign:** Design a sample Google Ads search campaign using mock billing. Choose keywords, write ad copy, set budget, and identify target audience.
- Design and Run a Facebook/Instagram Ad (Simulation):** Use Meta Business Suite to design a mock or actual ad campaign. Define objective, target demographics, ad design, and expected reach.
- Create a Social Media Content Calendar:** Plan one week of social media posts for a chosen brand. Include post types, platforms, visuals, and caption samples using tools like Canva or Buffer.
- Create and Send Email Campaign Using Mailchimp:** Design and send a sample marketing email using Mailchimp or similar tools. Include subject line, body, image, call-to-action, and analyze open/click-through rate.
- Blog Setup and Optimization:** Create a blog using Blogger or WordPress. Write an SEO-optimized post including internal/external links, headings, and media.
- Google Analytics Simulation and Reporting:** Set up a Google Analytics demo account and generate basic reports. Interpret metrics like bounce rate, session duration, and traffic sources.
- Build a Business Page on LinkedIn/Facebook:** Create a professional brand page for a business/service. Add cover image, description, services, and one sample post.
- Reputation Management Simulation:** Track brand mentions online using Google Alerts or Brand24 (trial). Write a brief strategy to handle a mock reputation crisis.
- Case Study: Successful Digital Campaign Analysis:** Analyze a famous digital campaign (e.g., Amul, Zomato, Swiggy, Nike). Present objectives, tools used, target audience, campaign

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creatives, and success factors.

- 12. Mini Project: Design a Complete Digital Strategy:** Choose a product/service and create a mini digital strategy. Include SEO plan, ad sample, social calendar, email draft, analytics dashboard (mock), and campaign goal. Submit final report with screenshots and justification of platform choices.

Text Books:

1. Seema Gupta, “Digital Marketing”, McGraw Hill Education.
2. Ian Dodson, “The Art of Digital Marketing”, Wiley

Reference Books:

1. Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, “Marketing 4.0: Moving from Traditional to Digital”, Wiley
2. Ryan Deiss & Russ Henneberry, “Digital Marketing for Dummies”, Wiley.
3. Avinash Kaushik, “Web Analytics 2.0”, Wiley

E-Resources:

1. Google Digital Garage: <https://learndigital.withgoogle.com>
2. HubSpot Academy: <https://academy.hubspot.com/>
3. Coursera – Digital Marketing Specialization: <https://www.coursera.org/specializations/digital-marketing>
4. Neil Patel Blog: <https://neilpatel.com>

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Program: B. Tech. (Information Technology)							Semester: III		
Course: Programming Lab – I							Code: 25ITVS303		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	04	-	02	-	-	25	-	25	50
Prerequisites:									
Basic understanding of C/C++, Knowledge of fundamental programming concepts such as loops, conditionals, and functions									
Course Objectives:									
1. To introduce object-oriented programming concepts using Java. 2. To develop Java programs using classes, objects, inheritance, and interfaces. 3. To implement exception handling, multithreading, and file I/O. 4. To use GUI components for interactive programming. 5. To apply object-oriented design in solving real-life problems.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Demonstrate understanding of object-oriented principles using Java.								
CO2	Develop modular programs using classes, objects, and constructors.								
CO3	Implement inheritance, interfaces, polymorphism, and abstraction in Java.								
CO4	Apply exception handling, file I/O, and multithreading in Java programs.								
CO5	Design basic GUI applications using AWT and Swing.								
CO6	Build mini-projects using multiple Java concepts in real-world applications.								
Guidelines for Instructor's Manual									
The instructor’s manual should include course objectives, unit-wise lab plans, expected outcomes, and model solutions. It must contain a detailed explanation of each experiment, code samples, evaluation rubrics, and CO mapping. The manual should help maintain consistency and outcome alignment across batches.									
Guidelines for Student's Lab Journal									
The journal should include a title page, table of contents, and properly formatted entries for each practical: aim, problem statement, algorithm, code, sample output, and conclusion. Each entry must be handwritten or neatly typed and signed weekly by the instructor.									
Guidelines for Lab /TW Assessment									
Term work will be assessed continuously based on timely submissions, quality of code, output, innovation, and viva performance. Each practical will carry marks based on correctness, documentation, and CO mapping. Bonus marks may be awarded for the mini-project.									

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Guidelines for Practical Examination

The practical exam will include any one program from the syllabus along with a viva. Evaluation will focus on logic, code correctness, output, and oral responses. External examiners must align with institutional rubrics.

Guidelines for Laboratory Conduction

Begin each lab session with a brief explanation of the concept. Encourage students to practice coding individually. Doubt sessions and frequent evaluation should be conducted. Maintain batch-wise attendance and performance records.

List of Assignments: - (Perform Any 10 Practical's)

1. Write a Java program to demonstrate variable declaration, data types and type conversion, operators, and control statements.
2. Create a class with data members and member methods. Write Java programs for object instantiation and accessing class methods.
3. Implement constructors (default and parameterized), constructor overloading, and method overloading in a Java program.
4. Write a Java program demonstrating single, multilevel inheritance, and method overriding using the super keyword.
5. Create an abstract class and interface to demonstrate abstraction and interface implementation in Java.
6. Demonstrate encapsulation using private data members and getter/setter methods. Use all four access specifiers in a Java program.
7. Write a Java program using try-catch blocks, multiple catch, nested try, finally, throw, and custom exceptions.
8. Implement file reading and writing using File Reader, FileWriter, BufferedReader, and Buffered Writer.
9. Demonstrate multithreading by extending the Thread class and implementing the Runnable interface. Include thread priority and synchronization.
10. Write a Java program to use Array List, HashMap, and TreeSet with generics to manage a list of student records.
11. Create a simple GUI application using AWT and Swing components such as buttons, labels, text fields, and layout managers.
12. **Case Study:** Document and analyze the OOP design of a real-world system (e.g., ATM simulator, Hospital Management). Include class structure, relationships (inheritance/interfaces), and design diagram.
13. **Mini Project**

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education
2. E. Balagurusamy, "Programming with Java", McGraw Hill Education

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Reference Books:
1. Paul Deitel & Harvey Deitel, “Java: How to Program”, Pearson Education
2. Cay S. Horstmann, “Core Java Volume I – Fundamentals”, Pearson Education
E-Resources:
1. NPTEL Java Programming: https://nptel.ac.in/courses/106/105/106105191/
2. Oracle Java Tutorials: https://docs.oracle.com/javase/tutorial/
3. GeeksforGeeks – Java: https://www.geeksforgeeks.org/java/

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Program: B. Tech. (Information Technology)						Semester: III			
Course: Mini Project						Code: 25ITCE301			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	50	-	-	50
Preamble:									
Project Based Learning (PBL) is a dynamic teaching methodology that fosters critical thinking, collaboration, and personalized learning experiences. In this approach, students work in groups to explore topics of personal interest through meaningful inquiry. Projects are rooted in real-world problems, aligned with the curriculum, and often span multiple disciplines. Students take ownership of their learning by determining how to approach the problem and selecting appropriate methods and activities. They gather information from diverse sources, analyze and synthesize data, and derive meaningful insights. The real-life relevance of PBL enhances student motivation and lends authenticity to their work, while also building essential life skills like teamwork and self-reflection. Each group is supported by a faculty member, known as a mentor, who provides guidance throughout the process. Technology plays a vital role in facilitating collaboration and supporting each phase of the project. At the conclusion of the project, students present their outcomes, demonstrating both their knowledge and communication skills. They also engage in self-assessment to reflect on their progress and learning. The mentor’s role is to support and advise, rather than to control or manage, encouraging student autonomy and deeper engagement.									
Companion Course:									
Online courses relevant to the project, along with expert lecture on Intellectual property rights, patents and software engineering.									
Course Objectives:									
1. To understand the key processes and methodologies involved in Project-Based Learning. 2. To enhance students' critical thinking abilities and their skills in solving real-world engineering problems. 3. To illustrate the roles and responsibilities of IT engineers in addressing engineering challenges within social, environmental, and economic contexts. 4. To prepare students with the knowledge and practical skills needed to develop effective solutions for problems typically presented in hackathons.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Develop innovative solutions for real-life problems by applying analytical thinking and collaborative problem-solving.								
CO2	Demonstrate the ability to learn through hands-on experiences, fostering habits of lifelong learning.								
CO3	Address and resolve technical challenges in real-world scenarios through effective teamwork.								
CO4	Participate actively in interdisciplinary collaborations to enhance knowledge integration and practical understanding.								

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Course Contents:

Group Structure

Students will work collaboratively in **mentor-guided teams** to plan, manage, and complete projects or activities that address defined real-world problems.

1. Each team should consist of **3 to 6 students**, working cohesively toward a common goal.
2. A **dedicated mentor** will be assigned to each group to support their learning and development throughout the PBL journey.

Project/Problem Selection

1. Projects may originate from any domain, though topics with an IT or technical focus are encouraged.
2. Projects initiated in the first year of engineering may be extended if they show potential and relevance.
3. Preference should be given to projects that involve conceptual modelling and the application of software tools.
4. Multiple solution approaches — such as theoretical analysis, practical implementation, working models, simulations, or software-based solutions — are encouraged.
5. Projects that require a multidisciplinary perspective are highly desirable.
6. Problems should demand in-depth exploration of practical, scientific, or technical areas.
7. The project methodology should incorporate hands-on activities, organizational and field visits, interaction with research institutes, and expert consultations to expose students to the latest technologies and practices.

Assessment

The department shall ensure rigorous monitoring and assessment of both student progress and the impact of their proposed solutions.

- Weekly reviews will be conducted to track the project's progress.
- Assessment will include both individual and group performance, facilitated by the assigned mentor.
- Students are expected to maintain a culture of authentic collaboration, self-motivation, and peer learning.
- Departments must provide guidance, orientation, and access to resources to support the project process.
- Students will showcase their learning through public products, reports, or presentations.

Components of Assessment:

1. **Individual Evaluation** – Assessment of personal involvement, contribution, and understanding.
2. **Group Evaluation** – Review of team dynamics, role distribution, communication, and cohesion.
3. **Presentation and Documentation** – Evaluation of reporting quality, organization, and communication of outcomes.

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Evaluation and Continuous Assessment

Students and mentors are required to maintain a PBL workbook that documents progress, deliverables, and reflections.

- The workbook will serve as a record of accountability, punctuality, technical writing skills, and project workflow.
- A Continuous Assessment Sheet (CAS) will be maintained by mentors and the department.

Suggested Assessment Criteria and Weightage:

1. Idea Inception – 5%
2. Solution Quality / Problem Solving / Final Output – 40%
3. Documentation (requirements, design, tools, report, etc.) – 25%
4. Patentability Potential – 10%
5. Demonstration (UI, usability, presentation) – 10%
6. Participation in Competitions / Publications – 5%
7. Consideration of Environmental, Ethical, Legal, or Social Aspects – 5%

Rubrics for evaluation should be designed based on these criteria and shared with students for transparency and guidance.

Faculty / Mentor is expected to perform following activities

Faculty mentors are expected to actively support student learning by:

1. Revising PBL concepts and assessing initial student skills
2. Forming diverse and balanced teams
3. Sharing knowledge on IPR (patents, copyrights, publications)
4. Discussing case studies to provide practical insight
5. Designing and explaining the rubrics for evaluation
6. Conducting weekly assessments of deliverables (presentations, reports, concept maps, logbooks)
7. Providing continuous guidance (scaffolding)
8. Engaging in both formative and summative assessment practices

Reference Books:

1. www.schoolology.com
2. www.wikipedia.org
3. www.howstuffworks.com

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Liberal Learning - III

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Program: B. Tech (Information Technology)							Semester: III		
Course: Liberal Learning – III (Guitar)							Code: 25ITCC305A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To develop advanced guitar techniques, including scales, arpeggios, fingerstyle, and lead guitar skills.									
2. To strengthen students’ understanding of music theory, chord construction, harmony, improvisation, and melodic phrasing.									
3. To enhance ensemble performance, stage confidence, musical communication, and readiness for intermediate-level performances.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Perform advanced scales, arpeggios, chord progressions, and fingerstyle techniques with accuracy.								
CO2	Apply music theory concepts in lead guitar playing, improvisation, and melodic expression.								
CO3	Demonstrate confident solo and ensemble performances with effective musical expression and stage readiness.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Semester II concepts, Warm-up & Finger Independence								2
2.	Major & Minor Scale Revision (Two Octaves)								2
3.	Pentatonic Scales & Blues Scale								2
4.	Arpeggios and Picking Exercises								2
5.	Chord Construction & Extended Chords (7th, Maj7, m7)								2
6.	Chord Progressions in Different Keys								2
7.	Fingerstyle Techniques – Patterns & Independence								2
8.	Lead Guitar Techniques – Hammer-ons, Pull-offs, Slides								2
9.	Improvisation using Pentatonic Scale								2
10.	Genre-based Playing (Blues, Rock, Pop)								2
11.	Ensemble Playing & Rhythm Coordination								2
12.	Solo Performance Practice & Individual Corrections								2
13.	Mock Performance & Stage Preparation								2
TOTAL								26	

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Text Books:

1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.
2. Mel Bay, "Modern Guitar Method – Grades 1, 2 & 3", Mel Bay Publications.
3. William Leavitt, "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Richard Chapman, "The Complete Guitar Manual", DK Publishing.
5. Ralph Denyer, "The Guitar Handbook", Knopf Publishing..

Reference Books:

1. Troy Stetina, "Fretboard Mastery", Hal Leonard Publications.
2. Tom Kolb, "Music Theory for Guitarists", Hal Leonard Publications.
3. Don Latarski, "Practical Theory for Guitar", Alfred Music.
4. Bruce Buckingham, "Scales and Modes for Guitar", Hal Leonard Publications.
5. Mark Phillips and Jon Chappell, "Guitar For Dummies", Wiley Publishing.

E-Resources:

1. **Berklee Online** – Guitar lessons, music theory, ear training, and performance resources. <https://online.berklee.edu>
2. **Justin Guitar** – Structured guitar lessons from beginner to advanced. <https://www.justinguitar.com>
3. **Fender Play** – Interactive lessons on chords, scales, techniques, and songs. <https://www.fender.com/play>
4. **TrueFire** – Professional online guitar courses covering multiple genres and techniques. <https://truefire.com>
5. **Ultimate Guitar** – Tabs, chord charts, scales, and community resources. <https://www.ultimate-guitar.com>
6. **MuseScore** – Free music notation software and sheet music library. <https://musescore.org>
7. **MusicTheory.net** – Interactive music theory lessons and exercises. <https://www.musictheory.net>
8. **Yamaha Music India** – Educational resources on guitar fundamentals and musicianship. <https://in.yamaha.com>

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Program: B. Tech (Information Technology)							Semester: III		
Course: Liberal Learning – III (Singing)							Code: 25ITCC305B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To develop students’ understanding of prescribed ragas and talas through theoretical and practical study. 2. To enhance vocal skills through Alankar practice in Shuddha and Vikrit (Komal) Swaras and different musical forms. 3. To strengthen rhythmic knowledge, musical expression, voice culture, and stage performance skills.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate understanding of prescribed ragas, talas, and Alankars through accurate vocal performance.								
CO2	Apply rhythmic patterns such as Bhajani Theka and Jhaptal in prescribed vocal compositions.								
CO3	Perform festival songs, ghazals, and vocal compositions with proper pitch, voice control, musical expression, and stage confidence.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Detailed Study of Prescribed Ragas: Raga Bageshree ,Raga Des, Raga Khamaj								6
2.	Study of Prescribed Talas: Bhajani Theka, Jhaptal								4
3.	Basic theory concepts								2
4.	Identification of Raga Characteristics and Tala Structure								2
5.	Festival Songs								2
6.	Gazals								2
7.	Soulful / Light Vocal Songs								2
8.	Interpretation and Presentation of Different Song Styles								2
9.	Practice of Ten Alankars in Shuddha/ Komal swaras								2
10.	Alankars based on the Prescribed Ragas								2
TOTAL								26	
Text Books:									
1. V. N. Bhatkhande, "Kramik Pustak Malika (Vol. III & IV)", Publications. 2. V. D. Paluskar, "Sangeet Bal Prakash", Publications.									
Reference Books:									
1. V. N. Bhatkhande, "Hindustani Sangeet Paddhati (Vol. I–IV)", Publications. 2. Ashok Da. Ranade, "Hindustani Music: Tradition in Transition", Publications. 3. S. N. Ratanjankar, "Abhinav Geet Manjari", Publications.									

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E-Resources:

1. [Sangeet Natak Akademi](#) - All India Radio (Akashvani)
2. [SwarGanga Music Foundation](#)
3. YouTube – Sangeet Natak Akademi Channel
4. Digital Tanpura and Tabla Applications (e.g., iTanpura, Riyaz, NaadSadhana)

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Program: B. Tech (Information Technology)							Semester: III		
Course: Liberal Learning – III (Cinematography)							Code: 25ITCC305C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.									
Course Objectives:									
1. To identify and operate camera equipment while understanding camera functions and exposure settings. 2. To develop skills in composition, framing, perspective, and lighting techniques. 3. To create visual stories through different photography genres and creative image-making. 4. To apply basic photo editing and post-processing techniques using editing software.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Operate cameras and apply appropriate settings, exposure, and lighting techniques to capture quality photographs.								
CO2	Compose visually appealing photographs using principles of composition, design, and creative framing.								
CO3	Capture photographs across different genres such as portrait, landscape, product, event, and wildlife photography.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Videography								2
2.	Basics of Video Camera operations								2
3.	Techniques for steady shooting (Tripod, Gimble)								2
4.	Basics shot types (Wide, Medium, Close-up)								2
5.	Basics shot types (Wide, Medium, Close-up)								2
6.	Camera Movement (Pan, Tilt, Roll)								2
7.	Practical								2
8.	Composition Technique - Focus and Depth of field								2
9.	Natural vs artificial lighting								2
10.	Practical								2
11.	Filming Techniques								2
12.	Audio Recording								2
13.	Practical Session								2
TOTAL								26	

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Text Books:
1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.
2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook.
Reference Books:
1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.
2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Illex Press.
E-Resources:
1. https://www.youtube.com/watch?v=xKRh4PI-BKg
2. https://www.youtube.com/@StudioBinder/videos

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Program: B. Tech (Information Technology)							Semester: III		
Course: Liberal Learning – III (Dance)							Code: 25ITCC305D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
</									

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Reference Books:

1. Kothari, Sunil, "Bharatanatyam", Marg Publications, Mumbai.
2. Vatsyayan, Kapila, "Classical Indian Dance in Literature and the Arts", Sangeet Natak Akademi.
3. Subramaniam, Padma, "Bharata's Art: Then and Now", Bharata Ilango Foundation.
4. Vatsyayan, Kapila, "Indian Classical Dance", Publications Division, Government of India.
5. Srinivasan, Priya, "Sweating Saris: Indian Dance as Transnational Labor", Temple University Press.
6. Sangeet Natak Akademi, "Bharatanatyam – A Reader", Sangeet Natak Akademi, New Delhi.

E-Resources:

1. <https://youtu.be/XONKu803dAk?si=LkLbNKPUvKpfZJkF>
2. <https://youtu.be/D0Ow529EHSo?si=upTtBpNp1lODzHMq>
3. <https://youtu.be/JDfYT3Ax7mE?si=Q9VYWj95cnLikw2V>
4. <https://youtu.be/GcZJMiHds3U?si=AXAMwJ37YuDEVbTF>
5. <https://youtu.be/2j9KmG25l8g?si=zH9rKV-VY7RPirgD>

DEPARTMENT OF INFORMATION TECHNOLOGY							Semester: III		
Program: B. Tech (Information Technology)							Code: 25ITCC305E		
Course: Liberal Learning – III (Synthesizer/Keyboard)									
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To strengthen students’ understanding and practical application of major/minor scales, chords, chord progressions, and inversions. 2. To develop skills in Western Staff Notation, accompaniment techniques, melody integration, and left-hand coordination. 3. To enhance technical proficiency, musical expression, rhythmic accuracy, ensemble coordination, and stage confidence.									
Course Outcomes:									
CO1	Apply scales, chords, chord progressions, and inversions in keyboard performance.								
CO2	Perform musical compositions using Indian and Western Staff Notation with suitable accompaniment techniques.								
CO3	Demonstrate technical proficiency, musical interpretation, ensemble coordination, and stage confidence.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of all Major Scales								2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)								2
3.	Revision of Major and Minor Chords,								2
4.	Revision of Chord Progression, Family chords, Chords Inversion								2
5.	Playing Simple Songs with Indian Notation								2
6.	Introduction to Staff Notation								2
7.	Understanding the Difference between Indian and Western Staff Notation								2
8.	Reading and Playing Simple Melodies from Staff Notation								2
9.	Playing Songs using Both Indian and Staff Notation								2
10.	Fundamentals of Keyboard Accompaniment								2
11.	Accompaniment using Major and Minor Chords								2
12.	Accompaniment with Scales and Simple Songs								2
13.	Group Performance								2
TOTAL								26	

Text Books:	DEPARTMENT OF INFORMATION TECHNOLOGY
1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music. 2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music. 3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer. 4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.	
Reference Books:	
1. Thompson, J., "Modern Course for the Piano", Willis Music. 2. Aaron, M., "Piano Course", Alfred Music. 3. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer. 4. Harrison, M., "Contemporary Music Theory", Hal Leonard. 5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.	
E-Resources:	
1. https://www.youtube.com/watch?v=5nA245TZvBY 2. https://www.youtube.com/watch?v=h4YGP7GyZNU&list=PLUPHIkAcHm-SvoAmFlkec2STxRdvJnYYF	

Program: B. Tech. (Information Technology) III						DEPARTMENT OF INFORMATION TECHNOLOGY			
Course: Liberal Learning – III (Basketball)						Code: 25ITCC305F			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.								
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.								
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Fundamentals Skill Review: Refresh all core basketball skills. Perform all basic techniques confidently.								2
2.	Skill Circuit: Practice all basic skills in rotation. Improve overall basketball fundamentals.								2
3.	Small Group Practice: Apply skills in partner and group activities. Work effectively with teammates.								2
4.	Player Stance & Footwork: Improve movement and body balance. Apply proper stance during movement.								2
5.	Passing Under Movement: Practice passing while changing positions. Execute accurate passes while moving.								2
6.	Dribbling Around Cones: Improve control through obstacle drills. Maintain dribbling control in different directions.								2
7.	Assessment- V								2
8.	Shooting Practice: Practice shooting from different spots. Improve shooting accuracy.								2
9.	Rebounding Drills: Practice timing and ball recovery. Perform effective rebounding.								2
10.	Individual Defense: Practice defensive movement in simple drills. Apply defensive techniques effectively.								2
11.	Body Technique: Improve body positioning and balance. Demonstrate better body control.								2
12.	Combined Fundamental Drills: Integrate all basketball skills. Execute skills smoothly in sequence, Practice skills with a partner. Improve teamwork and communication								2
14.	Assessment – VI								2
TOTAL								26	

Text Books:	DEPARTMENT OF INFORMATION TECHNOLOGY
1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA) 2. Dr. James Naismith, "Basketball: Its Origin & Development", 3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon	
Reference Books:	
1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press. 2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics	
E-Resources:	
1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners 2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training 3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS] 4. Basketball: Rebounding	

Program: B. Tech (Information Technology)						Semester-III			
Course: Liberal Learning – III (Cricket)						Code: 25ITCC305G			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Analyze batting, bowling, fielding, and match strategies across T20, ODI, and Test cricket formats.								
CO2	Apply tactical decision-making, leadership, field placements, and performance analysis during competitive matches.								
CO3	Demonstrate effective cricket performance by integrating sports psychology, nutrition, injury prevention, and technology in match situations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Batting Strategies: Build innings in different formats								2
2.	Bowling Plans: Field settings and tactical bowling								2
3.	Captaincy & Leadership: Decision-making and leadership								2
4.	Match Strategy: Powerplay, middle overs, death overs								2
5.	T20 Cricket Strategies: Aggressive tactics								2
6.	ODI Cricket Strategies / Test Cricket Strategies: Rotation of strike and partnerships / Patience and long-form tactics								2
7.	Assessment – V								2
8.	Advanced Field Placements: Offensive and defensive setups								2
9.	Sports Psychology: Confidence and concentration								2
10.	Nutrition for Cricketers: Performance nutrition								2
11.	Injury Prevention & Recovery: Basic sports medicine								2
12.	Technology in Cricket: DRS, Hawk-Eye, performance analysis								2
14.	Assessment – VI								2
TOTAL								26	
Text Books:									
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan 2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press 3. R. Sridhar, "Coaching Beyond", Rupa Publications India									
Reference Books:									
1. Rob Eastaway, "Cricket Explained: From Grubbers to Googlies", St. Martin’s Griffin 2. Surendra Shrivastava, "Cricket – Khel Aur Niyam", Prabhat Prakashan									



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E-Resources: DEPARTMENT OF INFORMATION TECHNOLOGY
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|---|
| <ol style="list-style-type: none">1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/2. How to Play Cricket3. Cricket rules explained in 2 minutes4. Every Cricket Shot Explained in 21 Minutes |
|---|

Program: B. Tech (Information Technology)						Semester-III			
Course: Liberal Learning – III (Rifle and Pistol Shooting)						Code: 25ITCC305H			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop safe shooting skills, accuracy concentration, and proper shooting techniques in students. It also aims to build discipline, confidence and prepare shooters for competitive events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.								
CO3	Apply mental focus, concentration, and scientific principles to improve shooting performance.								
CO4	Demonstrate sportsmanship, discipline, and overall proficiency in competitive shooting.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Recoil Management: How to avoid recoil								2
2.	Loading and Unloading Procedures: Procedure to load a gun.								2
3.	Malfunction Identification and Clearance: What is malfunction and its solutions								2
4.	PGun Cleaning and Maintenance: Process to open a gun and clean it								2
5.	Ammunition Types and Selection: Selecting a perfect ammunition from different ammunition companies								2
6.	Environmental Effects on Shooting: Effect on a shot of environment								2
7.	Assessment – V								2
8.	Scoring Systems: How to read score.								2
9.	Competition Rules: Explaining the rules and commands								2
10.	Match Preparation: Physical and mental preparation of a shooter for match								2
11.	Mental Conditioning and Concentration: Making a shooter mentally strong and increasing concentration process								2
12.	Time-Controlled Shooting: Procedure to fire a shot in given time								2
13.	Assessment – VI								2
TOTAL								26	
Text Books:									
1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)									
2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America									
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America									

Reference Books:

DEPARTMENT OF INFORMATION TECHNOLOGY

1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America
2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras,
<https://nptel.ac.in/courses/109106406>
2. [Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube](#)
3. [Basics of the Standing Position | Sauer Academy](#)
4. [The Ideal Air Rifle Shooter with Abhinav Bindra \[IND\]](#)

Course: Liberal Learning – III (Volleyball)				Code: 25ITCC305I					
DEPARTMENT OF INFORMATION TECHNOLOGY									
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.								
CO3	Apply concentration, mental focus, and scientific principles to improve shooting performance.								
CO4	Demonstrate discipline, sportsmanship, and overall proficiency in competitive shooting.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Double Blocking Technique: Introduction to double blocking, stance and ready position, footwork for lateral movement, timing the jump with the attacker, hand positioning over the net, coordination between middle and wing blocker, drills on blocking angles and recovery.								2
2.	Advance Digging: Advanced defensive posture, digging against hard-driven spikes, rolling and diving techniques, pancake save, anticipation and reading the attacker, transition from defense to offense, reaction drills.								2
3.	Advance Setting: Jump setting, back setting, quick setting, setting accuracy under pressure, decision-making, communication with hitters, setter movement and transition drills.								2
4.	Cross Court And Line Spiking: Approach mechanics, body positioning, wrist action, cross-court attack, line attack, shot placement, attacking against blockers, controlled hitting drills.								2
5.	Advanced Blocking: Single, double and triple blocking strategies, reading setter intentions, block coverage, penetration over the net, transition after blocking, tactical blocking drills.								2
6.	Libero Skills: Role and responsibilities of the libero, serve receive, defensive positioning, emergency setting, court communication, floor defense techniques, specialized libero drills.								2
7.	Assessment – V								2
8.	Offensive Systems (5-1): Introduction to the 5–1 offensive system, player rotations, setter responsibilities, transition from defense to offense, positional responsibilities, team coordination.								2

9.	Offensive Combinations: Quick attacks, tandem attack, slide attack,	2
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	combination plays, synchronization between setter and attackers, offensive communication and execution drills.	
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10.	Team Defensive System: Perimeter defense, rotational defense, block-defense coordination, defensive coverage, court positioning, communication, transition to counterattack.	2
11.	Tactical Serving: Float serve and jump serve placement, serving strategies against different formations, targeting weak receivers, serving under pressure, tactical decision-making.	2
12.	Competitive Match Practice: Full competitive matches following official rules, tactical implementation, referee signals, teamwork, leadership, sportsmanship, and post-match performance evaluation.	2
13.	Assessment – VI	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications 2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics		
Reference Books:		
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics		
E-Resources:		
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube		

Course: Liberal Learning – III (Football)				DEPARTMENT OF INFORMATION TECHNOLOGY					
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance football players’ technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain attacking, defensive, formation, and set-piece principles in football.								
CO2	Apply possession, counter-attacking, and transition strategies in match situations.								
CO3	Analyze performance using psychology, nutrition, injury management, and technology.								
CO4	Demonstrate teamwork, decision-making, and tactical skills during matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Principles of Attack: Understand and apply the principles of attack, including creating space, supporting teammates, progressing the ball, and creating goal-scoring opportunities.								2
2.	Principles of Defense: Understand and apply the principles of defense, including pressure, cover, balance, marking, and communication to effectively prevent opponents from scoring.								2
3.	Team Formations: Understand and apply different team formations to improve player positioning, tactical organization, and overall team performance.								2
4.	Transition Play: Understand and apply effective transition play by quickly switching between attacking and defensive phases to maintain team advantage.								2
5.	Possession-Based Football: Develop possession-based football skills by improving ball retention, passing accuracy, movement, and decision-making to control the game effectively.								2
6.	Counter-Attacking Football: Understand and apply counter-attacking principles by transitioning quickly from defense to attack through speed, movement, and effective decision-making.								2
7.	Assessment-V								2
8.	Set-Piece Organization: Understand and apply set-piece organization by developing effective attacking and defensive strategies for free kicks, corners, and restarts.								2
9.	Sports Psychology: Develop mental skills such as confidence, focus, motivation, resilience, and decision-making to enhance football performance and overall sporting attitude.								2

10.	Injury Management: Understand basic injury management practices, including	
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	prevention, immediate care, recovery strategies, and safe return to play procedures for football players.	
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11.	Technology in Football: Understand the role of technology in football by exploring tools for performance analysis, player development, match decisions, and injury prevention.	2
12.	Full Match Analysis: Analyze full match performance by evaluating tactics, player decisions, team organization, strengths, and areas for improvement.	2
13.	Assessment-VI	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA 2. International Football Association Board (IFAB), "Laws of the Game", IFAB		
Reference Books:		
1. Charles Hughes, "The Winning Formula in Soccer", Meyer & Meyer Sport 2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA 3. International Football Association Board (IFAB), "Laws of the Game", IFAB		
E-Resources:		
1. Udeemy – Soccer Courses - https://www.udemy.com/topic/soccer/ 2. Beginner's guide to football Football for dummies 3. Every position in soccer explained 4. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners		

Course: Internship – I				DEPARTMENT OF INFORMATION TECHNOLOGY					
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
4 Weeks			02	-	-	25	-	-	25
Preamble:									
Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.									
Course Objectives:									
1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.									
2. Learn to implement the technical knowledge in real industrial situations.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.								
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.								
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.								
Internship Requirements									
1. Internship Duration: It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 4 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).									
2. Internship Opportunities: Students can explore various opportunities for internships at:									
a. Industries									
b. Research labs or organizations									
c. Collegiate clubs									
d. In-house research projects									
e. Online internships									
3. Support and Assistance: Students can seek assistance for securing internships from:									
a. The Training and Placement cell, along with departmental coordinators									
b. Department or institute faculty members									
c. Personal contacts									
d. Directly connecting with industries or organizations									
4. Request Letter: Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.									

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5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.

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SYLLABUS

SEMESTER - IV

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: IV		
Course: Database Management System							Code: 25ITPC405		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
1. Basic knowledge of data structures and programming									
2. Understanding of file systems and operating system fundamentals									
Course Objectives:									
1. To introduce the fundamental concepts of database systems									
2. To design relational databases using E-R models and normalization techniques									
3. To develop skills in SQL for managing and querying relational databases									
4. To understand transaction processing, concurrency control, and recovery									
5. To explore indexing, query optimization, and database architectures									
6. To gain insight into emerging trends like NoSQL and distributed databases									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand basic database concepts and architecture								
CO2	Design relational databases using E-R models and normalization								
CO3	Write SQL queries to manage, retrieve, and manipulate data								
CO4	Apply transaction management, concurrency control, and recovery techniques								
CO5	Analyze indexing strategies and query optimization methods								
CO6	Explore advanced topics such as NoSQL, distributed, and cloud-based databases								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Database Systems: Purpose of databases, file system vs DBMS, advantages of DBMS, database users and administrators, DBMS architecture, data models (hierarchical, network, relational), schema and instance, data independence, DBMS languages (DDL, DML).								06
2.	Entity-Relationship (ER) Modeling and Relational Model: ER model: entity types, attributes, relationships, generalization, specialization, aggregation. Converting ER to relational schema. Relational model: structure, keys, integrity constraints, relational algebra operations.								06
3	Structured Query Language (SQL): Basic SQL commands (SELECT, INSERT, DELETE, UPDATE), constraints, aggregate functions, group by, order by, joins (inner, outer, self), subqueries, views, indexes, and stored procedures.								07

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4.	Normalization and Functional Dependencies: Functional dependencies, decomposition, lossless-join and dependency preservation, normal forms (1NF, 2NF, 3NF, BCNF), multivalued dependencies, join dependencies, demoralization.	07
5.	Transaction Management and Concurrency Control: Transaction properties (ACID), transaction states, serializability, conflict and view serializability, concurrency control protocols: locking, timestamp ordering, deadlock handling, recovery concepts and techniques.	07
6.	Query Optimization and Advanced Topics Query: Processing overview, evaluation strategies, indexing (B+ trees, hash-based), and introduction to NoSQL, distributed databases, cloud-based databases, and emerging trends in database systems.	06
TOTAL		39
Text Books:		
1. Korth, Silberschatz & Sudarshan, “Database System Concepts”, McGraw Hill Education. 2. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson Education.		
Reference Books:		
1. C.J. Date, “An Introduction to Database Systems”, Addison-Wesley. 2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, McGraw Hill. 3. Rob and Coronel, “Database Systems: Design, Implementation, and Management”, Cengage Learning.		
E-Resources:		
1. NPTEL – Database Management Systems: https://nptel.ac.in/courses/106/105/106105175/ 2. GeeksforGeeks – DBMS: https://www.geeksforgeeks.org/dbms/ 3. Oracle SQL Tutorial: https://docs.oracle.com/en/database/		

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: Database Management System Laboratory							Code: 25ITPC405P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	25	50
Prerequisites:									
Basic knowledge of programming, data structures, and fundamental database concepts.									
Course Objectives:									
1. To develop practical skills in designing, creating, and managing relational databases using SQL. 2. To enable students to write and optimize queries using joins, subqueries, views, indexes, and aggregate functions. 3. To develop skills in database design, normalization, PL/SQL programming, transactions, and real-world database applications.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Create, manipulate, and retrieve data using SQL and integrity constraints.								
CO2	Apply joins, subqueries, aggregate functions, views, and indexes to retrieve and manage data efficiently.								
CO3	Design relational databases using ER modeling and normalization techniques.								
CO4	Develop stored procedures, functions, triggers, and cursors for database applications.								
CO5	Manage transactions and demonstrate concurrency control using commit, rollback, save points, and locking.								
CO6	Design and implement a real-world database application through a case study and mini project.								
List of Assignments: - (Perform Any 10 Practical's)									
1. Execute SQL commands to create, insert, update, delete, and retrieve data from a single table. Apply integrity constraints (primary key, not null, unique, default, check). 2. Perform queries involving two or more tables using INNER JOIN, LEFT JOIN, RIGHT JOIN, and FULL OUTER JOIN. Retrieve complex data using aliasing and filtering. 3. Write SQL queries using aggregate functions (SUM, AVG, COUNT, MIN, MAX) along with GROUP BY, HAVING, and ORDER BY. 4. Use nested subqueries in SELECT, FROM, and WHERE clauses. Demonstrate use of correlated subqueries and EXISTS operator. 5. Create and use views to simplify complex queries. Create indexes on selected columns to improve performance. Analyze execution plans if supported by the DBMS. 6. Design an ER model for a real-world scenario (e.g., Library or Hospital). Convert ER into relational schema and implement the schema using SQL CREATE TABLE. 7. Given a data set or set of attributes, normalize it into 1NF, 2NF, 3NF, and BCNF. Identify and explain functional dependencies and keys.									

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8. Create stored procedures and functions using PL/SQL or equivalent in MySQL/PostgreSQL. Demonstrate passing parameters and returning values.
9. Create BEFORE and AFTER triggers for insert/update/delete operations. Write cursors to iterate through query results and perform row-wise operations.
10. Simulate multiple users performing transactions. Demonstrate commit, rollback, and save point. Handle concurrency using isolation levels and locking.
11. **Case Study:** Choose a real-world system (e.g., Student Portal, Inventory, Hospital). Model ER diagram, create schema, write at least 5–6 queries, and explain relationships and normalization.
12. **Mini Project**

Reference Books:

1. C.J. Date, “An Introduction to Database Systems”, Addison-Wesley.
2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, McGraw Hill.
3. Rob and Coronel, “Database Systems: Design, Implementation, and Management”, Cengage Learning.

E-Resources:

1. NPTEL – Database Management Systems: <https://nptel.ac.in/courses/106/105/106105175/>
2. GeeksforGeeks – DBMS: <https://www.geeksforgeeks.org/dbms/>
3. Oracle SQL Tutorial: <https://docs.oracle.com/en/database/>

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: IV		
Course: Software Engineering							Code: 25ITPC406		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
1. Basic knowledge of the Internet and the World Wide Web 2. Familiarity with business or commerce principles 3. Interest in digital platforms and technologies									
Course Objectives:									
1. Understand the role of software engineering in system development. 2. Learn different software development life cycle models. 3. Apply design methodologies, testing techniques, and quality assurance. 4. Use project management tools and principles. 5. Explore advanced practices like Agile, DevOps, and software security.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Define and explain the foundational principles of software engineering.								
CO2	Identify and apply appropriate software process models.								
CO3	Analyze and document software requirements using industry-standard techniques.								
CO4	Design software using modeling tools and design patterns.								
CO5	Apply software testing strategies and evaluate software quality.								
CO6	Utilize modern engineering practices such as Agile, DevOps, and CI/CD pipelines.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Software Engineering: Introduction to SE, Myths & Principle, Software Development Life Cycle (SDLC) Process Models: Waterfall, Incremental, Spiral, V-Model, Software Engineering Ethics (ACM/IEEE Code), Software vs. Program, Software Characteristics Introduction to CASE Tools.								06
2.	Requirements Engineering & Feasibility Study: Requirement Engineering Phases, Functional & Non-functional Requirements SRS: Structure and IEEE Standard Format, Feasibility Analysis: Technical, Operational, Economic, Use Case Modeling and Requirement Tools								06

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3.	Software Design & Modeling: Principles of Design: Modularity, Abstraction, Coupling, Cohesion, Design Techniques: Structured and Object-Oriented, UML Diagrams: Use Case, Class, Sequence, Activity, Introduction to Design Patterns: Singleton, MVC	07
4.	Software Testing and Maintenance: Testing Lifecycle, Types of Testing (Unit, Integration, System), Testing Techniques: BVA, Equivalence Partitioning, Path Testing, White Box & Black Box Testing, Test Case Design & Test Plan Preparation, Software Maintenance, Configuration Management.	07
5.	Software Project Management: Project Planning, Scheduling, Risk Management, Work Breakdown Structure (WBS), Gantt Charts, Cost Estimation Techniques (COCOMO, FP), Software Metrics: LOC, Cyclomatic Complexity, Tools: JIRA, Trello, GitHub Project	07
6.	Advanced Trends in Software Engineering: Agile Software Development: Scrum, Kanban, DevOps Lifecycle, CI/CD Pipelines, Software Reengineering and Reverse Engineering, Software Security: OWASP Basics	06
TOTAL		39
Text Books:		
1. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw Hill 2. Ian Sommerville, “Software Engineering”, Pearson Education		
Reference Books:		
1. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa 2. Bob Hughes, Mike Cotterell, “Software Project Management”, McGraw Hill 3. Rajib Mall, “Fundamentals of Software Engineering”, PHI		
Digital References:		
1. NPTEL – Software Engineering (IIT KGP): https://nptel.ac.in/courses/106105087 2. Coursera – Agile with Atlassian Jira (Atlassian): https://www.coursera.org/learn/agile-with-atlassian-jira 3. GeeksforGeeks – Software Engineering Portal: https://www.geeksforgeeks.org/software-engineering/ 4. GitHub Education – Student Developer Pack: https://education.github.com/pack		

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: Computer Organization							Code: 25ITPC407		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100
Prerequisites:									
Basic knowledge of Digital Systems Design and Architecture, Basics of Computer systems									
Course Objectives:									
1. Describe CPU, memory, I/O devices, and system buses.									
2. Explain ALU, control units, registers, and instruction cycles.									
3. Analyze instruction formats, addressing modes, interrupts, and pipelines									
4. Illustrate memory hierarchy, cache mapping, and DMA techniques.									
5. Differentiate I/O mechanisms and demonstrate peripheral device operations.									
6. Compare ARM and RISC architectures and assess embedded applications.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Describe computer organization basics, CPU components, and differentiate between Von Neumann and Harvard architectures.								
CO2	Explain processor structure including ALU, registers, control unit, and the instruction cycle.								
CO3	Interpret machine instructions, addressing modes, interrupts, exceptions, and pipelining techniques.								
CO4	Explain memory organization, cache mapping, coherence mechanisms, and DMA operations.								
CO5	Compare different I/O mechanisms and demonstrate the functioning of standard peripheral devices.								
CO6	Analyze and compare modern processor architectures (GPU, TPU, and NPU) and evaluate their suitability for parallel processing and AI-based computing applications.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction To Computer Organization: Basics of computer organization and architecture, CPU, Memory, I/O unit’s overview System buses: Address, Data, and Control, On Neumann vs. Harvard architecture, Introduction to RISC and CISC concepts								04
2.	Design and Architecture of a Processor: CISC vs RISC: basic comparison, Processor components: ALU, Registers, Control Unit, Instruction cycle: Fetch, Decode, Execute, Basics of pipelining and CPU performance, Single bus CPU organization and key register types (PC, MAR, MBR, IR), Micro-operations during instruction execution								05

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3.	Processor Instructions & Advancements: Instruction structure, formats (0–3 address), and mnemonics Addressing modes and basic instruction types, Interrupts: types and handling (ISR, exceptions), Introduction to instruction pipelining, Basics of multiprocessor systems: MIMD and multicore overview	05
4.	Memory Organization: Memory hierarchy: main, cache, and registers, Memory types: SRAM, DRAM, ROM, Cache memory: mapping techniques, replacement basics, Basics of memory access and DMA (Direct Memory Access)	04
5.	Input / Output Systems: Peripheral devices, Input-output subsystems, I/O device interface, I/O Processor, I/O transfers–Program controlled, Working mechanisms of peripherals: keyboard, video displays, touch screen panel, printers	04
6.	Advanced Trends: Introduction to modern processors like GPU and TPU, Parallel Processing. GPU vs TPU: Performance Comparison ,GPU Architecture Components ,NPU's (Neural Processing Units)	04
TOTAL		26
Textbooks:		
1. William Stallings, “Computer Organization and Architecture: Designing for Performance”, 7th Edition, Pearson Prentice Hall Publication. 2. C. Hamacher, V. Zvonko, S. Zaky, “Computer Organization”, 5th Edition, Tata McGraw Hill Publication. 3. Kai Hwang, “Advanced Computer Architecture”, Tata McGraw-Hill.		
Reference Books:		
1. Hwang and Briggs, “Computer Architecture and Parallel Processing”, Tata McGraw Hill Publication. 2. A. Tanenbaum, “Structured Computer Organization”, Prentice Hall Publication. 3. David A. Patterson & John L. Hennessy “Computer Organization and Design: The Hardware/Software Interface”.		
E-Resources:		
1. NPTEL Video Lectures: www.nptelvideos.in 2. GeeksforGeeks – Computer Organization: https://www.geeksforgeeks.org/computer-organization-and-architecture 3. Udemy – Computer Organization & Architecture Courses: https://www.udemy.com		

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: IV		
Course: Computer Organization Laboratory							Code: 25ITPC407P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Basic knowledge of Digital Systems Design and Architecture, Basics of Computer systems									
Course Objectives:									
1. To develop an understanding of CPU organization, instruction execution, memory hierarchy, and I/O mechanisms. 2. To enable students to simulate processor components, instruction cycles, pipelining, cache organization, interrupts, and I/O techniques. 3. To develop analytical skills through simulation and case study of modern processor systems.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Explain and simulate basic CPU components and the fetch-decode-execute cycle.								
CO2	Implement instruction formats, addressing modes, and instruction pipelining with hazard analysis								
CO3	Simulate and compare different cache mapping and memory access techniques.								
CO4	Demonstrate interrupt handling and different I/O mechanisms using simulations.								
CO5	Analyze memory control signals and processor communication mechanisms.								
CO6	Analyze the architecture and operation of a modern processor system through a case study.								
List of Experiments:									
Perform the following assignments using a virtual lab simulator (Proteus or Logisim Evolution, ARM Keil µVision) 1. Simulate basic CPU components such as ALU, registers, and control unit. 2. Simulate the fetch-decode-execute cycle of a processor. 3. Simulate instruction pipelining with stages and show data/control hazards. 4. Implement and simulate different instruction formats and addressing modes. 5. Simulate direct-mapped, associative, and set-associative cache 6. Simulate software and hardware interrupts and priorities. 7. Simulate memory-mapped vs. isolated I/O; programmed vs. interrupt-driven I/O 8. Demonstrate memory access mechanisms and control signals. 9. Write a case study on a modern processor system									
Reference Books:									
1. Hwang and Briggs, “Computer Architecture and Parallel Processing”, Tata McGraw Hill Publication. 2. A. Tanenbaum, “Structured Computer Organization”, Prentice Hall Publication. 3. David A. Patterson & John L. Hennessy “Computer Organization and Design: The Hardware/Software Interface”.									

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E-Resources:

1. NPTEL Video Lectures: www.nptelvideos.in
2. GeeksforGeeks – Computer Organization: <https://www.geeksforgeeks.org/computer-organization-and-architecture>
3. Udemy – Computer Organization & Architecture Courses: <https://www.udemy.com>

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Information Technology)							Semester: IV		
Course: Discrete Mathematics							Code: 25ITMD402		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic Mathematics									
Course Objectives:									
1. Equip students with foundational concepts of discrete mathematics essential for computing. 2. Provide understanding of sets, logic, functions, and relations to model real-world problems. 3. Develop problem-solving skills in combinatorics, graph theory, and tree structures relevant to algorithm design and analysis. 4. Foster mathematical thinking to support learning in data structures, databases, and theoretical computer science.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Apply the fundamentals of set theory, propositional logic, and mathematical induction in computing.								
CO2	Analyze and classify different types of relations and functions with their properties and applications.								
CO3	Solve counting problems using permutations, combinations, and pigeonhole principle.								
CO4	Illustrate and solve problems using graph theory concepts and algorithms.								
CO5	Apply algorithms on graphs for shortest path, coloring, and identify special graph types.								
CO6	Explain properties of trees and apply them in decision-making and real-life computing applications.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Set Theory and Logic: Introduction and significance of Discrete Mathematics, Sets–Introduction to Set, Set Operations, Cardinality of set, Principle of inclusion and exclusion. Propositional Logic- logic, Propositional Equivalences, Application of Propositional Logic Translating English Sentences Mathematical Induction- Mathematical Induction. and Strong Mathematical Induction and Examples								07

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2.	Relations and Functions: Relations – Relations and their Properties, Representing relations, Closures of relations, Equivalence relations, Partial orderings, Partitions, Hasse diagram, Lattices, Chains and Anti-Chains. Functions and its types, The Pigeonhole Principle. Recurrence Relations: Recurrence Relation, Linear Recurrence Relations with Constant Coefficients, Total Solutions, Applications of Relations and Functions	07
3.	Counting Principles: The Basics of Counting, rule of Sum and Product, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Algorithms for generating Permutations and Combinations.	07
4.	Graph Theory: Graph Terminology and Special Types of Graphs, Matrix Representing Graphs and handshaking lemma, Graph Isomorphism, Connectivity	06
5.	Algebra of Graphs: Euler and Hamilton Paths, Single source shortest path- Dijkstra's Algorithm, Planar Graphs, Graph Colouring	06
6.	Trees: Introduction to Trees and Properties decision tree, prefix codes and Huffman coding, Decision Trees and their Applications in Machine Learning, Applications of Trees in File Systems, cut sets, The Max flow- Min Cut Theorem in Transport network.	06
TOTAL		39
Text Books:		
1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw-Hill Education. 2. C. L. Liu, "Elements of Discrete Mathematics", McGraw-Hill		
Reference Books:		
1. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House. 2. Tremblay J.P. and Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill. 3. Norman L. Biggs, "Discrete Mathematics", Oxford University Press.		
E-Resources:		
1. NPTEL: Discrete Mathematics – IIT Ropar (Prof. Sudarshan Iyengar) :https://nptel.ac.in/courses/106106183 2. Discrete Mathematical Structures – IIT Madras : https://nptel.ac.in/courses/106106094 3. SWAYAM – Discrete Mathematics : https://swayam.gov.in/nd1_noc24_cs56/preview		

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OPEN ELECTIVE - II
(Select any one course from the given Open
Elective Courses)

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Cyber Security & Laws)							Code: 25ALOE402A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Foundational knowledge in computer science, networking.									
Course Objectives:									
1. To introduce the cyber world and cyber law in general. 2. To enhance the understanding of problems arising out of online transactions and provoke them to find solutions. 3. To know the technologies that stand behind certain cyber rimes. 4. To identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Illustrate and discuss the basic concepts of cyber security, Devices.								
CO2	Understand the aspects related to personal data privacy and security.								
CO3	Understand the main components of cyber security plan.								
CO4	Understand about the type and nature of cyber-crimes.								
CO5	Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.								
CO6	Explain the difference between Systems Cyber Security, Network Cyber Security, and Cryptography, Crypto-Protocols, etc.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Cyber Security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security.								04
2.	Digital Devices Security, Tools and Technologies for Cyber Security: End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall, Wi-Fi security, Configuration of basic security policy and permissions.								04
3.	Cyber security Management, Compliance and Governance: Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.								05

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Cybercrimes:		
4.	Targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach Cybersquatting, Pharming, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft Cyber Police stations, Crime reporting procedure, Case studies	05
5.	Cybercrime: Illustrations, Examples and Mini cases, Real-life examples, Mini Cases-Social Engineering Attacks, Illustration of financial frauds in cyber domain, Digital Signature- Related Crime scenarios, Digital forensics case Illustrations, Online scams.	04
6.	Cyber law: Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies-AI/ML, IOT, Block chain, Dark net and social media, Cyber Laws of other countries.	04
TOTAL		26
Text Books:		
1. Michael E. Whitman, Herbert J. Mattord, (2018), “Principles of Information Security”, 6th edition, Cenage Learning, N. Delhi. 2. Chris Reed & John Angel, “Computer Law”, OUP, New York, (2007). 3. Prasad R.S., “Cyber Crime an Introduction”. 4. Ed. Kumar Krishna, “Cyber Laws”.		
Reference Books:		
1. Angus M. Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008. 2. Sushma Arora, Raman Arora, “Cyber Crimes & Laws”, 4th Edition 2021, Publisher: Taxmann, 3. N S Nappinai, “Technology Laws Decoded”, 1st Edition, Publisher: Lexis Nexis.		
E-Resources:		
1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview 2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview 3. https://onlinecourses.nptel.ac.in/noc25_cs116/preview		

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Sustainability and Climate Change)							Code: 25ALOE402B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Students should have knowledge about current environmental issues, various types of pollution and the concept of sustainable development.									
Course Objectives:									
1. To introduce the fundamental concepts and definitions of sustainability									
2. To equip students with knowledge of sustainable construction solutions.									
3. To develop an understanding of the Earth's climate system, assess the impacts of climate change, and evaluate the vulnerabilities of natural systems.									
Course Outcomes: After the completion of course, students will be able to									
CO1	Explain the principles, challenges, global agreements, and legislations related to sustainable development and environmental protection.								
CO2	Apply green materials, energy-water efficiency strategies, and green building rating systems to develop sustainable infrastructure solutions.								
CO3	Analyze the earth’s climate system, human influences, and observed trends to understand the fundamentals of climate change.								
CO4	Evaluate the causes, impacts, and physical evidence of climate change at global and regional scales.								
CO5	Assess the sectoral impacts of climate change on natural systems, infrastructure, and human health.								
CO6	Recommend mitigation strategies and policy measures through international frameworks and technological interventions to address climate change.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Sustainable Development: Definitions & Dimensions: sustainability, Brundtland Report, triple bottom line (economic, social, environmental), Global & Local Environmental Challenges: resource depletion, climate change, pollution, Agenda 21, CDM, Paris/Kyoto Protocols, Clean Development Mechanism, Environmental Legislation & Standards: ISO 14000 series, Indian Water & Air Acts.								05
2.	Sustainable Solutions: Green Materials & Techniques: low-VOC paints, agro-waste bricks, bamboo, ferro-cement, stabilized soil blocks. Energy & Water Efficiency: passive design, renewable/solar/wind energy, rainwater harvesting, EIA in construction. Green Building Systems: LEED, GRIHA, ECBC, BREEAM rating frameworks for sustainable infrastructure.								05

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~~Climate & Climate Change Fundamentals:~~

3.	Earth's Climate System: Atmosphere structure, energy balance, greenhouse effect, climate zones, monsoons, El Niño/La Niña Human Influence: Greenhouse gas emissions, global warming trends, carbon cycle, RCP/SSP scenarios, Indian climate observations	04
4.	Climate Change Impact: Climate Change Impact: Temperature shifts, sea-level rise, extreme weather, glacier melt, urban heat islands, Natural vs. anthropogenic causes; Milankovitch cycles, anthropogenic emissions. Physical evidence: rising global temperatures, melting glaciers, sea-level rise, extreme weather trends in India and globally.	04
5.	Impacts on Natural System: Sectoral impacts: agriculture, water resources, infrastructure, coastal zones, urban systems including heat islands, flooding, human health	04
6.	Mitigation & Policy Measures: International policy processes: UNFCCC, IPCC, Kyoto/Montreal Protocols, CDM & carbon trading Technological and engineering mitigation: renewable energy, CCS, reflective surfaces (cool roofs), bioengineering (e.g., slope stabilization)	04
TOTAL		26

Text Books:

1. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science", Pearson Education.
2. D. N. Murty, "Sustainable Development", Himalaya Publishing House.
3. Peter P. Rogers, Kazi F. Jalal, and John A. Boyd, "An Introduction to Sustainable Development", Routledge, Earthscan Series.
4. N. H. Ravindranath and Jayant Sathaye, "Climate Change and Developing Countries", Springer.

Reference Books:

1. K. S. Jagadish et al., "Alternative Building Materials & Technologies", New Age International Publishers.
2. P. T. Anastas and J. B. Zimmerman, "Principles of Green Engineering", Oxford University Press.
3. David T. Allen and David R. Shonnard, "Sustainability Engineering: Concepts, Design & Case Studies", Pearson Education.
4. S. Kumar Dash, "Climate Change – An Indian Perspective", Cambridge University Press, 2007.
5. John M. Wallace and Peter V. Hobbs, "Atmospheric Science: An Introductory Survey", Elsevier Academic Press, 2006.
6. IPCC Assessments, Intergovernmental Panel on Climate Change (IPCC), as referenced in Anna University syllabus.

E-Resources: DEPARTMENT OF INFORMATION TECHNOLOGY

1. UNEP (United Nations Environment Programme)
<https://www.unep.org/resources>
2. IPCC (Intergovernmental Panel on Climate Change) Reports
<https://www.ipcc.ch/reports/>
3. edX - Sustainability Courses
<https://www.edx.org/learn/sustainability>
4. Coursera - Climate Change Courses
<https://www.coursera.org/courses?query=climate%20change>
5. NASA Global Climate Change: Vital Signs of the Planet
<https://climate.nasa.gov/>
6. World Bank Open Knowledge Repository
<https://openknowledge.worldbank.org/>
7. UC Berkeley Environmental Courses (Search for PDFs)
<https://nature.berkeley.edu/classes/>
8. MIT Open Courseware - Environmental Topics
<https://ocw.mit.edu/courses/find-by-topic/#cat=environment>

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Energy Audit and Electrical Safety)							Code: 25ALOE402C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Concept of power & energy in three phase & single phase, Various electrical equipment & specifications									
Course Objectives:									

2.	Energy Management & Audit: Definition, need and types of energy audit. Energy management (audit) approach-	05
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	understanding energy costs, benchmarking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments, Facility as an energy system, Energy analysis and the Sankey Diagram, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager, force field analysis, Energy policies and its purpose.	
3.	Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of ESCOs, Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques -energy consumption, production, cumulative sum of difference (CUSUM).	04
4.	Energy Efficiency in Electrical Utilities: Electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors, energy conservation opportunities in Fans, Blower, Pumps, Lighting System.	04
5.	Introduction to Electrical Safety, Shocks And Their Prevention: Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, principles of electrical safety, Primary and secondary electrical shocks, causes of electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns in residential buildings and shops.	04
6.	Safety During Installation of Plant and Equipment: Introduction, preliminary preparations, preconditions for start of installation work, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines.	04
TOTAL		26

Text Books:

1. Energy Audit and Management, Volume-I, IECC Press.
2. W.R. Murphy, G. McKay Butter worth, "Energy management", Elsevier/bsp Books Pvt. Ltd., 2003.
3. Gupta B. R.: Generation of Electrical Energy, Eurasia Publishing House Pvt. Ltd., New Delhi, 2001
4. Prasanna Chandra, "Financial management", Tata McGraw Hill, 10th Edition, 2019.
5. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
6. Pradeep Chaturvedi, "Energy Management Policy, Planning & Utilization", Concept Publishing.

Reference Books:

1. Albert Thumann, P.E., C.E.M. William J. Younger, "Handbook of Energy Audits", River Publishers,
2. Paul O'Callaghan, "Energy management", McGraw-Hill Education, 1992.

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| <p>3. CB Smith, “Energy Management Principles” Pergamon Press, New York.</p> <p>4. W. C. Turner, “Energy Management Hand Book”. John Wiley and sons.</p> |
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E-Resources:

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| <p>1. NPTEL course on Basic Principles of Energy Management & Energy Audit, By Dr. R. N. Patel & Dr. Akhilesh Kumar Tiwari, Chhattisgarh Swami Vivekanand Technical University, Bhilai.
Basic Principles of Energy Management & Energy Audit - Course</p> <p>2. NPTEL course on Building Energy Systems and Auditing, By Prof. Shankha Pratim Bhattacharya, IIT Kharagpur.
Building Energy Systems and Auditing - Course</p> |
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DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Digital Marketing)							Code: 25ALOE402D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Fundamentals of Business, Digital Tools									
Course Objectives:									
1. To understand digital marketing & process of website design. 2. To identify the keywords for a website & understand the SEO. 3. To Study the various Digital Marketing Tools. 4. To learn the use of social media websites for Digital Marketing. 5. To be Conversant with Linked In platform. 6. To know the recent trends in Digital Marketing.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Design websites using free tools like WordPress and explore it for digital marketing.								
CO2	Apply various keywords for a website & to perform SEO.								
CO3	Understand the various SEM Tools and implement the Digital Marketing Tools.								
CO4	Illustrate the use of Facebook, Instagram and YouTube for Digital Marketing in real life.								
CO5	Use Linked in platform for various campaigning.								
CO6	Understand the importance of recent trends in digital marketing.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Digital Marketing Planning and Structure: Importance of Digital Marketing, Digital Marketing Vs. Traditional Marketing, Inbound vs Outbound Marketing, Understanding Demographics. WWW, Buying a Domain, Core Objective of Website and Flow, One Page Website, Strategic Design of Products & Services Page, Strategic Design of Landing Page, Segmentation & Targeting and Positioning to Digital Marketing, Portfolio, Gallery and Contact Designing Wordpress Website.								04
2.	Search Engine Optimization (SEO): Fundamentals; Keywords and SEO Content Plan; SEO & Business Objectives; Writing SEO Content; On-site & off-site SEO; Optimize Organic Search Ranking, Website SEO Auditing. Introduction to Web Analytics								04
3.	Search Engine Marketing: Importance of Adwords, Google Ad Types, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planner, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Search Engine Marketing (SEM) Tools, Bidding Strategy for CPC.								05

DEPARTMENT OF INFORMATION TECHNOLOGY

~~Case Studies, Conversion Tracking Code, Designing Image Ads, Creating Video Ads, Youtube Video Promotion~~

4.	Social Media Marketing (SMM) Part 1: B to C Perspective, B to B Perspective: Introduction; Major Social Media Platforms for Marketing; Developing Data-driven Audience & Campaign Insights; Social Media for Business. Facebook & Instagram Marketing: Understanding of Facebook Marketing, Types of Facebook Advertising, Creating first ad on Facebook, Setting Campaign and optimization, Facebook Power Editor, Facebook Video Marketing, Facebook App & Shopping Marketing. Youtube Marketing: YouTube Account Setup (Create a business account with a personal account), YouTube Monetization, YouTube Ads, YouTube Analytics.	05
5.	Social Media Marketing (SMM) Part 2: LinkedIn Advertising: How to use LinkedIn Professionally, Types of LinkedIn Advertising, LinkedIn New feed Advertising, LinkedIn Message Pitching, Traffic and Leads Generation, Billing and Report. Email Marketing: Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, Web Forms Lead Importing, Integrating Landing Page Forms, Campaign Reports and Insights, Segmentation Strategy, Responder Tracker.	04
6.	Upcoming Trends in Digital Marketing: Podcast, OTT Platforms, Mob-Ad, No Click Searches, Google Verified Listing, Voice Search, Visual Search, Online Reviews, Automated and Smart Bidding, Chatbots, Affiliate Marketing.	04
TOTAL		26

Text Books :

1. Cory Rabazinsky, "Google-Ad words for Beginners: A Do-It-Yourself Guide to PPC Advertising".
2. Ian Brodie, "Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing".
3. Jan Zimmerman and Deborah, "Social Media Marketing All-In-One for Dummies".
4. Dave Chaffey, Fiona Ellis-Chadwick, Kevin Johnston, Richard Mayer, "Internet Marketing", Pearson Education.
5. Oliver J Rich, "Digital Marketing".
6. Gerry T. Warner and Joe Wilson Schaefer "Online Marketing".

Reference Books:

1. Prof. Seema Gupta, "Digital Marketing", McGraw Hill Publications.
2. Judy Strauss, Adel Ansary, Raymond Frost, Prentice Hall, "E- Marketing".
3. Dr. Andy Williams, "WordPress for Beginners 2020: A Visual Step-by-Step Guide to Mastering WordPress".
4. Cecilia Figueroa, "Introduction To Digital Marketing 101", BPB Publications.
5. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley; 1st edition (2016).

E-Resources: DEPARTMENT OF INFORMATION TECHNOLOGY

1. Digital Tools Certification- By Google.

Link of the Course: <https://skillshop.exceedlms.com/student/catalog>

2. Swayam Certification course on, “Digital Marketing”, by Dr. Tejindarpal Singh Panjab University Chandigarh.

Link of the Course: https://swayam.gov.in/nd2_ugc19_hs26/preview

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech. (Robotics & Automation Engineering)							Semester: IV		
Course: Open Elective – II (Entrepreneurship and Innovations)							Code: 25ALOE402E		
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Professional Development, Quality Management System									
Course Objectives:									
1. To learn the student’s various aspects of innovation and methods of fostering Innovation									
2. To appreciate the importance of embarking on self-employment and has developed the confidence and personal skills for the same.									
3. To start a small business enterprise by liaising with different stake holders.									
4. To effectively manage small business enterprise.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand the key concepts of innovation								
CO2	Identify and analyze opportunities for innovation								
CO3	Recognize the potential and value of self-employment								
CO4	Develop a viable business plan for a small enterprise								
CO5	Apply financial principles to plan and structure engineering and automation projects effectively								
CO6	Apply fundamental principles of management								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Innovation: Creativity, Invention and innovation, Types of Innovation, Relevance of Technology for Innovation, The Indian innovations and opportunities, Promoting and managing innovation, Innovators and Imitators, Patents, Trademarks, Intellectual Property, Exploring, Executing, Leveraging and renewing innovation, Enhancing Innovation Potential & Formulating strategies for Innovation								04
2.	Strategy for Commercializing Innovation: Innovation Process, Risks and barriers for introducing products and services, selecting a Strategy, setting up the Investment and establishing organization, Evaluating the Costs and impact of the Project								04
3.	Entrepreneurship: Definition. Growth of industries in developing countries; role of industries in the national economy; characteristics; demand based and resources based ancillaries and sub-control types. Government policies, stages in starting an industry, types (family business/start-ups etc.), Sources of finance								04

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4.	Project Identification and Accountancy: Assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, Accountancy: Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, preparation of financial reports, accounts and stores studies.	04
5.	Project Planning and Control: The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.	05
6	Laws: Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	05
TOTAL		26
Text Books:		
1. Rabindra N. Kanungo, "Entrepreneurship and Innovation", Sage Publications, New Delhi, 1998. 2. Donald F. Kuratko, "Entrepreneurship – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014. 3. Peter F. Drucker, "Innovation and Entrepreneurship", Butterworth-Heinemann.		
Reference Books:		
1. Robin Lowe and Sue Marriott, "Enterprise: Entrepreneurship and Innovation – Concepts, Contexts and Commercialization", Butterworth-Heinemann. 2. S. S. Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013. 3. Joseph L. Massie, "Essentials of Management", Prentice Hall of India.		
E-Resources:		
1. https://ocw.mit.edu/collections/entrepreneurship/ 2. https://onlinecourses.nptel.ac.in/		

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: E-Commerce							Code: 25ITMC402		
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
01	-	01	02	-	-	25	-	-	25
Prerequisites:									
1. Basic knowledge of the Internet and the World Wide Web 2. Familiarity with business or commerce principles 3. Interest in digital platforms and technologies									
Course Objectives:									
1. To provide an understanding of fundamental concepts and models in E-Commerce. 2. To familiarize students with digital business strategies and payment systems. 3. To develop awareness of legal, ethical, and security issues in E-Commerce. 4. To give exposure to digital marketing and E-Commerce tools.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand the foundations and evolution of E-Commerce and its business models.								
CO2	Analyze various payment systems, technologies, and infrastructure of E-Commerce.								
CO3	Examine security and legal frameworks applicable to E-Commerce.								
CO4	Evaluate the ethical, social, and regulatory concerns in digital commerce.								
CO5	Apply digital marketing strategies to online businesses.								
CO6	Develop and demonstrate a basic E-Commerce prototype or campaign.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to E-Commerce: Definition, history, and evolution; traditional vs. electronic commerce; E-Commerce framework and business impact; features and limitations of E-Commerce.								02
2.	E-Commerce Business Models: B2B, B2C, C2C, C2B, G2C; revenue models; case studies (Amazon, Flipkart, Meesho, etc.); advantages and challenges.								02
3.	E-Commerce Infrastructure: Internet and WWW, web hosting, domain registration, client-server architecture; overview of E-Commerce platforms (Shopify, Wix, WooCommerce).								03
4.	Electronic Payment Systems & Security: Payment methods: credit/debit cards, wallets, UPI, net banking; digital signatures; SSL; common threats and prevention; e-fraud case studies.								02
5.	Legal, Ethical & Regulatory Issues: Overview of IT Act 2000, data protection laws (GDPR); privacy concerns; ethical and IPR issues in digital business.								02

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6.	Digital Marketing & Strategy: Introduction to SEO, SEM, affiliate marketing, email campaigns, and social media marketing; use of Google Ads, Meta Ads, CRM tools.	02
TOTAL		13
Text Books:		
1. P.T. Joseph, "E-Commerce: An Indian Perspective", PHI Learning 2. Kenneth C. Laudon & Carol Guercio Traver, "E-Commerce 2023", Pearson		
Reference Books:		
1. S.J. Joseph, "E-Commerce: A Managerial Perspective", Prentice Hall 2. Elias M. Awad, "Electronic Commerce: From Vision to Fulfilment", Pearson		
E-Resources:		
1. NPTEL: https://nptel.ac.in 2. Google Digital Garage: https://learndigital.withgoogle.com 3. HubSpot Academy: https://academy.hubspot.com		

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: Quantitative Aptitude & Numerical Analysis							Code: 25ITAE402		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
1. Basic knowledge of Mathematics at Higher Secondary Level									
2. Familiarity with basic logical reasoning and problem-solving skills									
Course Objectives:									
1. To develop and enhance quantitative aptitude and numerical problem-solving skills.									
2. To train students in basic numerical techniques useful for competitive exams and placements.									
3. To encourage analytical thinking and logical reasoning									
Course Outcomes: After completion of this course, students will able to -									
CO1	Solve basic and advanced quantitative aptitude problems.								
CO2	Apply shortcut methods for fast calculations in aptitude questions.								
CO3	Develop logical reasoning skills for competitive exams.								
CO4	Use numerical techniques to solve real-life problems.								
CO5	Improve accuracy and speed in solving numerical analysis problems.								
CO6	Demonstrate confidence in attempting placement and entrance tests.								
Guidelines for Instructor's Manual									
The instructor’s manual should contain detailed solutions and clear explanations for each assignment included in the lab syllabus. It should also mention alternative methods for solving problems where applicable and provide additional practice questions to help students strengthen their understanding. The manual must support instructors in conducting the practical sessions smoothly and effectively.									
Guidelines for Student's Lab Journal									
Each student must maintain a well-organized lab journal, which should include the problem statement, a detailed step-by-step solution, and the final answer for every assignment. Students should write their observations and conclusions after completing each practical. The journal should reflect neatness, clarity, and completeness, ensuring it serves as a valuable reference for revision.									
Guidelines for Lab /TW Assessment									
Term work should be evaluated continuously throughout the semester. Marks should be awarded based on the regularity and punctuality of submissions, the correctness and completeness of solutions, and the student’s understanding of the methods used. Viva voce examinations should also be conducted periodically to assess the student’s conceptual clarity and problem-solving approach.									
Guidelines for Practical Examination									
The practical examination should test the student’s ability to solve given numerical and aptitude problems accurately within a limited time frame. Along with the problem-solving part, an oral examination should be conducted to check the student’s understanding of the methods and logic									

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applied during the practical's. The exam should ensure that students can confidently apply the techniques learned during the course.

Guidelines for Laboratory Conduction

Practical sessions should begin with an explanation of the relevant concepts and shortcut methods, followed by solving a few examples as a demonstration. Instructors should encourage students to discuss alternative approaches and share problem-solving tips among peers. Ample practice problems should be given during lab hours to reinforce learning and improve speed and accuracy.

List of Assignments:

1. To solve problems based on number systems including even-odd numbers, divisibility rules, and digit sums using shortcut methods.
2. To find the Highest Common Factor (HCF) and Least Common Multiple (LCM) of numbers and apply shortcut techniques for fast calculations.
3. To solve various percentage-based problems related to profit, loss, discounts, and marked price efficiently using quick methods.
4. To apply profit and loss formulas to practical business scenarios and calculate gains or losses using fast techniques.
5. To solve problems on ratio, proportion, and partnership using direct and inverse methods and learn practical applications.
6. To analyze time and work problems involving efficiency, multiple workers, and pipes & cisterns using various shortcut approaches.
7. To calculate time, speed, and distance for different situations including trains, boats & streams, and relative speed problems.
8. To compute simple and compound interest for different principal amounts, rates, and time periods and understand installment calculations.
9. To interpret and analyze data using tables, bar graphs, pie charts, and line graphs and solve related questions accurately.
10. To solve problems on permutations and combinations and apply counting principles for arrangements and selections.
11. To understand and solve basic probability problems including independent and dependent events and real-life applications.
12. To apply the properties of logarithms to simplify and solve exponential equations and real-life numerical problems.

Text Books:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publishing.

Reference Books:

1. Arun Sharma, "How to Prepare for Quantitative Aptitude for CAT", McGraw Hill.
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill.

E-Resources:

1. www.indiabix.com
2. www.lofoya.com

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: Programming Lab – II (Python Programming)							Code: 25ITVS404		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	04	-	02	-	-	25	-	25	50
Prerequisites:									
Basic understanding of programming logic (preferably C/C++), Knowledge of flowcharts, algorithms, and data types									
Course Objectives:									
1. To introduce Python programming language for general-purpose and application development. 2. To develop the ability to write simple to intermediate Python programs. 3. To implement object-oriented and modular programming in Python. 4. To utilize Python libraries for real-world problems including data handling.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand Python syntax, data types, and control structures.								
CO2	Develop Python programs using functions, modules, and file handling.								
CO3	Implement object-oriented programming concepts in Python.								
CO4	Use libraries like NumPy and Pandas for data processing.								
CO5	Solve real-world problems using Python scripting.								
CO6	Analyze and debug Python programs to improve code efficiency and readability.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Python: Overview of Python, features, applications, Python interpreter, comments, indentation, basic syntax, variables, keywords, operators, input/output, basic data types: int, float, string, Boolean, Python Casting								08
2.	Control Structures and Data Structures: Conditional statements (if, elif, else), loops (for, while), loop control statements (break, continue). Data structures – lists, tuples, sets, dictionaries – creation, operations, and methods.								08
3.	Functions, Modules and Date-Time: Defining and calling functions, argument types, return values, recursion. Lambda functions. Modules – built-in and user-defined. Packages and main, datetime, date, time, timedelta, Formatting dates using strftime / strptime								09

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4.	Object Oriented Programming in Python: Classes and objects, constructor, instance and class variables, inheritance, method overriding, polymorphism, encapsulation.	09
5.	File Handling, Exception Handling and Regular Expressions: Opening, reading, writing files, file modes. Exception handling – try, except, else, finally, custom exceptions, re module, Searching, matching, replacing	09
6.	Data Processing with Libraries: Introduction to NumPy – arrays, Dimensions in array, Indexing in Numpy, Numpy functions, vectorized operations. Pandas – Series, DataFrame, file I/O (CSV, Excel), basic operations. Simple data visualization using Matplotlib.	09
TOTAL		52

List of Assignments: - (Perform Any 10 Practical's)

- Write a Python program to accept a number from the user and check whether it is even or odd. Then, use a for loop to display the multiplication table of that number from 1 to 10.
- Create a list of five student names and display each using a loop. Then create a dictionary to store the names and their marks, and display the highest marks using a dictionary method.
- Write a function to calculate the **simple interest** using parameters: principal, rate, and time. Also write a recursive function to find the **factorial** of a number entered by the user.
- Create a user-defined module math_utils.py with functions for square () and cube(). Write a main Python program that imports this module and uses these functions for user input. Also, ask the user for their birthdate (in DD-MM-YYYY format) and display:
 - Their age in years
 - Day of the week they were born
 - Days left until their next birthday
- Create a class Student with attributes name and roll number. Add a method to display student details. Create an object of the class and call the method.
- Write a program that accepts a string from the user and writes it into a file data.txt. Then, read the content back and display it. Handle exceptions like file not found and input errors.
- Write a Python program to:
 - Validate an email address using regular expressions
 - Extract all mobile numbers from a given multiline string
 - Replace all whitespace with a hyphen in a given sentence
- Create a NumPy array of 5 elements and display the array. Perform operations like array addition, mean, and sorting.
- Create a DataFrame from a dictionary containing employee names and salaries. Display the DataFrame and calculate the average salary using Pandas.
- Write a Python program using Matplotlib to draw a bar chart showing the marks of 5 subjects. Add proper labels and title.

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11. Write a program that accepts a list of filenames from the user and checks which of them exist in the current directory using the os module.
12. Create a simple student record keeper that stores name and marks using a dictionary. Allow the user to add, search, and delete records using functions.

Text Books:

1. Reema Thareja, "Python Programming", Oxford University Press
2. E. Balagurusamy, "Introduction to Computing and Problem Solving with Python", McGraw-Hill

Reference Books:

1. Mark Lutz, "Learning Python", O'Reilly
2. Allen B. Downey, "Think Python", O'Reilly

E-Resources:

1. NPTEL Online Courses: <https://nptel.ac.in>
2. W3Schools: <https://www.w3schools.com>
3. GeeksforGeeks: <https://www.geeksforgeeks.org>
4. Coursera: <https://www.coursera.org>

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Liberal Learning - IV

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Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Guitar)							Code: 25ITCC406A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To develop advanced technical proficiency, musical interpretation, and performance skills through complex repertoire.									
2. To enhance creativity, improvisation, composition, and theoretical understanding across multiple musical genres.									
3. To strengthen ensemble leadership, stage performance, and professional musicianship for advanced musical pursuits.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Perform advanced guitar repertoire with technical accuracy, musical expression, and stylistic interpretation.								
CO2	Apply advanced harmony, rhythm, improvisation, composition, and performance techniques across different musical genres.								
CO3	Demonstrate ensemble leadership, collaboration, stage etiquette, and professional musicianship.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Semester III Concepts								2
2.	Advanced Chord Voicings & Inversions								2
3.	Modal Scales & Advanced Scale Applications								2
4.	Improvisation over Chord Progressions								2
5.	Advanced Fingerstyle & Hybrid Picking								2
6.	Guitar Solo Techniques – Bends, Vibrato, Legato								2
7.	Song Arrangement & Musical Interpretation								2
8.	Introduction to Composition & Melody Writing								2
9.	Ensemble Rehearsal & Musical Communication								2
10.	Genre-based Performance (Jazz, Rock, Blues, Contemporary)								2
11.	Stage Performance Techniques & Performance Psychology								2
12.	Mock Recital & Individual Feedback								2
13.	Final Rehearsal & Performance Preparation								2
TOTAL								26	

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Text Books:

1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.
2. Mel Bay, "Modern Guitar Method – Grade 1, 2 & 3", Mel Bay Publications.
3. Leavitt, W., "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Stetina, T., "Fretboard Mastery", Hal Leonard Publications.
5. Kolb, T., "Music Theory for Guitarists", Hal Leonard Publications.

Reference Books:

1. Chapman, R., "The Complete Guitar Manual", DK Publishing.
2. Latareski, D., "Practical Theory for Guitar", Alfred Music.
3. Denyer, R., "The Guitar Handbook", Knopf Publishing.
4. Buckingham, B., "Scales and Modes for Guitar", Hal Leonard Publications.

E-Resources:

1. Berklee Online – Guitar lessons, music theory, ear training, and performance resources.
<https://online.berklee.edu>
2. JustinGuitar – Structured guitar lessons from beginner to advanced.
<https://www.justinguitar.com>
3. Fender Play – Interactive lessons on chords, scales, techniques, and songs.
<https://www.fender.com/play>
4. TrueFire – Professional online guitar courses covering multiple genres and techniques.
<https://truefire.com>
5. Ultimate Guitar – Tabs, chord charts, scales, and community resources.
<https://www.ultimate-guitar.com>
6. MuseScore – Free music notation software and sheet music library.
<https://musescore.org>
7. MusicTheory.net – Interactive music theory lessons and exercises.
<https://www.musictheory.net>
8. Yamaha Music India – Educational resources on guitar fundamentals and musicianship.
<https://in.yamaha.com>

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Singing)							Code: 25ITCC406B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To develop voice modulation, singing, and expression techniques across different musical genres.									
2. To familiarize students with microphone handling, studio setup, microphone placement, and recording practices.									
3. To enhance students’ recording and stage performance skills through practical application of raga, tala, rasa, and presentation techniques.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply voice modulation, pitch control, and singing techniques in various styles.								
CO2	Perform Khayal, Semi-Classical, and Folk compositions with musical expression.								
CO3	Demonstrate microphone handling, recording skills, and stage presentation.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Voice range development and voice modulation, Pitch control and tonal accuracy								4
2.	Voice culture for studio singing								4
3.	Singing techniques in different genres: Light Music, Film Songs, Ghazals, Lavani etc., Expression according to song style								4
4.	Vilambit Khayal, Drut Khayal								4
5.	Semi-Classical Music, Folk Music								2
6.	Performance practice, Stage presentation skills								2
7.	Knowledge of Raga and Tala, Rasa and Musical Expression								2
8.	Studio setup, Microphone handling techniques, Microphone placement, Recording techniques, Recording practice								4
TOTAL								26	
Text Books:									
1. Bhatkhande, V. N., "Kramik Pustak Malika (Vol. III & IV)", Hindustani Music Publications.									
2. Paluskar, V. D., "Sangeet Bal Prakash", Gandharva Mahavidyalaya Mandal.									
Reference Books:									
1. Bhatkhande, V. N., "Hindustani Sangeet Paddhati (Vol. I–IV)", Sangeet Karyalaya.									
2. Ranade, A. D., "Hindustani Music: Tradition in Transition", Promilla & Co. Publishers.									
3. Ratanjankar, S. N., "Abhinav Geet Manjari", Sangeet Karyalaya.									

E-Resources: DEPARTMENT OF INFORMATION TECHNOLOGY
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| <ol style="list-style-type: none">1. Sangeet Natak Akademi2. All India Radio (Akashvani)3. SwarGanga Music Foundation4. YouTube – Sangeet Natak Akademi Channel5. Digital Tanpura and Tabla Applications (e.g., iTanpura, Riyaz, NaadSadhana) |
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Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Cinematography)							Code: 25ITCC406C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.									
Course Objectives:									
1. To develop proficiency in camera operation, exposure settings, and photographic composition. 2. To apply lighting techniques and visual storytelling principles across different photography genres. 3. To develop basic image editing and post-processing skills using appropriate software. 4. To enhance creative, technical, and professional skills for effective photography practice.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Operate cameras confidently and use various camera settings effectively.								
CO2	Apply exposure principles by controlling aperture, shutter speed, and ISO to capture quality images.								
CO3	Compose visually appealing photographs using principles of composition and design.								
CO4	Utilize natural and artificial lighting techniques to enhance photographic results.								
CO5	Capture photographs in different genres such as portrait, landscape, product, event, and wildlife photography.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision Session Of Sem III								2
2.	Storyboarding and planning								2
3.	Short film Screening								2
4.	Short Film Project (Camera-Phone)								2
5.	Short Film Project								2
6.	Short Film Project								2
7.	Short Film Project								2
8.	Short Film Project								2
9.	Short Film Project								2
10.	Short Film Project Submission								2
11.	Introduction Video Editing								2
12.	Basic Knowledge of Editing Tools								2
13.	Basics Timeline, Color Correction, Transition, Effects								2
TOTAL								26	

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Text Books:

1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.
2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook.

Reference Books:

1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.
2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Illex Press.

E-Resources:

1. <https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxK0m>
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Dance)							Code: 25ITCC406D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
1. To develop advanced dance techniques with precision, coordination, balance, flexibility, and rhythmic control. 2. To enhance expressive skills, musicality, stage presence, and overall performance quality. 3. To develop creativity and choreography skills through individual and group dance compositions. 4. To integrate technique, rhythm, expression, synchronization, and stagecraft in complete performances. 5. To develop leadership, teamwork, discipline, confidence, and professional performance skills through rehearsals, competitions, and cultural events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate advanced dance techniques with precision, coordination, flexibility, balance, and rhythmic control.								
CO2	Apply musicality, expression, synchronization, creativity, and stage presence in individual and group performances.								
CO3	Create and present dance compositions using advanced choreography, formations, transitions, and stagecraft.								
CO4	Plan, rehearse, and perform polished dance presentations for cultural events, competitions, and advanced training.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of prior semester & Warm-up								2
2.	Introduction formatted story telling through dance								2
3.	Learning the First Half of the Composition ,								2
4.	Completion of Composition with Rhythm and introduction to live music dancing format								2
5.	Theme-Based Choreography – Planning and Concept Development								2
6.	Production introduction and choreography completion								2
7.	Lights and stage formative knowledge								2
TOTAL								26	

Text Books: DEPARTMENT OF INFORMATION TECHNOLOGY
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| <ol style="list-style-type: none">1. Bharata Muni, "Natyashastra", translated by Manomohan Ghosh, Asiatic Society, Kolkata.2. Nandikeshvara, "Abhinaya Darpana", translated by Manomohan Ghosh.3. Balasaraswati, T., "Dance", Madras Music Academy.4. Krishna Iyer, E., "Dance", Ganesh & Co., Chennai. |
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Reference Books:

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| <ol style="list-style-type: none">1. Kothari, Sunil, "Dance", Marg Publications, Mumbai.2. Vatsyayan, Kapila, "Dance: Indian Dance in Literature and the Arts", Sangeet Natak Akademi.3. Payne, Helen, "Creative Dance and Movement in Groupwork", Routledge, 2021. |
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E-Resources:

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| <ol style="list-style-type: none">1. https://youtu.be/VTrGVHvWfPA?si=AvKTenB7bpx302R62. https://youtu.be/pG0NmQDKspc?si=AEfhhRAEs9OjNErp3. https://youtu.be/eg-3ybiL6UI?si=AOj0NuGXDupxD2Mt |
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Program: B. Tech (Information Technology)							Semester: IV		
DEPARTMENT OF INFORMATION TECHNOLOGY									
Course: Liberal Learning – IV (Synthesizer/Keyboard)							Code: 25ITCC406E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To strengthen understanding of fundamental keyboard concepts and techniques. 2. To develop proficiency in major and minor scales and arpeggios through practical exercises. 3. To enhance accompaniment, improvisation, and jamming skills through practical performance. 4. To develop listening skills, musical creativity, and ensemble performance techniques.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate improved technical proficiency through advanced practice of Major and Minor Scales.								
CO2	Perform musical pieces based on Minor Scales with proper fingering, expression and dynamics.								
CO3	Apply arpeggio patterns effectively in chord progressions and keyboard performance.								
CO4	Demonstrate accompaniment, improvisation and jamming skills in solo and group performances.								
CO5	Develop listening ability, rhythmic accuracy and musical confidence through ear training and ensemble practice.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Revision of all Major Scales								2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)								2
3.	Revision of Major and Minor Chords,								2
4.	Revision of Chord Progression, Family chords, Chords Inversion								2
5.	Playing Simple Songs with Indian Notation								2
6.	Introduction to Staff Notation								2
7.	Understanding the Difference between Indian and Western Staff								2
8.	Reading and Playing Simple Melodies from Staff Notation								2
9.	Playing Songs using Both Indian and Staff Notation								2
10.	Fundamentals of Keyboard Accompaniment								2
11.	Accompaniment using Major and Minor Chords								2
12.	Accompaniment with Scales and Simple Songs								2
13.	Group Performance								2
TOTAL								26	

Text Books:	DEPARTMENT OF INFORMATION TECHNOLOGY
1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music. 2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music. 3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer. 4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.	
Reference Books:	
1. Thompson, J., "Modern Course for the Piano", Willis Music. 2. Aaron, M., "Piano Course", Alfred Music. 3. Harrison, M., "Contemporary Music Theory", Hal Leonard. 4. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer. 5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.	
E-Resources:	
1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH 2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb	

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech (Information Technology)						Semester: IV			
Course: Liberal Learning – IV (Basketball)						Code: 25ITCC406F			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate fundamental basketball skills including passing, dribbling, shooting, and rebounding.								
CO2	Apply proper footwork, body control, and individual defensive techniques during play.								
CO3	Integrate fundamental skills effectively through drills, small-sided games, and practice matches.								
CO4	Demonstrate teamwork, coordination, confidence, and consistency in basketball performance.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Complete Skill Revision: Review all basketball fundamentals. Recall and perform all basic skills.								2
2.	Passing & Receiving Practice: Improve passing speed and accuracy. Demonstrate efficient passing skills.								2
3.	Dribbling: Enhance control and confidence. Maintain effective dribbling during movement.								2
4.	Shooting: Continue improving shooting technique. Achieve better shooting consistency.								2
5.	Rebounding: Reinforce rebounding fundamentals. Secure rebounds confidently.								2
6.	Individual Defense: Improve defensive positioning. Apply correct defensive techniques.								2
7.	Assessment – VII								2
8.	Body Technique and Footwork: Reinforce movement and balance. Demonstrate efficient basketball footwork.								2
9.	Skill Integration: Combine all fundamental skills. Execute basketball movements smoothly.								2
10.	Partner Skill: Develop teamwork through drills. Improve coordination with teammates.								2
11.	Small Sided Games: Apply skills in simple match situations. Use basketball fundamentals during gameplay.								2

12.	Practice Match Reinforce practical learning. Participate confidently in basketball games.	2
13.	Assessment - VIII	2
TOTAL		26
Text Books:		
1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA) 2. Dr. James Naismith, "Basketball: Its Origin & Development" 3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon		
Reference Books:		
1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press. 2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics		
E-Resources:		
1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners 2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training 3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS] 4. Basketball: Rebounding		

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Program: B. Tech (Information Technology)						Semester: II			
Course: Liberal Learning – II (Cricket)						Code: 25ITCC406G			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic batting, bowling, and fielding skills with consistency.								
CO2	Apply learned cricket skills, coordination, and decision-making during match situations.								
CO3	Demonstrate basic umpiring knowledge, fair play, teamwork, and sportsmanship.								
CO4	Demonstrate overall cricket proficiency through practice and competitive matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Batting Skills: Strengthen all basic batting techniques.								2
2.	Revision of Bowling: Improve consistency and control in bowling.								2
3.	Revision of Fielding Skills: Enhance catching, throwing, and ground fielding.								2
4.	Combined Skill Practice: Practice batting, bowling, and fielding together.								2
5.	Net Practice: Improve performance through focused practice.								2
6.	Team Coordination: Develop communication during play.								2
7.	Assessment - VII								2
8.	Match Awareness Practice Match I: Understand basic match situations / Apply all learned skills in a game.								2
9.	Practice Match II: Improve decision-making during play.								2
10.	Practice Match III: Build confidence through match experience.								2
11.	Basic Umpiring: Learn simple umpiring signals and decisions.								2
12.	Fair Play & Sportsmanship: Understand discipline and ethics in cricket.								2
13.	Assessment - VIII								2
								TOTAL	26
Text Books:									
1. Sridhar, R., "Coaching Beyond", Rupa Publications India.									

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Reference Books:
1. Eastaway, R., "Cricket Explained: From Grubbers to Googlies", St. Martin's Griffin.
E-Resources:
1. How to Play Cricket
2. Cricket rules explained in 2 minutes
3. Every Cricket Shot Explained in 21 Minutes

DEPARTMENT OF INFORMATION TECHNOLOGY

Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Rifle and Pistol Shooting)							Code: 25ITCC406H		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop safe shooting skills, accuracy, concentration, and proper shooting techniques in students.									
2. To build discipline, confidence and prepare shooters for competitive events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, coordination, and posture.								
CO3	Apply mental focus and scientific principles to improve shooting performance.								
CO4	Demonstrate discipline, sportsmanship, and overall shooting proficiency.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Shot calling: Shot calling is the ability to mentally identify the exact location of the shot.								2
2.	Maintain training diary: To maintain notes given by coach								2
3.	Pressure handling: To handle pressure during match, shooters get tensed during match due to crowd or pressure about the performance								2
4.	Full qualification matches: Qualifying test match								2
5.	Final match: Final match between the qualified shooters								2
6.	Dry firing test: To do the whole process of firing the shot but the gun is not loaded								2
7.	Assessment –VII								2
8.	Advanced Accuracy Drills: It is a structured training exercise designed to improve precision, consistency, shot execution and mental control.								2
9.	Mock Competition I: It is a simulated shooting match conducted under actual competition conditions –match no.- 1								2
10.	Mock Competition II: It is a simulated shooting match conducted under actual competition conditions –match no.- 2								2
11.	Equipment Inspection and Adjustment: Learn to adjust the weapon according to the shooter								2
12.	Ethics and sportsmanship: It refers to the moral principles ,values, and respectful behavior that guide shooters during training and competition								2
13.	Assessment – VIII								2
TOTAL								26	

Text Books: DEPARTMENT OF INFORMATION TECHNOLOGY

1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

Reference Books:

1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America
2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras,
<https://nptel.ac.in/courses/109106406>
2. [Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube](#)
3. [Basics of the Standing Position | Sauer Academy](#)
4. [The Ideal Air Rifle Shooter with Abhinav Bindra \[IND\]](#)

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Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Volleyball)							Code: 25ITCC406I		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain the official rules, referee signals, and scoring procedures of volleyball.								
CO2	Demonstrate advanced volleyball skills, fitness components, and position-specific techniques.								
CO3	Apply offensive, defensive, and tactical strategies effectively during competitive play.								
CO4	Demonstrate proficiency in officiating, teamwork, sportsmanship, and overall match performance.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Official Volleyball Rules: History and development of volleyball rules, Court dimensions and equipment specifications, Team composition and player positions, Rotation and substitution rules, Scoring system (Rally Point System), Faults, violations, and penalties, Service order and match regulations.								2
2.	Referee Signals: Duties of the first and second referee, Official hand signals for all game situations, Line judge signals, Communication between officials, Practical demonstration of referee signals.								2
3.	Score Sheet And Match Procedures: Components of the official score sheet, Recording player line-ups and substitutions, Recording time-outs, sanctions, and scores, Match protocol before, during, and after play, Practical score sheet filling								2
4.	Physical Conditioning: Volleyball-specific warm-up exercises, Strength development for upper and lower body, Core stability exercises, Endurance training, Cool-down and recovery methods.								2
5.	Speed And Agility And Plyometric: Sprint drills , Agility ladder exercises, Cone drills , Jump training (plyometrics) , Explosive movement drills for volleyball								2
6.	Flexibility And Injury Prevention: Dynamic and static stretching, Mobility exercises, Common volleyball injuries, Injury prevention techniques, Recovery and rehabilitation basics								2
7.	Assessment - VII								2

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Position Specific Training: Setter responsibilities and drills, Outside hitter		
8.	techniques, Middle blocker skills, Opposite hitter training, Libero defensive techniques, Position-based game practice.	2
9.	Complex Offensive System: 5–1 offensive system, 6–2 offensive system, Quick attack combinations, Setter-hitter coordination, Transition offense, Team offensive strategies.	2
10.	Complex Defensive System: Block defence system, Perimeter defense, Rotation defense, Backcourt positioning, Defensive communication, Transition from defense to attack.	2
11.	Tournament Practice: League and knockout match formats, Tournament scheduling, Team strategy under competition conditions, Match officiating practice, Sportsmanship and fair play.	2
12.	Comprehensive Skill Revision: Revision of all technical skills, Tactical system review, Fitness drills, Match-based practice, Error correction and performance improvement	2
13.	Assessment - VIII	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications 2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics		
Reference Books:		
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics		
E-Resources:		
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube		

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Program: B. Tech (Information Technology)							Semester: IV		
Course: Liberal Learning – IV (Football)							Code: 25ITCC406J		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance football players’ technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate advanced football skills, position-specific techniques, and physical conditioning.								
CO2	Apply leadership, coaching, refereeing, and talent identification skills in football.								
CO3	Analyze match statistics, player performance, and team effectiveness using appropriate methods.								
CO4	Demonstrate teamwork, fair play, ethics, and overall football proficiency in competitive matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Advanced Technical Drills: Develop advanced football techniques through challenging drills that improve skill execution, speed, accuracy, and game adaptability.								2
2.	Position-Specific Training: Understand and apply position-specific skills, roles, and responsibilities to enhance individual performance within the team structure.								2
3.	Leadership & Captaincy: Develop leadership qualities, communication skills, and decision-making abilities to effectively guide and motivate teammates.								2
4.	Football Coaching Methods: Understand and apply effective coaching methods, session planning, and teaching approaches to improve player development.								2
5.	Talent Identification: Understand the principles of talent identification by evaluating technical, physical, tactical, and psychological attributes of players.								2
6.	Strength & Conditioning: Develop football-specific strength, endurance, speed, agility, and conditioning to improve athletic performance and reduce injury risk.								2
7.	Assessment-VII								2
8.	Refereeing & Match Officiating: Understand the laws of the game and develop basic refereeing skills for fair and effective match officiating.								2
9.	Match Statistics & Performance Analysis: Analyze match statistics and performance data to evaluate player contributions, team effectiveness, and areas for improvement.								2
10.	Fair Play & Professional Ethics: Understand the importance of fair play, respect, discipline, teamwork, and ethical behavior in football.								2

11.	Tournament Practical: Apply technical, tactical, physical, and teamwork skills in a competitive tournament environment.	2
12.	Final Competitive Match: Demonstrate overall football development by applying skills, tactics, teamwork, and sportsmanship in a competitive match setting.	2
13.	Assessment-VIII	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA. 2. International Football Association Board (IFAB), "Laws of the Game", IFAB.		
Reference Books:		
1. Hughes, C., "The Winning Formula in Soccer", Meyer & Meyer Sport. 2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA. 3. International Football Association Board (IFAB), "Laws of the Game", IFAB		
E-Resources:		
1. Beginner's guide to football Football for dummies 2. Every position in soccer explained 3. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners		

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Program: B. Tech. (Information Technology)							Semester: IV		
Course: Internship – II							Code: 25ITIN402		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	-	-	02	-	-	25	-	-	25
Preamble:									
Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.									
Course Objectives:									
1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry. 2. Learn to implement the technical knowledge in real industrial situations.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.								
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.								
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.								
Internship Requirements									
1. Internship Duration: It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW). 2. Internship Opportunities: Students can explore various opportunities for internships at: a. Industries b. Research labs or organizations c. Collegiate clubs d. In-house research projects e. Online internships 3. Support and Assistance: Students can seek assistance for securing internships from: a. The Training and Placement cell, along with departmental coordinators b. Department or institute faculty members c. Personal contacts d. Directly connecting with industries or organizations 4. Request Letter: Once an industry, research organization, or collegiate club is identified,									

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students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.