AC –02/2024
Item No. –iii

As per NEP 2020

SRDSP Mandal's

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi-416510 (Autonomous)
Affiliated to University of Mumbai

Title of the program: **Science**
B.Sc. (Information Technology)

A. U.G. Certificate in Information Technology
B. U.G. Diploma in in Information Technology
C. B. Sc. (Information Technology)

Syllabus for
Sem-III and Sem-IV

Ref: GR dated 20th April 2023 for Credit structure of UG
(With Effect from the academic year 2024-25 progressively)

Sr. No.	Headings	Particulars	
1	Title of the Program	**A**	U.G. Certificate in Information Technology
		B	**U.G. Diploma in Information Technology**
		C	B. Sc. (Information Technology**)**
2	Eligibility	**B**	A candidate who has completed Diploma in IT/CS/Electrical/Electronics/Mechanical/ Civil/Electronics and Telecommunication /Instrumentation and/or allied branches from MSBTE or equivalent board (OR) Under Graduate Certificate in Information Technology
3.	Duration of the Programme	**A**	One Year
		B	Two Years
		C	Three Years
4.	Intake Capacity	60/Division	
5.	Scheme of Examination		60% External : 40% Internal Semester End Examination Individual Passing in External and Internal examination
6.	Standard of Passing		40%
7.	**Credit Structure** **Sem I –** **Sem II –**		
	Sem III – **Sem IV –**		
	Sem V – **Sem VI –**		
8.	Semester	**A**	**SEM I & II**
		B	**SEM III & IV**
		C	**SEM V & VI**
9.	Program Academic Level	**A**	4.5
		B	5.0
		C	5.5

10	Pattern	**Semester**
11	Status	**New**
12	To be implemented from Academic Year Progressively	**From Academic Year: 2024-25**

Committee for Creation of Syllabus

Sign of the BOS
Chairman
Mrs. A.Y.Godkar
Information Technology

Sign of
BOS

Sign of

Proposed First Year Credit Structure as per NEP 2020

Department of Information Technology

Proposed Structure for Major / Minor/OE/VSE/SEC/VEC/IKS/VEC

Level 5.0					
Semester	**Subject code**	**Subject name**	**Th/ Pract**	**Category**	**Cr.**
III	S201ITT	Core Java	TH	Major	8
	S202ITT	Data Structure	TH		
	S203ITP	Practical-I (S201ITT&202ITT)	Pract		
	S204ITT	Database Management System	TH		
	S205ITT	Applied Mathematics	TH	Minor	4
	S206ITT	Introduction to Data Science	TH		
	ITOE05T	Information Technology in Banking & Insurance - I	TH	OE	2
	ITVS03P	PL SQL and STAR UML	Pract	VSC	2
	ITAE03T	English Communication (Grammar)	TH	AEC	6
	ITCC02P	Android App Development	Pract	CC	
	ITFP01P	FP	Pract	FP	
				Total	**22**
IV	S207ITT	Computer Network	TH	Major	8
	S208ITT	Computer Graphics and Animation	TH		
	S209ITP	Practical-I (S207ITT&S208ITT)	Pract		
	S210ITT	Data Warehousing	TH		
	S211ITT	Computer Oriented Statical Techniques	TH	Minor	4
	S212ITT	Data Mining	TH		
	ITOE06T	Information Technology in Banking & Insurance - II	TH	OE	2
	ITSE03T	Embedded system	TH	SEC	2
	ITAE04T	Green Computing (EVS)	TH	AEC	2

	ITCC03P	R Programming & Arduino Programming	Pract	CC	2
	ITCEP01	Digital Hygiene		CEP	2
				Total	**22**

SEMESTER III

B. Sc. (Information Technology)	Semester – III
Course Name: Core Java	Course Code: S201ITT
Credits	2

Course Objective:

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

- Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, automatic documentation through comments, error exception handling).
- Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.
- Develop programs using the Java Collection API as well as the Java standard class library.
- Apply object-oriented programming concepts in problem solving through JAVA.

Unit	Details	Lectures
I	**Introduction:** History, Features of Java, Java Development Kit, Java Application Programming Interface, Java Virtual Machine, Java Program Structure. **Classes:** The Class Object and Its Attributes, Constructors, this keyword, super keyword, Types of Classes, Scope Rules, Access Modifier, garbage collection	10
II	**Inheritance:** Inheritance types, Default Base Class Constructors and its types, this and super keywords. Abstract Classes, Abstract Methods, Interfaces. **Exceptions:** Exception handling, its keywords. **Multithreading:** Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization **Packages:** Introduction to predefined packages, User Defined Packages	**10**
III	**Introduction to JFC and Swing**- Features of the Java Foundation Classes, Swing API Components, **Layouts:** Flow Layout, Grid Layout, Border Layout **Event Handling:** Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes	**10**

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, sharnam Shah	SPD	1st	2015
2.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9TH	2014
3.	Murach's beginning Java with Net Beans	Joel Murach , Michael Urban	SPD	1st	2016
4.	Core Java, Volume I: Fundamentals	Hortsman	Pearson	9th	2013
5.	Core Java, Volume II: Advanced Features	Gary Cornell and Hortsman	Pearson	8th	2008
6.	Core Java: An Integrated Approach	R. Nageswara Rao	DreamTech	1st	2008

Course Outcome:

After completing the course, the learner will be able to:

CO1: Learn the architecture of Java

CO2: Identify data types, control flow, classes, inheritance, exceptions and event handling

CO3: Use object-oriented concepts for problem solving real-life applications

CO4: Build GUI programs

CO5: Create event driven programs using java.

B. Sc. (Information Technology)	Semester – III
Course Name: Data Structures	Course Code: S202ITT
Credits	2

Course Objective:

- Ability to analyze the performance of algorithms.
- Ability to choose appropriate algorithm design techniques for solving problems.
- Understand how the choice of data structures and the algorithm design methods impact the performance of programs.

Unit	Details	Lectures
I	**Introduction:** Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. **Linked List:** Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Circular Linked List, Applications of Circular Linked List	10
II	**Stack**: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion**.** **Queue:** Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues. **Sorting and Searching Techniques** Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches.	10

III	**Tree:** Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. **Advanced Tree Structures:** Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree. **Hashing Techniques** Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A Simplified Approach to Data Structures	Lalit Goyal, Vishal Goyal, Pawan Kumar	SPD	1st	2014
2.	An Introduction to Data Structure with Applications	Jean – Paul Tremblay and Paul Sorenson	Tata McGraw Hill	2nd	2007
3.	Data Structure and Algorithm	Maria Rukadikar	SPD	1st	2017
4.	Schaum's Outlines Data structure	Seymour Lipschutz	Tata McGraw Hill	2nd	2005
5.	Data structure – A Pseudocode Approach with C	AM Tanenbaum, Y Langsam and MJ Augustein	Prentice Hall India	2nd	2006
6.	Data structure and Algorithm Analysis in C	Weiss, Mark Allen	Addison Wesley	1st	2006

Course Outcome:

After completing the course, the learner will be able to:

CO1: Identify and distinguish data structure classification, data types, their complexities CO2: Implement array, linked list, stack and queue.

CO3: Implement trees, various hashing techniques and graph for various applications

CO4: Compare various sorting and searching techniques

B. Sc. (Information Technology)	Semester – III
Course Name: Practical-I (S201ITT & S202ITT)	Course Code: S203ITP
Credits	2

UNIT	List of Practical (Core JAVA)		Lecture
Unit I	**1.**	**OOPs concepts in Java – 1**	**10**
	a	Write a program to create a class and implement a default, overloaded and copy Constructor.	
	b	Write a program to create a class and implement the concepts of Method Overloading	
	c	Write a program to create a class and implement the concepts of Static methods	
	2	**OOPs concepts in Java – 2**	
	a.	Write a program to implement the concepts of Inheritance and Method overriding	
	b.	Write a program to implement the concepts of Abstract classes and methods	
	c.	Write a program to implement the concept of interfaces	
	3.	**Demonstrate use of used defined Package**	
Unit II	**4.**	**Exceptions**	10
	a.	Write a program to raise built-in exceptions and raise them as per the requirements	
	b.	Write a program to define user defined exceptions and raise them as per the requirements	
	5.	**Multithreading:**	
	a.	Write a java application to demonstrate 5 bouncing balls of different colors using threads.	
	6.	**Swing**	
	a.	Create a swing application that randomly changes color on button click.	
	b.	Create a Swing application to demonstrate use of TextArea using ScrollPane to show contest of text file in TextArea selected using file chooser	
Unit III	**7.**	**Layouts: Write programs for the following layouts:**	10
	a.	Flow Layout	
	b.	Grid Layout	
	c.	Border Layout	
	8.	**Events: Write programs to demonstrate the following events:**	
	a.	Action Event	
	b.	KeyEvent	
	c.	SelectionEvent	
	d.	MouseEvent	

	e.	FocusEvent	
	9.	**Demonstrate the use of Adapter Class in Event Handling**	
	10.	**Demonstrate the use of Anonymous Inner Class in Event Handling**	

UNIT	**List of Practical (Data Structure)**		**Lecture**
UNIT - I		**Implement the following:**	**10**
	1.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]	
	2.	Write a program to create a single linked list and display the node elements in reverse order.	
	3.	Write a program to search the elements in the linked list and display the same	
	4.	Write a program to create double linked list and sort the elements in the linked list.	
	5.	Write a program to create Circular linked list and Display them	
UNIT - II	6.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.	10
	7.	Write a program to convert an infix expression to postfix and prefix conversion.	
	8.	Write a program to implement Tower of Hanoi problem.	
	9.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.	
	10.	Write a program to implement the concept of Circular Queue	
UNIT - III	11.	Write a program to implement bubble sort, selection sort.	10
	12.	Write a program to implement insertion sort, merge sort.	
	13.	Write a program to search the element using sequential search and binary search	
	14.	Write a program to create the tree and display the elements.	
	15.	Write a program for inorder, postorder and preorder traversal of tree	

Note: Solve any 10 programs.

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Data Structures and Algorithms Using Python	Rance Necaise	Wiley	First	2016
2.	Data Structures Using C and C++	Langsam , Augenstein, Tanenbaum	Pearson	First	2015
3.	Core Java 8 for	Core Java 8 for	Core Java 8 for	Core Java 8 for	Core Java 8 for
4.	Beginners	Beginners	Beginners	Beginners	Beginners

B. Sc. (Information Technology)	Semester – III
Course Name: Database Management System	**Course Code: S204ITT**
Credits	**2**

Course Objectives:

The objective of the course is to present an introduction to fundamentals of database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Unit	Details	Lectures
I	Database system- concept and Architecture, Relational model and Relational database constraints. Relational Algebra.,Conceptual modelling and database design: Data modelling using the Entity Relationship model (ER).The enhanced entity relationship model. Relational database design by ER and EER model. Practical database design methodology and use of UML diagrams.	10
II	Database Design theory and normalization: Basics of functional dependencies and normalization for relational databases. Relational database design and further dependencies.	**10**
III	Transaction management and concurrency control and recovery: Introduction to transaction processing concepts and theory. Concurrency control technique. Database recovery technique.	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Fundamentals of Database systems.	Ramez Elmasri, Shamkant B Navathe	Pearson.	6th	
2	Database Systems: Design implementation and management.	Carlos Coronel, Steven Morris, Peter Rob	Cengage Learning	9th	2010

Course Outcomes:

Learners will be able to

1. Define and describe the fundamental elements of relational database management system.
2. To relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
3. Design ER-models to represent simple database application scenarios.
4. Transform the ER-model to relational tables, populate relational database and formulate SQL queries on data.
5. Improve the database design by normalization.

B. Sc. (Information Technology)	Semester – III
Course Name: Applied Mathematics	**Course Code: S205ITT**
Credits	**2**

Course Objective:

The course is aimed to develop the basic Mathematical skills of IT students that are imperative for effective understanding of IT subjects.

1. Apply the knowledge of matrices to solve the problems.
2. Know and to understand various types of numerical methods.
3. Ability to interpret the mathematical results in physical or practical terms for complex numbers.
4. Inculcate the habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion
5. Solve and analyze the Partial derivatives and its application in related field of engineering

Unit	Details	Lectures
I	**Equation of the first order and of the first degree:** Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution. **Differential equation of the first order of a degree higher than the first:** Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution.	**10**
II	**The Laplace Transform:** Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives	**10**
III	**Double Integrals and its applications:** Double Integral, Change of the order of the integration, Applications of integration, Areas Beta and Gamma Functions – Definitions, Properties and Problems., Duplication formula.	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
2.	Applied Mathematics II	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
3.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications		

Course Outcomes:

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

CO 1: Solve the matrix operations, identify the linear dependence and independence of a vectors.
CO 2: Familiar with the various forms and operations of a complex number.
CO 3: Find the Laplace transform of a function and Inverse Laplace transform of a function using definition also solve ordinary differential equations using Laplace transform.
CO 4: Evaluate the multiple integrals in Cartesian, Polar coordinates, change the order of the integral,
CO 5: Apply integration methods to calculate the areas and volumes of solids.
CO 6: Evaluate the Beta, Gamma, Differentiation Under integral sign and error functions

B. Sc. (Information Technology)	Semester – III
Course Name: Introduction to Data Science	**Course Code: S206ITT**
Credits	**2**

Course Objective:

To enable the students to:

1: Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.

2: Practice problem analysis and decision-making

Unit	Details	Lectures
I	**Data Science Introduction & Basics** **Data Science Technology Stack:** Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools- Spark, **Layered Framework:** Definition of Data Science Framework, Cross Industry Standard Process for Data Mining (CRISP-DM),	**10**
II	**Business Layer:** Business Layer, Engineering a Practical Business Layer **Utility Layer**: Basic Utility Design, Engineering a Practical Utility Layer	**10**
III	**Statistics for Data Science a. Three Management Layers**: Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer. **Retrieve Superstep:** Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, **Assess Superstep**: Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Practical Data Science	Andreas François Vermeulen	APress		2001

Course Outcomes (COs)

Upon completing this course, the student will be able to:

CO1. Apply quantitative modeling and data analysis techniques to the solution of real world Business problems, communicate findings, and effectively present results using data Visualization techniques.

CO2. Recognize and analyze ethical issues in business related to intellectual property, data Security, integrity, and privacy.
CO3. Apply ethical practices in everyday business activities and make well-reasoned ethical Business and data management decisions.
CO4. Demonstrate knowledge of statistical data analysis techniques utilized in business decision-making

B. Sc. (Information Technology)	Semester – III
Course Name: Information Technology in Banking & Insurance - I	**Course Code: ITOE05T**
Credits	**2**

Course Objective:

1. Understand the fundamental principles of information technology as applied in the banking and insurance sectors.
2. Explore the role of information technology in enhancing operational efficiency and customer service within banking and insurance organizations.
3. Analyze the specific IT infrastructure and systems utilized in banking and insurance operations, including security protocols and data management.
4. Evaluate emerging technologies and trends shaping the future of information technology within the banking and insurance industries.
5. Develop practical skills in implementing and managing IT solutions tailored to the needs and challenges of banking and insurance environments.

Unit	Details	Lectures
I	**Introduction to Electronic Commerce:** A) **E-Commerce Framework**, E-Commerce and media convergence, anatomy of E-Commerce Applications, E-Commerce Consumer and Organization Applications B) The network Infrastructure for Electronic Commerce - Market forces influencing the I-way, Components of I-way, Network Access Equipment C) **E-Commerce and World Wide Web**- Architectural framework of ECommerce, WWW and its architecture, hypertext publishing, Technology behind the web, Security and the Web	10
II	**E-banking:** **A) Meaning, definition, features, advantages and limitations-** core banking, the evolution of e-banking in India, Legal framework for e-banking. **B) Electronic Payment System** Types of Electronic Payment Systems, Digital Token-based EPS, Smart Card EPS, Credit Card EPS, Risk in EPS, Designing a EPS	**10**
III	**MS-Office: Packages for Institutional Automation**: **A) Ms-Word:** Usage of smart art tools, bookmark, cross-reference, hyperlink, mail merge utility and converting word as PDF files. **B) Ms-Excel**: Manipulating data, Working with charts, Working with PIVOT table and what-if analysis; Advanced excel functions-Vlookup (),hlookup(),PV(), FV(),average(),goal seek(),AVERAGE(), MIN(), MAX(), COUNT(),COUNTA(), ROUND(), INT(), nested functions, name ,cells/ranges/constants,relative, absolute & mixed cell references, >,<,=operators, Logical functions using if, and, or =, not, date and time functions & annotating formulae.	**10**

	C) Application in Banking and Insurance Sector – Calculation of Interest, Calculation of Instalment, Calculation of Cash Flow, Calculation of Premium, Calculation of risk coverage in Insurance and Reporting	

Course Outcome:

CO1. Demonstrate a comprehensive understanding of the role and significance of information technology within the banking and insurance sectors, including its impact on operational efficiency, risk management, and customer experience.

CO2. Analyze the specific IT infrastructure, systems, and applications utilized in banking and insurance operations, including security measures, data analytics tools, and electronic payment systems.

CO3. Evaluate emerging technologies and trends shaping the future of information technology within the banking and insurance industries, and assess their potential implications for business strategies and regulatory compliance.

B. Sc. (Information Technology)	Semester – III
Course Name: PL SQL & STAR UML	**Course Code: ITVS03P**
Credits	**2**

UNIT	List of Practical (PL SQL)		Lecture
UNIT - I		**Implement the following:**	**10**
	1.	PL/SQL Basics	
	2.	Use of variables.	
	3.	Write executable statement.	
	4.	Interacting with Oracle Server.	
	5.	Create anonymous PL/SQL block	
UNIT - II	6.	Control Structure in PL/SQL (While, For, Do loop)	**10**
	7.	Use of GOTO statement	
	8.	Create conditional statement using PL/SQL (Using if statement, Using if else statement)	
	9.	Create conditional statement Using case expression.	
	10.	Creation of Sequence in PL/SQL	
UNIT - III	11.	Create cursor in PL/SQL (Implicit cursor, Explicit, Parameterized cursor)	**10**
	12.	Creation of Procedures in PL/SQL	
	13.	Functions in PL/SQL	
	14.	Creation of Trigger	
	15.	Handling exceptions	

Note : Solve any 10 Program.

UNIT	List of Practical (STAR UML)		Lecture
UNIT - I		**Implement the following:**	**10**
	1.	Study and implementation of class diagrams.	
	2.	Study and implementation of Use Case Diagrams.	
	3.	Study and implementation of Entity Relationship Diagrams.	
	4.	Case study -1	
UNIT - II	5.	Study and implementation of Sequence Diagrams.	10
	6.	Study and implementation of State Transition Diagrams.	
	7.	Study and implementation of Data Flow Diagrams.	
	8.	Case study -2	

	9.	Case study -3	
UNIT - III	10.	Study and implementation of Collaboration Diagrams.	10
	11.	Study and implementation of Activity Diagrams.	
	12.	Study and implementation of Component Diagrams.	
	13.	Study and implementation of Deployment Diagrams.	
	14.	Case study -4	
	15.	Case study -5	

Note : Solve any 10 Program.

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Object - Oriented Modeling and Design	Michael Blaha, James Rumbaugh	Pearson		2011
2.	Learning UML 2. 0	Kim Hamilton, Russ Miles	O'Reilly Media		

Course Outcomes: Learner will be able to:

1. Understand the basics of PL/SQL.
2. Use of the control and conditional statement in PL/SQL.
3. Apply sequences and cursor in PL/SQL.
4. Know the concept of stored procedure and functions
5. Create the triggers and packages in PL/SQL.
6. Implement the concept of Exception handling.

B. Sc. (Information Technology)	Semester – III
Course Name: English Communication	**Course Code: ITAE03T**
Credits	**2**

Course Objective:

1. Develop proficiency in English language skills essential for success in competitive examinations, including reading comprehension, vocabulary, grammar, and writing.
2. Enhance listening skills to effectively comprehend spoken English passages and instructions commonly encountered in competitive exams.
3. Strengthen verbal communication abilities through practice in articulating ideas clearly and confidently in English.
4. Improve written communication skills by learning strategies for structuring essays, letters, and reports required in competitive exam formats.
5. Expand vocabulary and idiomatic expressions specific to the context of competitive exams to aid in comprehension and expression.

Unit	Details	Lectures
I	**Vocabulary**: Synonyms And Antonyms, Homonyms, Spelling Test/Cloze Test, Fill in the Blanks, Idioms & Phrases, One Word Substitution, Sentence or Phrase Improvement, Word Association	10
II	**Grammar**: Active and Passive Voice, Direct & Indirect Speech, Fill in Blanks – Conjunction, Preposition, Tenses, etc, Sentence Correction/Error Spotting, Multiple Meaning	**10**
III	**Rearrangement of Sentences**: Para Jumbles/ Jumbled Sentence, Paragraph Completion **Comprehension**: Reading Comprehension	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Objective General English	S.P. Bakshi	Arihant		
2.	Word Power Made Easy	Norman Lewis	PENGUIN INDIA		

Course Outcomes:

1. Demonstrate a heightened proficiency in English language skills, including grammar, vocabulary, reading comprehension, and writing, essential for success in competitive examinations.
2. Exhibit enhanced listening skills, enabling comprehension of spoken English passages and instructions commonly encountered in competitive exam settings.
3. Display improved verbal communication abilities by articulating ideas clearly and confidently in English, conducive to effective performance in interview and group discussion rounds of competitive exams.
4. Produce well-structured and coherent written communication, including essays, letters, and reports, meeting the standards expected in competitive exam formats

B. Sc. (Information Technology)	Semester – III
Course Name: Android Mobile Programming (Practical)	Course Code: ITCC02P
Credits	2

UNIT	List of Practical		Lecture
UNIT - I		**Implement the following:**	**10**
	a.	Setting up Flutter, PhoneGAP Project and environment.	
	b.	Program to demonstrate the features of Dart language.	
	c.	Designing the mobile app to implement different widgets.	
	d.	Designing the mobile app to implement different Layouts.	
	e.	Designing the mobile app to implement Gestures.	
UNIT - II	f.	Designing the mobile app to implement the theming and styling.	10
	g.	Set up navigation between different screens using Navigator.	
	h.	Implement navigation with named route.	
	i.	Designing the mobile app to implement the routing.	
	j.	Design a form with various input fields.	
UNIT - III	k.	Implement form validation and error handling.	10
	l.	Designing the mobile app to implement the animation.	
	m.	Designing the mobile app to implement the state management.	
	n.	Designing the mobile app working with SQLite Database.	
	o.	Designing the mobile app working with Firebase.	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Flutter for Beginners	Alessandro Biessek	Packt Publishing		2019
2.	PhoneGap By Example	Andrey Kovalenko	PACKT Publishing	1st	2015

B. Sc. (Information Technology)	Semester – IV
Course Name: Field Project	Course Code: ITFP01P
Credits	2
Refer Circular No.AAMS_UGS/1CC/2024-25/213 on Dated 18Jan.2025	

SEMESTER IV

B. Sc. (Information Technology)	Semester – IV
Course Name: Computer Networks	Course Code: S207ITT
Credits	2

Course Objective:

1. Knowledge of uses and services of Computer Network.
2. Ability to identify types and topologies of network.
3. Understanding of analog and digital transmission of data.
4. Familiarization with the techniques of routing.
5. Understand the functioning of networking application

Unit	Details	Lectures
I	**Introduction:** Computer Network, Evolution of Computer Networks Different types of Computer Network, Difference between LAN, MAN and WAN **Hardware Devices used for Networking:** Network Interface Card (NIC), Modem, Hub, Switch L1 and L2 switches, Comparison between switch and hub, Bridge, Router, Gateway. Standards and administration.	10
II	**Network Models:** Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding **Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.	10
III	**Network Layer:** IPv4 Addresses, IPv4 Protocol, ARP, ICMP, IPv6 Routing: RIP, OSPF, BGP **Transport Layer:** UDP, TCP **Application Layer:** WWW, HTTP, DNS, SMTP, POP3, MIME, IMAP, DHCP, TELNET, SSH, FTP	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	TCP/IP Protocol Suite	Behrouz A. Forouzan	Tata McGraw Hill	------	2010
2	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw Hill		
3	Computer Networks	Andrew Tanenbaum	Pearson	5th	2013

Online Resources:

· https://ekumbh.aicte-india.org/allbook.php
· https://free.aicte-india.org/

Course Outcomes:
After completing the course, the learner will be able to:
CO1: Identify various data communication standards, topologies and terminologies
CO2: Describe how signals are used to transfer data and communication aspects between nodes
CO3: Configure IP addresses using TCP/IP protocol suite
CO4: Use different application layer protocols

B. Sc. (Information Technology)	Semester – IV
Course Name: Computer Graphics and Animation	Course Code: S208ITT
Credits	2

Course Objectives:

1. To train the students to acquire skills in generating marketable computer graphics and animated pictures, especially in the area of advertisements.
2. To train the students to acquire skills and mastery in the use of different software producing graphics and animation.
3. The course introduces the basic concepts of computer graphics.
4. It provides the necessary theoretical background and demonstrates the application of computer science to graphics.
5. The course further allows students to develop programming skills in computer graphics through programming assignments.

Unit	Details	Lectures
I	**Introduction to Computer Graphics:** Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video	
	Basics, The Video Controller, Random-Scan Display Processor, LCD displays. **Scan conversion** – Digital Differential Analyzer (DDA) algorithm, Bresenhams' Line drawing algorithm. Bresenhams' method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Polygons, problem with multiple components.	**10**
II	**Two-Dimensional Transformations:** Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations. **Three-Dimensional Transformations:**	**10**

	Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, **Viewing in 3D**	
III	**Light:** Radiometry, Transport, Equation, Photometry **Color:** Colorimetry, Color Spaces, Chromatic Adaptation, Appearance **Computer Animation:** Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects. **Image Manipulation and Storage:** What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson	2nd	
2.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	4th	2016
3.	Computer Graphics	Hearn, Baker	Pearson	2nd	
4.	Principles of Interactive Computer Graphics	William M. Newman and Robert F. Sproull	TMH	2nd	
5.	Mathematical Elements for CG	D. F. Rogers, J. A. Adams	TMH	2nd	

Course Outcomes:

CO 1. Understand the basics of computer graphics, different graphics systems and applications
CO 2. Use of geometric transformations on graphics objects and their application in composite form.
CO 3. Extract scene with different clipping methods and its transformation to graphics display device.
CO 4. Render projected objects to naturalize the scene in 2D view and use of illumination models
CO 5. Understand the core concepts and mathematical foundations of computer graphics
CO 6. Know the fundamental computer graphics algorithms and data structures
CO 7. Understand an overview of different modeling approaches and methods
CO 8. Apply basic shading and texture mapping techniques
CO 9. Understand light interaction with 3D scenes
CO 10. Explain the applications, areas, and graphic pipeline, display and hardcopy technologies.
CO 11. Discuss OpenGL application programming Interface and apply it for 2D & 3D computer graphics.

B. Sc. (Information Technology)	Semester – IV
Course Name: Practical- II (S207ITT & S208ITT)	**Course Code: S209ITP**
Credits	**2**

UNIT	List of Practical (Computer Networks)		Lecture
Unit I	1.	Color code for crimping LAN (Cat 5/6/7) cable	**10**
	2.	a.Study of Different color codes b. Study of different connecting devices and their differences c. Crimping LAN Cable	
	3.	Configuring LAN setup a**.** Planning and Setting IP networks b. Configuring subnet c. Study of basic network command and Network configuration commands. ipconfig, netstat, ARP, ping, trace route etc. d. Basic network troubleshooting. e. Configuration of TCP/IP Protocols in Windows / Linux. f. Implementation of Drive/file sharing and printer sharing	
	4.	IPv4 Addressing and Subnetting a. Given an IP address and network mask, determine other information about the IP address such as: • Network address • Network broadcast address • Total number of host bits • Number of hosts	
	5.	a. Given an IP address and network mask, determine other information about the IP address such as: • The subnet address of this subnet • The broadcast address of this subnet • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask • The number of hosts for each subnet • The number of subnet bits	
Unit II	6.	Designing and configuring a network topology a. Configure IP static routing 24	10
	7.	Configure IP routing using RIP.	
	8.	Configuring Simple and multi-area OSPF	
	9.	Configuring server and client. a. Configure DHCP	

	10.	Configure DNS	
Unit III	**11.**	Configure HTTP	10
	12.	Configure Telnet e. Configure FTP	
	13.	Configure basic security features for networks	
	14.	Packet capture and header analysis by wire-shark (TCP, UDP, IP etc.)	
	15.	Planning and design a corporate network for a given scenario.	

Note: Solve any 10 Practicals

UNIT	**List of Practical (Computer Graphics)**		**Lecture**
UNIT - I	1.	Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them.	10
	2.	Draw a co-ordinate axis at the center of the screen.	
	3.	Divide your screen into four regions, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message	
	4.	Draw any object on the screen. (hut, boat, car, bicycle)	
	5.	Develop the program for DDA Line drawing algorithm or mid-point circle drawing algorithm.	
UNIT - II	6.	Write a program to implement 2D scaling.	.
	7.	Write a program to perform 2D translation.	
	8.	Perform 2D Rotation on a given object.	
	9.	Write a program to perform 3D translation.	10
	10.	Write a program to implement 3D scaling.	
UNIT - III	11.	Write a program to fill a circle using Flood Fill Algorithm.	10
	12.	Write a program to fill a circle using Boundary Fill Algorithm.	
	13.	Develop a simple text screen saver using graphics functions.	
	14.	Perform any animation using graphic functions.	
	15.	Draw the moving car on the screen.	

Note: Solve any 10 Practical's.

B. Sc. (Information Technology)	Semester – IV
Course Name: Data Warehousing	Course Code: S210ITT
Credits	2

Course Objective:

1. Understand the fundamental concepts and principles of data warehousing, including its role in business intelligence and decision support systems.
2. Explore the architecture and components of a data warehouse system, including data sources, extraction, and transformation, loading (ETL), storage, and retrieval mechanisms.
3. Learn various data modeling techniques and schema designs for organizing and structuring data within a data warehouse environment.

Unit	Details	Lectures
I	Overview and Concepts: Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing. Data Marts, Data Staging, Meta Data, Data Warehousing & ERP, Data Warehousing & KM, Data Warehousing & CRM.	10
II	Planning & Project Management: Life-cycle approach, Collecting the requirements, The Development phases, Dimensional analysis, Dimensional modelling, Star Schema, Snow Flake Schema. Data Design and Data Representation: Principles of dimensional modelling. OLAP: OLAP Architecture, Relational OLAP, Multidimensional OLAP, Relational Vs Multidimensional OLAP, Web based OLAP.	**10**
III	Major features & functions: Drill down and Roll-up, Slice and Dice or Rotation. Recent Trends in Data Analysis: Introduction to Data lake and Hybrid Databases. Introduction to Big Data: Definition of Big Data, Challenges with Big Data.	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Data Warehousing Fundamentals	Paulraj Ponnaiah,	Wiley	student Edition	
2.	"The Data Warehouse Lifecycle toolkit'	Ralph Kimball	John Wiley.		

Course Outcomes:

CO1. Demonstrate a comprehensive understanding of data warehousing concepts, architectures, and principles, including their applications in business intelligence and decision support systems.

CO2. Design and implement effective data warehouse solutions tailored to specific organizational needs, encompassing data modeling, ETL processes, and schema designs.

CO3. Apply various data modeling techniques to organize and structure data within a data warehouse environment, including dimensional modeling and relational modeling, to support analytical requirements.

B. Sc. (Information Technology)	Semester – IV
Course Name: Computer Oriented Statical Techniques	Course Code: S211ITT
Credits	2

Course Objective:

1. To learn the different methods of calculating the central tendencies.
2. To introduce the moments, skewness and kurtosis.
3. To learn scientific view to conduct the survey in proper way to collect the data about specific perspective.
4. To Learn variety of probability sampling methods for selecting a sample from a population.
5. To learn the sampling theory and testing of hypothesis and making inferences.
6. To introduce the students with understanding of the curve fitting, regression and correlation techniques.

Unit	Details	Lectures
I	The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency, The Arithmetic Mean, The Weighted Arithmetic Mean, Properties of the Arithmetic Mean, The Arithmetic Mean Computed from Grouped Data, The Median, The Mode, The Empirical Relation Between the Mean, Median, and Mode	
II	The Geometric Mean G, The Harmonic Mean H, The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Dispersion, or Variation, The Range, The Mean Deviation, The Semi Interquartile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation, Standardized Variable; Standard Scores.	10
III	**The Chi-Square Test**: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi-square.	10

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Statistics	Murray r. Spiegel, larry j. Stephens.	Mcgraw – Hill Iternational	4^{th}	
2.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1^{st}	2017
3.	Fundamental of Mathematical Statistics	S.c. gupta and v.k. Kapoor	Sultan Chand and Sons	11^{th}	2011
4.	Mathematical statistics	J.n. kapur and h.c. Saxena	S. Chand	12^{th}	2005

Course Outcome:

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

CO 1: To calculate and apply measures of central tendencies and measures of dispersion -- grouped and ungrouped data cases.
CO 2: To calculate the moments, skewness and kurtosis by various methods.
CO 3: How to apply discrete and continuous probability distributions to various business problems.
CO 4: Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values
CO 5: Apply simple linear regression and correlation model to real life examples.

B. Sc. (Information Technology)	Semester – IV
Course Name: Data Mining	Course Code: S212ITT
Credits	2

Course Objective:

Be familiar with mathematical foundations of data mining tools.

1. Understand and implement classical models and algorithms in data warehouses and data mining
2. Characterize the kinds of patterns that can be discovered by association rule
3. Mining, classification and clustering.
4. Master data mining techniques in various applications like social, scientific and environmental context.
5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems

Unit	Details	Lectures
I	**Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems.	10
II	**Information Privacy and Data Mining:** Basic principles to protect information piracy, Primary aims of data mining, pitfalls of data mining.	**10**
III	**Categories of Web Mining**: Web Content Mining, Web Structure Mining, Web Usage Mining, Applications of Web Mining, and Agent based and Data base approaches, Web mining Software. **Data mining applications**	**10**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	"Data Mining Concepts and Techniques"	Han, Kamber	Morgan Kaufmann.		
2.	"Data Mining: Concepts and Techniques"	Margaret Dunham	Morgan Kaufmann Pub.		

Course Outcomes:

Understand the functionality of the various data mining component

- **CO1.** Appreciate the strengths and limitations of various data mining
- **CO2.** Explain the analyzing techniques of various data
- **CO3.** Describe different methodologies used in data mining
- **CO4.** Compare different approaches of data mining with various technologies

B. Sc. (Information Technology)	Semester – IV
Course Name: Information Technology in Banking & Insurance - II	Course Code: ITOE06T
Credits	2

Course Objective:

1. Understand the fundamental principles of information technology as applied in the banking and insurance sectors.
2. Explore the role of information technology in enhancing operational efficiency and customer service within banking and insurance organizations.
3. Analyze the specific IT infrastructure and systems utilized in banking and insurance operations, including security protocols and data management.
4. Evaluate emerging technologies and trends shaping the future of information technology within the banking and insurance industries.
5. Develop practical skills in implementing and managing IT solutions tailored to the needs and challenges of banking and insurance environments.

Unit	Details	Lectures
I	**E-banking Business Models** Various models- home banking, office banking, online banking, internet banking, mobile banking, SMS banking,- models of electronic payments, other business models	10
II	**Induction of TechnoManagement** **Development Life Cycle**, Project Management, Building Data Centres, Role of DBMS in Banking, Data Warehousing and Data Mining, RDBMS Tools **Technological Changes in Indian Banking Industry,** Trends in Banking and Information Technology, Technology in Banking,Lead Role of Reserve Bank of India, New Horizons for Banking based IT, Automated Clearing House Operations, Electronic Wholesale Banking Credit Transfer, Credit Information Bureau (I) Ltd., Credit Information Company Regulation Bill- 2004, Automation in Indian Banks, Cheque clearing using MICR technology, Innovations, Products and Services, Core-Banking Solutions(CBS), Human Resource Development(HRD)-The Road Ahead, T**echnology in Banking Industry,** Tele-conferencing, Internet Banking, Digital Signature in Banking, MICRFacility for 'paper-based' clearing, Cheque Truncation **Dealing with Fraudulent transactions under CTS,** Efficient customer service, smart quill computer pen, Institute for Development & Research in Banking & Technology (IDRBT). **E-Checks-Protocols and Standards,**	**10**

	Problems on mechanization, e-Banking-RBI Regulations & Supervision, Technology Diffusion.	
III	**IT Applications and Banking** Objectives, Electronic Commerce and Banking, Banking Software, Electronic Clearing and Settlement Systems, Plastic Money	**10**

Course Outcome:

CO1. Demonstrate a comprehensive understanding of the role and significance of information technology within the banking and insurance sectors, including its impact on operational efficiency, risk management, and customer experience.

CO2. Analyze the specific IT infrastructure, systems, and applications utilized in banking and insurance operations, including security measures, data analytics tools, and electronic payment systems.

CO3. Evaluate emerging technologies and trends shaping the future of information technology within the banking and insurance industries, and assess their potential implications for business strategies and regulatory compliance.

B. Sc. (Information Technology)	Semester – IV
Course Name: Embedded System	Course Code: ITSE03T
Credits	2

Course Objective:

- To introduce the Building Blocks of Embedded System
- To Educate in Various microcontrollers used in Embedded Development
- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in sensors and actuators.
- To familiar with the real world application development using embedded system.

Unit	Details	Lectures
I	**Getting Started with Arduino:** Introduction, Arduino Variants, Install the Drivers, Arduino IDE **Basic Functions:** Overview, Structure, Digital I/O Functions, Analog I/O Functions, Advanced I/O Functions, Timer Functions, Communication Functions, Interrupt Functions, Math Functions, Programming Language Reference	**10**
II	**Using Sensors with the Arduino:** Light Sensitive Sensors, Temperature Sensors, Temperature and Humidity Sensor, Line-Tracking Sensor, Ultrasonic Sensors, Digital Infrared Motion Sensor, Joystick Module, Gas Sensor, Digital Tilt Sensor, Analog Sound Sensor, Voice Recognition Module, Digital Vibration Sensor, Flame Sensor, Capacitive Touch Sensor **Electromechanical Control Using the Arduino:** DC Motor, Stepper Motor, Servo Motor	**10**
III	**Wireless Control Using the Arduino:** Infrared Transmitter and Receiver, Wireless Radio Frequency, Bluetooth, GSM/GPRS, Wi-Fi **Case Studies:** ● Air Quality Monitor Using Arduino ● A Fire-Fighting Robot Using Arduino ● Intelligent Lock System Using Arduino	**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Programming Embedded Systems in C and C++	Michael Barr	O'Reilly	First	1999
2.	Introduction to embedded systems	Shibu K V	Tata Mcgraw-Hill	First	2012

3.	The 8051 Microcontroller and Embedded Systems	Muhammad Ali Mazidi	Pearson	Second	2011
4.	Embedded Systems	Rajkamal	Tata Mcgraw-Hill		

Course Outcome:

CO1: Differentiate between general purpose and embedded systems
CO2: Discuss the characteristics and quality attributes of embedded systems CO3: Use different types of sensors for appropriately
CO4: Design and develop embedded systems

B. Sc. (Information Technology)	Semester – IV
Course Name: Green Computing	Course Code: ITAE04T
Credits	2

Course Objective:

1. Understand the concept of green computing and its significance in mitigating environmental impact and promoting sustainability in IT infrastructure and operations.
2. Explore the principles and practices of energy-efficient computing, including hardware optimization, power management techniques, and renewable energy integration.
3. Learn about the environmental implications of computing technologies, including e-waste management, resource conservation, and carbon footprint reduction strategies.
4. Gain knowledge of green computing standards, certifications, and best practices established by industry organizations and regulatory bodies.

Unit	Details	Lectures
I	**Overview and Issues:** **Problems:** Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, WEEE Directive, RoHS, National Adoption, Asia.	10
II	**Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online **Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice	**10**
III	**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling. **Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the	**10**

	CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations.	

Title	Author/s	Publisher	Edition	Year
"Green Computing: Tools and Techniques for Saving Energy, Money, and Resources"	Bud E. Smith	Auerbach Publications	1st	2013
"Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting"	Jason Harris	Emereo Publishing		2008

Course Outcomes:

CO1. Understand the principles and significance of green computing in mitigating environmental impact and promoting sustainability within IT infrastructures and operations.

CO2. Evaluate energy-efficient computing technologies and practices, including hardware optimization, power management techniques, and renewable energy integration, to minimize energy consumption and carbon emissions.

CO3. Apply green computing principles to design and implement environmentally sustainable IT solutions, considering factors such as energy efficiency, resource conservation, and e-waste reduction.

B. Sc. (Information Technology)	Semester – IV
Course Name: R Programming & Arduino Programming	**Course Code: ITCC03P**
Credits	**2**

UNIT	List of Practical (R Programming)		Lecture
UNIT - I		**Implement the following:**	**10**
	1.	Using R/Python execute the basic commands, array, list and frames	
	2.	Create a Matrix using R/Python and Perform the operations addition, inverse .	
	3.	Create a Matrix using R/Python and Perform the operations transpose and multiplication operations.	
	4.	Using R/Python Execute the statistical functions: mean, median, mode.	
	5.	Using R/Python Execute the statistical functions: quartiles, range, inter quartile range histogram.	
UNIT - II	6.	Using R/Python import the data from Excel / .CSV file and Perform the above functions.	10
	7.	Using R/Python import the data from Excel / .CSV file and Calculate the standard deviation.	
	8.	Using R/Python import the data from Excel / .CSV file and Calculate the variance, co-variance.	
	9.	Using R/Python import the data from Excel / .CSV file and draw the skewness.	
	10.	Import the data from Excel / .CSV and perform the hypothesis testing.	
UNIT - III	11.	Import the data from Excel / .CSV and perform the Chi-squared Test.	10
	12.	Using R/Python perform the binomial and normal distribution on the data.	
	13.	Perform the Linear Regression using R/Python.	
	14.	Compute the Least squares means using R/Python.	
	15.	Compute the Linear Least Square Regression using R/Python	

Note: Solve any 10 Practicals

List of Practical: (Arduino Programming) Note: All practicals to be done online using TinkerCAD		Lectures
UNIT I	**Introduction to Arduino** 1. Introduction to Arduino circuits and breadboarding 2. Blinking of LEDs and Interfacing RGB LED's 3. Program using Light Sensitive Sensors 4. Program using temperature sensors	10
UNIT II	5. Programs using humidity sensors 6. Programs using Line tracking sensors 7. Programs using Ultrasonic Sensors 8. Programs using digital infrared motion sensors	10
UNIT III	9. Programs using gas sensors 10. Programs using servo motors 11. Programs making Joystick with Arduino 12. Design simple Piano using Arduino	10

Note: Solve any 10 Practical's

B. Sc. (Information Technology)	Semester – IV
Course Name: Digital Hygiene	Course Code: ITCEP01
Credits	2

Course Overview:
This course aims to equip students with the necessary knowledge and skills to engage with their communities on topics related to digital hygiene, online payment methods, and cyber security awareness. Through hands-on activities, community visits, and awareness programs, students will develop a deeper understanding of the socio-economic implications of digital technologies and their role in fostering a safer and more inclusive digital environment.

Course Objectives:
1. Understand the importance of digital literacy and cyber security in today's socio-economic landscape.
2. Develop practical skills in organizing and conducting community engagement activities.
3. Analyze the socio-economic impact of digital technologies on communities.
4. Foster critical thinking and problem-solving skills in addressing digital challenges within communities.
5. Demonstrate effective communication and leadership skills in engaging with diverse community members.

Course Structure:

Unit	Details	Lectures
Module 1	**Preparation Stage** 1.**Curriculum Development**: Based on the needs assessment, develop a curriculum that covers relevant topics such as digital hygiene, online safety, secure payment methods, and identifying online scams. Ensure that the content is easy to understand, culturally sensitive, and addresses the specific concerns of the target audience. 2.**Assessing Target Audience Needs**: Before designing the program, it's essential to understand the digital literacy levels, specific challenges, and concerns of the target audience. Conduct surveys, interviews, or focus group discussions to gather insights into their existing knowledge of digital technologies, online behaviours, and areas where they may need guidance or support. 3. **Engaging Community**: Collaborate with local community leaders, NGOs, government agencies, and other relevant stakeholders to garner support and resources for the program. Their involvement can help increase outreach, access to facilities, and enhance the credibility of the program within the community. 4. **Selecting Delivery Methods**: Choose appropriate delivery methods and formats for the digital awareness program based on	**30**

	the characteristics of the target audience, available resources, and logistical considerations. This could include workshops, seminars, interactive sessions, educational videos, printed materials, or online resources. 5. **Logistics Planning**: Plan the logistics of the awareness program, including venue selection, scheduling, transportation arrangements, and provision of necessary equipment and materials. Ensure that the chosen venue is accessible to the target audience and conducive to learning and interaction. Create a detailed timeline and allocate responsibilities to team members to ensure smooth execution of the program.	
Module 2	**Community Visits and Awareness Programs** 1. Field trips to local neighbourhoods, villages, and gram panchayats to interact with community members. 2. Conducting awareness programs on digital hygiene, online payment methods, and cyber security. 3. Hands-on workshops and interactive sessions with community members.	**30**
Module 3	**Data Collection and Report Preparation** 1. Keeping records of community engagement activities: Attendance sheets, feedback forms, documentation of sessions. 2. Analysing data collected during community visits. 3. Preparation of a comprehensive report summarizing the program's objectives, activities, outcomes, and reflections.	**30**

Assessment:

1. Participation in community engagement activities: 30%
2. Report on community engagement program: 40%
3. Reflection and self-assessment: 20%
4. Presentation of key learnings: 10%

Resources:

1. Textbooks and academic articles on digital literacy, cyber security, and community engagement.
2. Online resources: Educational websites, tutorials, TED Talks.
3. Guest speakers: Experts in digital technology, cyber security, and community development.
4. Collaboration with local NGOs, government agencies, and community organizations.