Mahatma Education Society's

Pillai HOC College of Arts, Science & Commerce (Autonomous)

Rasayani

Affiliated to University of Mumbai
NAAC Accredited with "A+" Grade in cycle II
ISO 9001:2015 Certified

SYLLABUS

B.Sc. Information Technology

F. Y. B. Sc. Information Technology

As per National Education Policy 2020

Academic Year 2026-27

Mahatma Education Society's College Code: 870
PILLAI HOC COLLEGE OF ARTS, SCIENCE & COMMERCE
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(NAAC Accredited 'A+' Grade , CGPA – 3.26 in Cycle 2 & ISO 9001:2015 Certified)
Affiliated to the University of Mumbai, Approved by Government of Maharashtra
(AUTONOMOUS COLLEGE)

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1	Dr. Swapna Kadam	Vice Chancellor Nominee	
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6	Mr. Swapnil H. Patil	Industry Representative	
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8	Dr. Rinkoo Shantnu	Principal	
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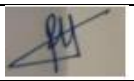
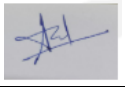
10	Ms. Priyanka Sorte	Head of the Department of BSc in Computer Science	
11	Ms. Priyanka Sonawane	Member	
12	Ms. Vinaya Bhoir	Member	
13	Ms. Namrata Kedari	Member	
14	Ms. Ashwini Patil	Member	
15	Ms. Ashwini Lad	Member	
16	Mr. Shinoj Mathew	Member	

1. Introduction

A **B.Sc. in Information Technology** is a three-year undergraduate program designed to bridge the gap between theoretical knowledge and practical application. This degree is designed to equip students with the essential knowledge and skills needed to manage, process, secure, and communicate information using computer systems and applications. Throughout the course, students develop key competencies:
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1. **Focus:** B.Sc. IT programs are generally **application-oriented**, emphasizing the practical implementation and management of IT systems, rather than the deep theoretical underpinnings. The curriculum revolves primarily around **databases, software, and networking**.
2. **Duration:** The program typically lasts **three years** and is divided into six semesters.
3. **Goal:** The primary goal is to produce graduates capable of designing, developing, implementing, and maintaining various IT solutions to solve real-world problems for businesses and organizations.

This interdisciplinary training not only prepares students for technical employment and advanced studies but also encourages them to launch their own startups or venture into new career paths, with the benefit of excellent placement and incubation assistance. The curriculum ensures exposure to modern advancements and new sub-fields within the field.

2. Programme Outcomes (POs)

PO. No.	PO Title	PO's in Brief
PPO1	**Fundamental Knowledge Acquisition**	Graduates will demonstrate a comprehensive and foundational knowledge of their chosen discipline along with an awareness of interdisciplinary connections.
PO2	**Critical Thinking and Analytical Reasoning**	Graduates will be able to analyse complex problems, synthesize data from multiple sources (qualitative and quantitative), and employ logical reasoning to formulate well-supported conclusions and arguments.
PO3	**Effective Communication**	Graduates will exhibit proficiency in both written and oral communication, articulating ideas clearly, persuasively, and ethically to diverse audiences
PO4	**Problem Solving**	Graduates will possess the ability to identify, formulate, and design solutions for real-world problems in their professional or social contexts,

		applying relevant theoretical knowledge and practical skills.
PO5	**Information and Digital Literacy**	Graduates will demonstrate the capability to locate, evaluate, and effectively use information from various sources, and utilize modern tools and Information and Communication Technology (ICT) for professional and academic tasks.
PO6	**Research Skills and Scientific Temperament**	Graduates will develop a sense of inquiry and research methodology, including the ability to design experiments (where applicable), collect and analyse data, and interpret results while maintaining scientific rigor and intellectual honesty.
PO7	**Ethical Reasoning and Professional Integrity**	Graduates will recognize ethical dilemmas, commit to professional and academic ethics, and demonstrate an understanding of moral and social responsibilities in their personal and professional conduct.
PO8	**Employability and Professional Skills**	Graduates will acquire the necessary job-ready skills, managerial competencies, and professional values to secure gainful employment or pursue advanced education in their respective fields.
PO9	**Environmental and Sustainability Consciousness**	Graduates will understand the importance of environmental conservation and sustainable development, displaying responsibility toward ecological challenges and advocating for healthy environmental practices.
PO10	**Life-Long Learning**	Graduates will develop the capacity for independent and self-directed learning to continuously upgrade their knowledge and skills, enabling them to adapt to rapid technological and societal changes.
PO11	**Civic and Social Responsibility**	Graduates will act as responsible citizens with an informed awareness of constitutional values, engaging proactively in community development and addressing social

		needs.
PO12	**Empathy and Social Intelligence**	Graduates will be able to cultivate and demonstrate affective, interpersonal, social and emotional intelligence.

3.Programme Specific Outcomes (PSOs)

PSOs. No.	PSO Title	PSOs in brief
PSO1	**Software Development Fundamental**	Develop understanding to design and build functional software using programming, data structures, databases, and web technologies.
PSO2	**Advanced Technical Problem Solving**	Apply the skill to solve tough IT problems using critical thinking and applying concepts like AI, Machine Learning, Cloud, and IoT.
PSO3	**Project Management and Research Communication**	Develop a research mindset to plan and manage IT projects, and clearly communicate technical ideas to others.
PSO4	**System Analysis and Secure Design**	Understand what users need and design secure, working IT systems using proper analysis methods.

4. Evaluation Pattern

Marking Code	Marking Scheme
A	50 Marks Semester End Exam, 50 Marks Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
B	50 Marks Semester End Exam
C	100 marks Continuous Assessment (distributed within 30 Marks Class Test, 30 Marks Presentation & Assignment, 30 Marks Online Quiz, 10 Attendance & Class Participation)
D	50 Marks of Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
E	50 Marks Practical Examination (distributed within 30 Marks Practical Module 1 & 2, 10 Marks Journal, 10 Marks Viva)

Course Structure

Semester I							
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures / Week**	**Evaluation Pattern**
HUSIT101	**Major**	**Programming With C**	**Theory**	**100**	**2**	**2**	**A**
HUSIT101P	**Major - Practical**	**Practical (HUSIT101)**	**Practical**	**50**	**1**	**2**	**E**
HUSIT102	**Major**	**Database Management System**	**Theory**	**100**	**2**	**2**	**A**
HUSIT102P	**Major - Practical**	**Practical (HUSIT102)**	**Practical**	**50**	**1**	**2**	**E**
HUSIT103	**Minor**	**Descriptive Statistics**	**Theory**	**100**	**2**	**2**	**A**
HUSIT103P	**Minor - Practical**	**Practical (HUSST103)**	**Practical**	**50**	**1**	**2**	**E**
HUSIT104	**SEC**	**Combinational & Sequential Design**	**Theory**	**100**	**2**	**2**	**A**
HUSIT104P	**SEC - Practical**	**Practical (HUSST104)**	**Practical**	**50**	**1**	**2**	**E**
HUSIT105	**IKS**	**Indian Roots & Information Science**	**Theory**	**50**	**2**	**2**	**D**
HUAEC101	**AEC**	**Communication Skills in English**	**Theory**	**50**	**2**	**2**	**D**
HUVEC101	**VAC/VEC**	**Fundamentals of Social & Emotional Skills**	**Theory**	**100**	**3**	**3**	**C**
HUOE104	**Multidisciplinary/OE**	**Basics of Marketing Mix**	**Theory**	**100**	**3**	**3**	**C**
Total				**900**	**22**		****

Abbreviations:

SEC: Skill Enhancement Course
AEC: Ability Enhancement Course
VAC: Value Added Course
VEC: Value Education Course
IKS: Indian Knowledge System
OE: Open Elective

SEMESTER I

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Programming with C**				
Course Code	**HUSIT101**	**Level**	**4.5**		
		Type	**Theory**	**Practical**	**Total**
Semester	**I**	**Credits**	02	01	03
Type	**Major**	**No of Teaching hours**	**30**	**30**	**60**
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**	
	150	**50**	**50**	**50**	

Learning Objectives	
1	To understand the concepts of procedural programming.
2	To apply syntax and semantics of the C language
3	To analyse loops and decision making in programming.
4	To use arrays, structures, union and pointers and dynamic memory allocation
5	To examine functions for modular code and handle errors.

Course Outcomes	
	After successful completion of the course Students will be able:
CO1	To build flowcharts, pseudo- code for C programs
CO2	To use C language syntax and semantics in their programs
CO3	To implement loops and decision making
CO4	To apply different types of data structures in their programs
CO5	To write well-structured, readable, and maintainable C code and to use dynamic memory allocation

Modules At Glance

Module No.	Content	No. of Hours	Mapping with CO
1	Introduction to C Programming	15	CO1 & CO2
2	Structured Programming and Memory Handling in C	15	CO3, CO4, CO5
		30	

Syllabus

Module No.	Content	No. of Lectures
1	**Module 1: Introduction to C Programming** • Introduction: Algorithms, Procedural Language , Structure of C Program. Program Characteristics • Compiler, Linker and preprocessor, pseudo code statements and flowchart symbols, Desirable program characteristics • Program structure. Compilation and Execution of a Program, C Character Set, identifiers and keywords, data types and sizes, constants and its types, variables, Character and character strings, Data type handling: typedef & typecasting • Type of operators: Arithmetic operators, relational and logical operators, Increment and Decrement operators, • Assignment operators, the conditional operator, Assignment operators and expression, • Precedence and order of Evaluation Block Structure, Initialization, C Preprocessor	15
2	**Module 2: Structured Programming and Memory Handling in C** • Control Flow: Statements and Blocks, If-Else, Else-If, Switch, Loops- While and For Loops Do-while, Break and Continue, Goto and Labels • Basics of functions. User defined and Built-In functions (Library functions) • Pointer and Addresses, Pointer and Function Arguments, Pointer and Arrays. • User-defined data types- structure, union & enum (enumerations) • Dynamic memory allocation malloc(), calloc(), free()	15

Case Study Scenario	
M1	A bank wants a simple C program that checks whether a user's withdrawal amount is valid. The program must read the balance and withdrawal amount, use **relational and logical operators** to verify limits, and display whether the transaction is allowed. The logic should be written using **if-else** statements, and the program must use correct **data types**, constants, and clear variable names.
M2	A school needs a small module that accepts marks of three subjects, stores them in an **array**, and uses a **conditional operator** to determine whether the student gets an A, B, or C grade. A function should calculate the average marks, and **typecasting** may be needed to ensure accurate percentage calculation.

Text and References:

- C Programming Language, Brian W. Kernighan, Dennis M. Ritchie , 2017 2.
- Let Us C, Yashvant Kanetkar, BPB Publications,2008.
- Mastering in C, K. R. Venugopal and Sudeep R. Prasad, Tata McGraw-Hill Publications.
- A Computer Science –Structure Programming Approaches using C, Behrouz Forouzan, Cengage Learning.

Semester End Evaluation (50 Marks) ***Time: 2 Hrs***

Paper Pattern

Question No	Questions	Total Marks: 50
Q1	Attempt any 3 out of 4 (Module I)	**15M**
Q2	Attempt any 3 out of 4 (Module II)	**15M**
Q3	Attempt any 3 out of 4 (Module I & II)	**15M**
Q4	Case Study (Attempt Any 1 from 2)	**05M**

Practical Syllabus

List of Practicals		No. Of. Lectures	CO Mapping
1	a. To calculate simple interest taking principal, rate of interest and number of years as input from the user. Write algorithm & draw flowchart for the same b. Write a program to find the greatest of three numbers using the conditional operator. Write algorithm & draw flowchart for the same. c. Write a program to check if the year entered is leap year or not. Write algorithm & draw flowchart for the same.	3	CO1
2	a. Write a program to calculate roots of a quadratic equation. b. Write a menu driven program using switch case to perform add / subtract / multiply / divide based on the user's choice. c. Write a program to print the pattern of asterisks.	3	CO1
3	a. Write a program using a while loop to reverse the digits of a number. b. Write a program to calculate the factorial of a given number. c. Write a program to print the Fibonacci series.	3	CO1, CO2
4	a. Write a program to print the area of the square using a function. b. Write a program using a recursive function. c. Write a program to square root, abs() value using function. d. Write a program using a goto statement .	3	CO1, CO2

5	a. Write a program to print roll numbers and names of 10 students using an array. b. Write a program to sort the elements of array in ascending or descending order	3	CO1, CO2, CO3
6	a. Write a program to print roll numbers and names of 10 students using an array. b. Write a program to sort the elements of an array in ascending or descending order	3	CO1, CO2, CO3
7	Write a program to swap two numbers using a function. Pass the values to be swapped to this function using call-by-value method and call-by reference method.	3	CO1, CO2, CO3
8	a. Write a program to read a matrix of size m*n. b. Write a program to multiply two matrices using a function.	3	CO1, CO2, CO3, CO4
9	Write a program to print the structure using Title, Author, Subject and Book ID. Print the details of two books.	3	CO1, CO2, CO3,CO4
10	Create a mini project on “Bank management system”. The program should be menu driven.	3	CO1, CO2, CO3, CO4

Practical Evaluation *(50 Marks)*

Question No.	Assessment/ Evaluation	Marks
Q1	Program	***30***
Q2	Journal	***10***
Q3	Viva & Attendance	***10***

BOS	**Mathematics, Statistics and Computer Application**					
Course	**Database Management System**					
Course Code	**HUSIT102**	**Level**	**4.5**			
		Type	**Theory**	**Practical**	**Total**	
Semester	**I**	**Credits**	2	1	3	
Type	**Major**	**No of Teaching hours**	30	30	60	
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**		
	150	**50**	**50**	**50**		

Learning Objectives	
1	To make students aware of the fundamentals of the database system.
2	To give an idea how ERD components are helpful in database design and implementation.
3	To experience the students working with databases using MySQL.
4	To familiarize the student with normalization, database protection and different DCL Statements.
5	To make students aware about the importance of protecting data from unauthorized users.
6	To introduce students to the concept and purpose of indexing in database systems.
7	To make students aware of granting and revoking rights of data manipulation.

Course Outcomes	
	After successful completion of this course, students would be able to: -
CO1	To appreciate the importance of database design.
CO2	Analyze database requirements and determine the entities involved in the system and them relationship to one another.
CO3	Write simple queries to MySQL related to String, Math's and Date Functions.
CO4	Create tables and insert/update/delete data, and query data in a relational using MySQL commands.
CO5	Understand the normalization and its role in the database design process. Handle data permissions.
CO6	Create indexes and understand the role of Indexes in optimization search.

Modules At Glance

Module No.	**Content**	**No. of Lectures**	**Mapping with CO**
1	Fundamentals of Database Concepts and Data Modeling.	15	CO1, CO2, CO5
2	Advanced Concepts in Relational Databases and Database Management.	15	CO3, CO4, CO5, CO6
	Total	30	

Syllabus

Module No.	Content	No. of Lectures
1	**Fundamentals of Database Concepts and Data Modeling.** 1. **Introduction to DBMS:** Database, DBMS – Definition, Overview of DBMS,Advantages of DBMS, Levels of abstraction, Data independence, DBMSArchitecture. 2. **Data models:** Client/Server Architecture, Object Based Logical Model, RecordBased Logical Model (relational, hierarchical, network). Relational data model**:** Domains, attributes, Tuples and Relations 3. **Entity Relationship Model and ER to Table:** Entities, attributes, entity sets,relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER(entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyondER) Entity to Table, Relationship to tables with and without key constraints. 4. **DDL Statements:** Creating Databases, Using Databases, data types, Creating Tables(with integrity constraints – primary key, default, check, not null), Altering Tables,Renaming Tables, Dropping Tables, Truncating Tables. 5. **DML statements:** Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause,having clause	15
2	**Advanced Concepts in Relational Databases and Database Management.** 1. **Functions:** String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions(adddate, datediff, day, month, year, hour, min, sec, now, reverse) 2. **Joining Queries:** inner join, outer join (left outer, right outer, full outer). Views**:** Creating, altering, dropping, renaming and manipulating views. 3. **Normal forms:** Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. 4. **DCL Statements:** Creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges), Transaction control commands –Commit,	15

	Rollback. 5. **Database Protection:** Security Issues, Security Mechanisms, Discretionary Access Control, Backing Up and Restoring databases, Threats to Database.**Database Administration and Security:** Data as a Corporate Asset, The Need for a Database and Its Role in an Organization, The DBA's Role.	
Case Study Scenario		
M1	University Course Registration System:A large university wants to design a database for its Course Registration System. The university needs to track students, instructors, courses, departments, classrooms, and student registrations. The system must also support rules such as prerequisite constraints, teaching assignments, and scheduling.	
M2	Online Bookstore Management System:An online bookstore, BookVerse, wants to analyze sales, customers, authors, and books. The database stores information about books, authors, customers, and orders. Managers frequently request reports, so the business wants to use joins and views to simplify querying.	

References Books

- Database System Concepts, Abraham Silberschatz, HenryF.Korth, S.Sudarshan, McGraw Hill,2017
- MySQL: The Complete Reference, VikramVaswani , McGraw Hill, 2017
- Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease, Ashwin Pajankar, BPB Publications, 2020
- Fundamentals of Database Systems, Elmasri Ramez and Navathe Shamkant B, Pearson Education 6th Edition, 2010.
- Database System Concepts Silberschatz, Korth, Sudarshan, McGraw Hill, 5 Edition, 2006.

Semester End Evaluation (50 Marks) ***Time: 2 Hr***

Paper Pattern

Question No	Questions	Total Marks: 50
Q1	Attempt 3 out of 5	**15**
Q2	Attempt 3 out of 5	**15**
Q3	Attempt 3 out of 5	**15**
Q4	Case Study	**05**

Practical Syllabus

Sr. No	List of Practicals	CO Mapping	No. of Lectures
1	**To design an ER model for an Employee Payroll System to represent employee details, payroll processing, and related relationships.** . Identifying and listing all required entities a. Defining attributes for each entity b. Establishing relationships among entities using ER notations c. Drawing the ER diagram to represent the system structure visually d. Verifying the model for normalization and data consistency	CO1, CO2	3
2	**Write SQL query for given problem statement.** . Viewing all databases a. Creating a Database Viewing all Tables in a Database	CO3, CO4	3
3	**Perform the following Operations.** . Creating Tables (With and Without Constraints) a. Inserting/Updating/Deleting Records in a Table Saving (Commit) and Undoing (rollback)	CO3, CO4	3
4	**Perform the following Operations.** . Altering a Table a. Dropping/Truncating/Renaming Tables b. Backing up / Restoring a Database.	CO4	3
5	**Perform following:** . Simple Queries with Where Operators a. Where with Keywords and Logical Operators b. Simple Queries with Aggregate functions c. Queries with Aggregate functions (group by and having clause)	CO3	3
6	**Perform Queries involving:** . Date Functions a. String Functions b. Math Functions	CO3	3
7	**Retrieving Data from Multiple Table:** . Joining Tables (InnerJoins, Outer-Joins) a. Aliases for Table Names	CO3, CO4	3
8	**Perform Views commands:** . Creating Views a. Dropping Views Selecting from view	CO4	3
9	**Perform DCL statements:** . Granting permissions a. Revoking permissions	CO5	3

10	**Use of DDL DML and DCL statement for employee payroll system (Or any other system recommended by teacher)** . Identify employee payroll entities a. Define and Create Database, tables with constraint b. Insert 10 to 20 relevant records to support further queries c. Design simple queries using operators and functions d. Create Views and perform drop and select view command Perform grant and revoke commands.	CO1, CO2,CO 3, CO4, CO5, CO6	3

Notes: The Practicals will be performed in PostgreSQL/Oracle

Practical Evaluation (50 Marks)

Question No.	Assessment/ Evaluation	Marks
Q1	Practical (Module 1 & Module 2)	30
Q2	Journal	10
Q3	Viva and Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Descriptive Statistics**				
Course Code	**HUSIT103**	**Level**	4.5		
		Type	**Theory**	**Practical**	**Total**
Semester	**I**	**Credits**	2	1	3
Type	**Minor**	**No of Teaching hours**	30	30	60

Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**	**Practical**
	150	50	50	50

Learning Objectives	
1	To understand different types of Data, and to analyze and present the data
2	To compute various Measures of Central Tendencies.
3	To compute various Measures of Dispersion.
4	To understand the concept of Skewness and Kurtosis.
5	To compute Correlation Coefficient for bivariate data and further apply the regression analysis .

Course Outcomes	
CO1	Able to organize, manage and present the data.
CO2	To understand the use Measures of Central Tendencies and Dispersion.
CO3	Able to understand and compute the consistent and inconsistent data
CO4	Able to identify the association between variables
CO5	Able to understand forecasting techniques and to find cause and effect relationship between variable through regression analysis.

Modules At Glance

Module No.	**Content**	**No. of Lectures**	**Mapping with CO**
1	1.1 Introduction of Statistics: 1.2. Measures of Central Tendencies: 1.3. Measures of Dispersion: 1.4. Raw and Central Moments, relation between Raw and Central moments, concept of Skewness and Kurtosis.	15	CO1, CO2, CO3

2	2.1.Correlation 2.2. Rank Correlation 2.3. Regression, 2.4 Relation between Correlation and Regression 2.5. Concept of multiple correlation 2.6. Concept of multiple regression and logistics regression	15	CO4, CO5
		30	

Syllabus

Module No.	Content	No. of Lectures
I	1.Introduction of Statistics: Meaning of Statistics, Importance of Statistics, Types of Characteristics, Different types of Scales: Nominal, Ordinal, Interval and ratio. Univariate frequency distribution of discrete and continuous variables and Cumulative frequency distribution. Data Presentation: Frequency Distribution, Histogram and Ogives Curves. 2. Measures of Central Tendencies: Concept of Central Tendency, characteristics of good measures of Central Tendency, Positional Averages: Median, Mode , Partition values: Quartiles, Deciles and Percentiles -examples of ungrouped and grouped data 3. Measures of Dispersion: Concept of Dispersion, Requirements of good measures of Dispersion, Absolute and Relative measures of Dispersion: Range, Quartile Deviation, Mean Absolute Deviation, Standard Deviation, Combined Standard Deviation-examples of ungrouped and grouped data 4. Raw and Central Moments, relation between Raw and Central moments, concept of Skewness and Kurtosis.	15
II	1.Concept of Correlation, types and interpretation, Scatter Diagram, Product Moment Correlation Coefficient, and its properties 2. Spearman' s Rank Correlation (with and without ties) 3. Concept of Linear Regression, Principle of Least Square, Fitting a straight line by method of least square. 4. Difference between Correlation and Regression, relation between Correlation and Regression 5.Concept of multiple correlation 6. Concept of multiple regression and logistics regression	

Case Study Scenario	
M1	A retail company collects data on customer age, product type and monthly spending to understand buying behavior. The data is classified using appropriate scales and organized into frequency and cumulative frequency distributions. Graphs such as histograms and ogives are used for presentation, and measures of central tendency like mean, median, mode, quartiles and percentiles are applied to identify average spending patterns and compare different customer groups.
M2	A college analyzes the performance of students by studying the relationship between study hours and marks. Measures of dispersion and moments are used to understand variability and distribution shape. Correlation and regression techniques are applied to determine and predict the relationship between variables, including the effect of multiple factors such as attendance and internal marks on overall academic performance.

References Books:

- Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentce Hall of India, NewDelhi.
- Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, NewDelhi.
- Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, NewDelhi.
- Schaum‟s Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum‟s Outline Series Mcgraw-Hill

Semester End Evaluation (50 Marks) ***Time: 2 Hr***

Paper Pattern

Question No	Questions	Total Marks: 50
Q1	Attempt 3 out of 5	**15**
Q2	Attempt 3 out of 5	**15**
Q3	Attempt 3 out of 5	**15**
Q4	Case Study	**05**

Practical Syllabus

Sr. No	List of Practicals	Mapping with CO	No. of Lectures
1.	**Introduction to Excel** a. Understanding Data Tools. b. Understanding Formula Tools, insert functional library using insert function. c. Add-Ins Analysis tool packs d. Formula writing, Functions, using Cell reference, Sort, Filter and Advance Filter	CO1	3

2.	**Data Entry and Manipulation** a. Tools for data entry and accuracy: Quick Access toolbar customization, Form tool b. Data Transposition to fit Excel (as an Array) c. Data Conversion with the Logical If, VLOOKUP, Pivot table, Pivot chart. d. Data conversion to Text from Non-Excel Sources. Using text to Column	CO1	3
3.	**Data Validation** a. Specifying a valid range of values for a cell. b. Specifying a list of valid values for a cell c. Specifying custom validation based on formula for a cell.	CO1	3
4.	**Diagrams and Graphs** a. Excel program to plot Histogram. b. Excel program to plot Bar Graphs. c. Excel program to plot Pie chart. d. Boxplot and multiple Boxplots	CO1	3
5.	**Measures of Central Tendency** a. Excel program to find Mean. b. Excel program to find Median. c.Excel program to find Mode	CO2	3
6.	**Measures of Dispersion** a.Excel program to find Range, Interquartile Range b. Excel program to find Variance. c. Excel program to find Standard Deviation. d. Excel program to find Skewness and Kurtosis..	CO3	3
7.	**Correlation** a. Excel program to find Positive Correlation. b. Excel program to find Negative Correlation. c. Excel program to find Zero Correlation	CO4	3
8.	**Regression-1** a. Excel program to perform linear regression for prediction. b. Excel program to perform polynomial regression for prediction	CO5	3
9.	**Regression – 2** a. Excel program to perform multiple linear regression for prediction. b. Excel program to perform logistic regression for prediction	CO5	3
10.	Design a survey form, get primary data and analyse it. (given case study)	CO1,CO2, CO3,CO14 ,CO5	3

Practical Evaluation (50 Marks)

Question No.	Assessment/ Evaluation	Marks
Q1	Practical (Module 1 & Module 2)	30
Q2	Journal	10
Q3	Viva and Attendance	10

Course	**Combinational & Sequential Design**				
Course Code	**HUSIT104**	**Level**	**4.5**		
		Type	**Theory**	**Practical**	**Total**
Semester	**I**	**Credits**	02	01	03
Type	**SEC**	**No of Teaching hours**	**30**	**30**	**60**
Evaluation/ Assessment	**Total Marks**	**Continuous Evaluation**	**SEM End Examination**	**Practical Exam**	
	150	**50**	**50**	**50**	

Learning Objectives	
1	Understand the basic concepts of digital logic, including logic gates, universal gates, and digital ICs used in modern digital systems.
2	Apply Boolean algebra rules and Karnaugh map techniques to simplify logic expressions and optimize digital circuit designs.
3	Design and implement combinational circuits such as arithmetic circuits, encoders, decoders, multiplexers, and demultiplexers for various applications.
4	Develop code converters and advanced arithmetic circuits & Construct and analyze sequential circuits like flip-flops, counters, shift registers, and display systems for data storage
5	Understand the fundamental principles and characteristics of various digital logic families, including RTL, DTL, TTL, ECL, CMOS, IIL, and HTL.

Course Outcomes	
CO1	Students will be able to understand and explain the operation of basic logic gates, universal gates, and standard digital ICs.
CO2	Students will be able to simplify and implement Boolean expressions using Boolean algebra and Karnaugh maps to design optimized digital circuits.

CO3	Students will be able to design and realize combinational circuits & sequential circuits.
CO4	Students will be able to implement code converters and advanced arithmetic circuits like multipliers and comparators for digital applications.
CO5	Students will be able to identify and describe the key characteristics and applications of various digital logic families.

Modules At Glance

Module No.	Content	No. of Hours	Mapping with CO
1	Digital Logic Fundamentals and Circuit Design	15	CO1 ,CO2
2	Combinational & Sequential Circuits.	15	CO3,CO4 & CO5
		30	

Syllabus

Module No.	Content	No. of Lectures
1	**Basic Logic Gates and Digital ICs** Basic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR Universal gates: Implementation of AND, OR, NOT, XOR, XNOR using only NAND and NOR gates Study of ICs: 7400, 7402, 7404, 7408, 7432, 7486, 74266 **Boolean Algebra and Logic Simplification** Boolean laws and theorems, Verification of De Morgan's laws, Simplification using Boolean algebra and Karnaugh Map (K-map), Problem-based design and K-map simplification, SOP and POS forms, Realization using minimum number of gates and ICs. **Code Conversion Techniques** Binary to Gray and Gray to Binary, Binary to BCD.	**15**
2	**Arithmetic and Logic Circuits** 2-bit by 2-bit multiplier, 2-bit comparator **Combinational Circuits :** Encoders, Decoders, Multiplexers, Demultiplexers. **Sequential Circuits :** Flip-Flops and Counters **Shift Registers and Display Systems :** Types: SISO, SIPO, PISO, PIPO & Seven-segment display applications **Logic Families:** Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS, IIR, HTL	**15**
Case Study Scenario		
M1	A digital security system uses motion, door, and window sensors along with an arm switch to activate an alarm. The alarm turns ON only when the system is armed and two or more sensors are active. Design the logic circuit using Boolean algebra and simplify it using K-map. Implement the final circuit using only NAND or NOR gates and identify suitable 7400-series ICs.	

M2	A ticket vending machine uses digital circuits to count tickets and display numbers from 0 to 15. Design a 2-bit comparator and 2×2 multiplier for ticket control and cost calculation. Use counters and shift registers for sequencing operations. Display the output using a seven-segment display and justify the choice of logic family.

Text and References:

- **M. Morris Mano, Michael D. Ciletti**,
  Digital Design, 5th Edition, Pearson Education.
- **R.P. Jain**,
  Modern Digital Electronics, 4th Edition, McGraw Hill Education.
- **Thomas L. Floyd**,
  Digital Fundamentals, 11th Edition, Pearson Education.
- **Digital Logic Families by R. P. Jain**

Semester End Evaluation (50 Marks) ***Time: 2 Hrs***

Paper Pattern

Question No	Questions	Mapped to CO	Total Marks: 50
Q1	Attempt any 3 out of 5	(Module I)	15M
Q2	Attempt any 3 out of 5	(Module II)	15M
Q3	Attempt any 3 out of 5	(Module I & II)	15M
Q4	Case Study (Attempt Any 1 from 2)	Any module or combination	5M

Practical Syllabus

List of Practicals		CO Mapping	No. of Lectures
1	Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates	CO1	3
2	Implement the given Boolean expressions using a minimum number of gates. a. Verifying De Morgan's laws.	CO1	3
3	Implement combinational circuits. a. Design and implement combinational circuit based on the problem given and minimizing using K-maps. (Various Equations, SOP, POS forms can be given)	CO2 & CO3	3
4	Implement code converters. a. Design and implement Binary – to – Gray code converter. b. Design and implement Gray – to – Binary code converter. c. Design and implement Binary – to – BCD code converter.	CO4	3

5	Implement Adder and Subtractor Arithmetic circuits. a. Design and implement Half adder and Full adder.		3
6	Implement Arithmetic circuits. a. Design and implement a 2-bit by 2-bitultiplier. b. Design and implement a 2-bit comparator.	CO4	3
7	Implement Encode and Decoder and a. Design and implement 8:3 encoder. b. Design and implement 3:8 decoder.	CO4	3
8	Implement Multiplexers & Demultiplexer a. 2:1 & 4:1 Multiplexer b. 2:1 & 4:1 Demultiplexer	CO4	3
9	Implement Asynchronous (Ripple) Counters & Flip Flops a.Design and implement a 3-bit binary ripple counter using JK flip-flops.. b.Design and test SR, JK, & D flip-flops using logic gates.	CO3	3
10	Design of shift registers and shift register counters. a. Design serial – in serial – out(SISO) , serial – in parallel – out(SIPO) , parallel – in serial – out(PISO) , parallel – in parallel – out (PIPO).	CO3	3

The above practical can be performed using any open source simulator (like Logisim) (Download it from https://sourceforge.net/projects/circuit/)

Practical Evaluation ***(50 Marks)***

Question No	Questions	Total Marks: 50
Q1	Question 1	30
Q2	Journal	10
Q3	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Indian Roots of Information Science**				
Course Code	**HUSIT105**		**Level**	**4.5**	
			Type	**Theory**	**Total**
Semester	**I**		**Credits**	02	02
Type	**IKS**		**No of Teaching hours**	**30**	**30**
Evaluation/ Assessment	**Total Marks**	**Semester End**		**Continuous**	**Practical**
	50	**-**		**50**	**-**

Learning Objectives	
1	To sensitize the students about context in which they are embedded i.e. Indian culture and civilisation including its Knowledge System and Tradition.
2	To help students to understand the knowledge, art and creative practices, skills and values in the ancient Indian system.
3	To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.

Course Outcomes	
CO1	Learner will understand and appreciate the rich Indian Knowledge Tradition.
CO2	Learner will understand the contribution of Indians in various fields
CO3	Learner will experience increase subject-awareness and self-esteem

Modules At Glance

Module No.	**Content**	**No. of Lectures**	**Mapping with CO**
1	Introduction to Indian Knowledge System	15	CO1,CO2
2	Basics Applications inspired by IKS	15	CO2,CO3
		30	

Syllabus

Module No	Content	No. of Lectures
1	**Introduction to Indian Knowledge System:** • Introduction to IKS: What is knowledge System, Characteristic & Features of Indian Knowledge System • Why IKS? : Cultural Awareness and Pride,Holistic Learning,Preservation and Innovation • Tradition & Scope of IKS : Vedas and Upanishads,Mathematics in Ancient India, Architecture & Vāstu, Scope: Natural Language Processing (NLP),Artificial Intelligence & Machine Learning,Algorithm Optimization Inspired by Vedic Math • History of Computers: Generations of Computers & Types of Computers	15
2	**Basic Applications inspired by IKS** • Mathematics & Computation : Logic & Reasoning (Nyāya and Anumāna) Binary Concepts using Vedic Mathematics • Patterns & Algorithms (Chandaḥśāstra – Prosody) **&** Language Structure (Paninian Grammar):Patterns in poetic meters → similar to binary sequences, Application in text analysis and compression algorithms, Concepts of meta-rules → foundations of programming languages , Influence on Natural Language Processing (NLP) • Time Representation & Calendars (Panchanga): Ancient Indian calendars use complex astronomical data, Concepts of time, cycles → used in simulations, data modeling • Classification and Categories (Ayurvedic Ontologies): Tridosa and Disease Classification,Knowledge Management,Data Analysis,Tools and Technologies	15
Case Study Scenario		
M1	An educational technology initiative aims to promote the **Indian Knowledge System (IKS)** by creating a digital platform that introduces its key characteristics, cultural significance, and holistic approach to learning. The platform highlights knowledge from the **Vedas and Upanishads**, showcases ancient Indian contributions to mathematics and science, and explains how traditional ideas of learning preservation and innovation remain relevant today, while drawing simple connections between ancient knowledge systems and the evolution of modern computing.	
M2	A research project applies concepts from **Indian Knowledge Systems** to modern technology by using **Nyāya logic** and **Vedic mathematics** for computational problem solving, **Paninian grammar and Chhandashastra** for text analysis and	

	NLP, **Panchanga-based time models** for simulations, and **Ayurvedic classifications** for data organization, demonstrating how traditional frameworks can support modern data analysis and technological applications.

References Books

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi 1958.
3. History of Chemistry in Ancient India & Medieval India, P.Ray- Indian Chemicals Society,Calcutta 1956
4. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
5. MacDonnell A.A- History of Sanskrit literature
6. Winternitz M- History of Indian Literature Vol. I, II & III
7. Dasgupta S.N & De S.K- History of Sanskrit literature Vol. I.
8. Ramkrishna Mission- cultural heritage of India Vol. I, II & III.
9. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
10. Keith A.B- History of Sanskrit literature.
11. Varadachari V- History of Sanskrit literature Chaitanya Krishna- A new History of Sanskrit