



Syllabus

First Semester Courses in Information Technology

2023-2024

Contents:

- Syllabus for Core Course:
 - USITY4501MJ1: Applied Mathematics
 - USITY4501MN1: Basics of Python Programming
 - USITY4501VS1: The Art of Programming
- Evaluation and Assessment guidelines



PRINCIPAL
ST. XAVIER'S COLLEGE
AUTONOMOUS
MUMBAI - 400 001.

APPROVED SYLLABUS

F. Y. B. Sc (Information Technology)

Course Code: USITY4501MJ1

Title: Applied Mathematics

Credits:4 (for Theory 4 (Total 60 hr))

Course Objectives:

The course will demonstrate proficiency in manipulating matrices, computing determinants, and finding matrix inverses and also to calculate eigenvalues and eigenvectors of matrices and apply them to analyze linear transformations and diagonalization.

Course Outcomes:

On completing the course, the student will be able to:

1. Acquire proficiency to perform basic matrix operations, such as addition, multiplication, and finding determinants.
2. Understand the concepts of eigenvalues and eigenvectors and apply them in solving systems of linear equations and analyzing linear transformations.
3. Gains a deep understanding of real-valued functions of one variable, covering limits, continuity, and differentiation

UNIT 1 **15**

Matrices, Eigen Values and Eigen Vectors

Rank of a Matrix, System of Homogeneous and Non-Homogeneous Linear Equations, Linearly Independent and Linearly Dependent Vectors, Characteristic Equation of a Square Matrix, Derogatory and Non-Derogatory Matrices, Eigen Values and Eigen Vectors of a Square Matrix, Diagonalization of a Square Matrix, Cayley-Hamilton Theorem, Adjoint of a Matrix.

UNIT 2 **15**

Real Valued Functions of One Variable

Intermediate Value Theorem, Successive Differentiation, Higher Order Derivatives and Leibnitz Rule, Mean Value Theorems, Increasing and Decreasing Functions, Finding Extreme Values by first and second Derivative Test, Concavity, Points of Inflection, Asymptotes, Tracing of Curves using first and second derivatives, Graphs of some standard function, Taylor's Series and Taylor's Polynomials.

UNIT 3 **15**

Real Valued Functions of Two or Three Variables

Limit (Two path test) and Continuity of Functions in 2 or 3 variables, Level Curves to draw Quadric Surfaces, Partial Differentiation, Implicit Differentiation, Chain Rule, Euler's Theorem, Directional Derivatives and Gradients, Extreme Values of a Function of two variables by second derivative test and by the method of Lagrange's Multiplier.

UNIT 4 **15**

Differential Equation

Exact Differential Equations of first order and first degree and Integrating Factors, Linear Differential Equations and Bernoulli's Differential Equation, Linear Differential Equations with Constant Coefficient

List of Recommended Reference Books

1. Grewal, B. S., Grewal, J. S., & Dhanoa, J. K. (2017). Higher engineering mathematics. New Delhi: Khanna Publishers.
2. Ramana, B. V. (2007). Higher Engineering Mathematics. Tata McGraw-Hill Education.
3. Lay, D. C., Lay, S. R., & McDonald, J. (2016). Linear algebra and its applications. Boston: Pearson.
4. Narayan, S., & Mittal, P. K. (2008). Differential calculus New Delhi: Shyam Lal Charitable Trust, Repr.
5. Thomas, G. B., Finney, R. L., & Weir, M. D. (1996). Calculus and analytic geometry. Noida, India: Pearson.

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

CIA II: Assignments / Project / Presentation / Case Study/ Written Test for 20 marks

End semester Exam :60 marks

Template for the Core course End Semester examination in Semester I

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	5	5	5	15
2	5	5	5	15
3	5	5	5	15
4	5	5	5	15
-TOTAL - Per objective	20	20	20	60
% WEIGHTAGE	34%	33%	33%	100%

F. Y. B. Sc (Information Technology)

Course Code: USITY4501MN1

Title: Basics of Python Programming

Credits:4 (for Theory 3 (Total 45 hr) and Practical 1 (Total 30 hr))

Course Objectives:

To have a strong grasp of the Python programming language, including its syntax and core features.

Course outcomes:

On completing the course, the student will be able to:

1. Perform basic programming fundamentals using Python.
2. Understand basic principles of programming, including variables, data types, and control structures in Python.
3. understand various data structures in Python

Unit 1

15

Introduction: Overview of Programming languages, Translators, Hardware Vs Software, Problem Analysis, Algorithms, Flow Charts, Examples of Algorithms and Flow Charts.

Introduction to Python: Python overview, Modes of Programming in Python, installing Python.

Unit 2

15

Data Types & Variables: Statements & Expressions, Variables, Integers & Floats, Strings, Operators and its types

Conditional Statements and Control flow: Conditional Statements and Loops, break and continue.

Unit 3

15

Data Structures & Attributes: Functions, Built-in Functions, Composition of Functions, User Defined Functions, Parameters and Arguments, Function Calls and return statement, Lists, Tuples and dictionaries, Indexing & Slicing.

Modules and Imports.

Packages.

List of Recommended Reference Books

1. E Balagurusamy (2018). Programming for Problem Solving. McGraw Hill Education India Private Limited
2. Harsh Bhasin. (2019). Python basics. Dulles Mercury Learning and Information.
3. Kanetkar Yashavant. (2019). Let Us Python. BPB Publications.

Practical:

1. Programs on data types and variables
2. Programs on operators
3. Programs on conditional statements
4. Programs on Loops
5. Programs on Pattern
6. Programs on List and Tuple
7. Programs on dictionaries
8. Programs on modules
9. Programs on Packages.

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

CIA II: Assignments / Project / Presentation / Case Study/ Written Test for 20 marks

End semester Exam :60 marks

Practical Exam:50 marks

Template for the Minor course End Semester examination in Semester I

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	5	5	10	20
2	5	10	5	20
3	5	5	10	20
-TOTAL - Per objective	15	20	25	60
% WEIGHTAGE	25%	33%	42%	100%

F. Y. B. Sc (Information Technology)

Course Code: USITY4501VS1

Title: The Art of Programming

Credits:2 (for Theory 1 (Total 15 hr) and Practical 1 (Total 30 hr))

Course Objectives:

To learn the art of problem-solving and to learn the fundamentals of a programming language using a structured programming approach.

Course Outcomes:

On completing the course, the student will be able to:

1. Gain the logical ability in order to develop algorithms, for real-world problems, independent of computer type, language, or application.
2. Develop C programs that use variables, data types, and control structures effectively.
3. Understand how to create and use functions in C to organize code and promote reusability

Unit I

Algorithm Design, Pseudo code/Flowchart, and Control structure construction. 15

Program Structure, Understanding Problem definition, input, processing output, program optimization, and importance of program documentation.

Programming fundamentals, Data types, operators, Loops, Conditional statements, terminating statements, arrays.

Unit 2

15

Functions and Pointers, Usage, Concept of module design, how to divide a given problem to modules, Inter module communication, module coupling, and local and global data. Pointers and Structures, Multithreading.

File handling, Reading and Writing data, Creating records

List Of Recommended Reference Books (list based on the most recent date of publication to oldest)

1. Juliff, P. L. (1984). Program Design: The Art of Structured Programming. United Kingdom: Interface.
2. Gottfried, B. S. (1996). Schaum's Outline of Programming with C. United Kingdom: McGraw-Hill Education.
3. Kanetkar, Y. P. (2017). Let Us C. India: BPB Publications.

Suggested reading

How to Solve it by Computer. (2008). India: Pearson Education.

Practical:

1. Case study-based approach for every session which explores programming fundamentals enabling the implementation of concepts learnt during the course.
2. Basic Programs on variables and Data Types
3. Conditional statements and Loops
4. Patterns
5. Arrays
6. Functions
7. Pointers
8. Structure

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

OR

Assignments / Project / Presentation / Case Study for 20 marks

End semester Practical Exam : 30 Marks



Syllabus

Second Semester Courses in Information Technology

2023-2024

Contents:

- Syllabus for Core Course:
 - USITY4502MJ1: Descriptive Statistics
 - USITY4502MN1: Database Management Systems
 - USITY4502VS1: C++ Programming
- Evaluation and Assessment guidelines

F. Y. B. Sc (Information Technology)

Course Code: USITY4502MJ1

Title: Descriptive Statistics

Credits:4 (for Theory 3 (Total 45 hr) and Practical 1 (Total 30 hr)

Learning Objectives:

The course aims to help students to understand different types of data and how they can be collected, organized, and summarized for analysis. The course helps students to understand the importance of data visualization in presenting data, and the effective use of software such as Excel and R and also understand basic concepts of measures of central tendency.

Course outcome:

On completing the course, the student will be able to:

1. Understand the importance of data collection in statistics.
2. Differentiate between primary and secondary data sources.
3. Define and explain the concept of dispersion in data.
4. Develop the skill of R programming

Unit 1

15

Statistical Survey and collection of data:

Collection of data, Methods of collecting Primary Data, Sources of secondary data
Classification and Tabulation: Objectives of classification, Rules of classification, Modes of classification, Frequency distribution, construction of grouped frequency distribution, tabulation, objectives of tabulation.

Diagrammatic and graphic representation and different types of graphs

Measures of Central Tendency:

Introduction, objectives of averaging, characteristics of a good average, types of average, Arithmetic mean and its properties (simple and weighted), Combined mean. Median, Mode, Geometric Mean and Harmonic Mean, choice of suitable average.

Unit 2

15

Measures of Dispersion:

Definition of dispersion, objectives of measuring dispersion, absolute and relative measures, range, coefficient of range, inter quartile range, mean deviation, standard deviation, coefficient of variation, graphic method of dispersion

Skewness:

Skewness introduction, objectives of Skewness, Measures of Skewness, Karl Pearson's coefficient of Skewness. Moments and Kurtosis

Unit 3

15

Correlation Analysis:

Introduction, Correlation and Causation, types of correlation, methods of studying correlation, correlation in bivariate frequency table

Regression Analysis

Meaning, Types of regression analysis, Principle of least squares Methods of studying regression, Graphic method and Algebraic method. Regression coefficients, Regression equations

List of Recommended Reference Books

1. Sancheti, D. C., Kapoor, V. K. (1981). Statistics: Theory, Methods and Application. India: Sultan Chand & Sons.
2. Gun, A. M., Gupta M.K., Dasgupta B (2008). Fundamentals Of Statistics. India: World Press.

Practical:

1. Introduction To R
2. R-Objects and Variables
3. R operators
4. R decision making commands
5. R- Loops
6. R-Function
7. Graphical representation of Data

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

CIA II: Assignments / Project / Presentation / Case Study/ Written Test for 20 marks

End semester Exam :60 marks

Template for the Core course End Semester examination in Semester II

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	5	5	10	20
2	5	10	5	20
3	5	5	10	20
-TOTAL - Per objective	15	20	25	60
% WEIGHTAGE	25%	33%	42%	100%

F. Y. B. Sc (Information Technology)

Course code: USITY4502MN1

Title: Database Management Systems

Credits:4 (for Theory 3 (Total 45 hr) and Practical 1 (Total 30 hr))

Course Objectives:

The course covers the fundamental concepts and principles of Database Management Systems and develop the skills to design, create, query, and manage relational databases.

Course Outcomes:

On completing the course, the student will be able to:

1. Design a database schema using the Entity-Relationship Diagram (ERD) notation.
2. Create and manage tables, relationships, and constraints in a relational database.
3. Write SQL queries to retrieve, update, and manipulate data.

Unit 1 15

Basic Concepts: Introduction to databases, Different data models, ER model, Creating and altering database tables, Constraints and types of constraints, defining primary keys and foreign keys, inserting records into a table, Basic structure of a SQL query, retrieving data using SELECT statements, Filtering data with WHERE clause.

Unit 2 15

Data Manipulation and Sorting: Updating and deleting records, sorting retrieved data using ORDER BY, limiting result sets with LIMIT, Introduction to JOINS, Using JOIN clauses to combine data from multiple tables, SELF JOIN, INNER JOIN, LEFT JOIN, RIGHT JOIN

Unit 3 15

Aggregate Functions and Subqueries: Working with logical operators (AND, OR), Using aggregate functions (SUM, AVG, COUNT, MIN, MAX), Grouping data using GROUP BY, filtering grouped data with HAVING, GROUP BY and JOINS, Subqueries: Using SELECT within SELECT, Handling NULL values in SQL, Use of IN, ANY, ALL, Correlated Subqueries

List of Recommended Reference Books

1. Silberschatz, A., Korth, H. F., Sudarshan, S. (2005). Database System Concepts. United Kingdom: McGraw-Hill Higher Education.
2. Rob, P., Coronel, C. (2006). Database Systems. United Kingdom: Thomson/Course Technology.

Practical:

1. Design a Database and create required tables. For e.g., Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL, Unique to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE.
4. Write the query for implementing the aggregate function.
5. Write the query to implement the concept of Group by and Having clause.
6. Write the query to perform sorting on the given data using ORDER BY clause.
7. Write the queries to implement the joins
8. Querying single and multiple tables using sub queries.

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

CIA II: Assignments / Project / Presentation / Case Study/ Written Test for 20 marks

End semester Exam :60 marks

Practical Exam:50 marks

Template for the Minor course End Semester examination in Semester II

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	5	5	10	20
2	5	10	5	20
3	5	5	10	20
-TOTAL - Per objective	15	20	25	60
% WEIGHTAGE	25%	33%	42%	100%

F. Y. B. Sc (Information Technology)

Course code: USITY4502VS1

Title: C++ Programming

Credits:2 (for Theory 1 (Total 15 hr) and Practical 1 (Total 30 hr)

Course Objectives:

To learn a Programming Language and to learn structured and procedural programming concepts and to emphasize on various Object-oriented Paradigm.

Course outcomes:

On completing the course, the student will be able to:

1. Develop good programming principles to the design and implementation of C++ program
2. Acquire strong understanding of the C++ programming language, including its syntax and core features.
3. Develop C++ programs that use variables, data types, and control structures effectively.

Unit 1

15

C++ concepts: Variables and Assignments Variables Identifiers Variable Declarations Assignment Input and Output: cin, cout, include directives and Data types and expressions, Conditional Statements and Loops.

Classes and Objects: Class Specification, Constructors and types, accessing class members, Passing Objects as Arguments, Returning Objects from functions, Data Hiding, Friend Function and Friend Class

Unit 2

15

Inheritance: Inheritance and member accessibility, Single, Multiple and multilevel Inheritance, Constructors in derived class, Polymorphism

Generic programming with Templates: Function Templates, Class Templates

List of Recommended Reference Books

1. Obj Oriented Prog With C++,5e. (2011). India: McGraw-Hill Education (India) Pvt Limited.
2. Kanetkar, Y. P. (1999). Let Us C++. India: BPB Publications.

Practical:

1. Basic C++ Programs on variables and datatypes
2. Programs on Conditional Statements and Loops
3. Functions
4. Classes and Objects
5. Passing and returning object as a parameter
6. Friend functions
7. Inheritance
8. Templates

ASSESSMENT:

THEORY:

CIA I: Written test for 20 marks

OR

Assignments / Project / Presentation / Case Study for 20 marks

End semester Practical Exam :30 marks