Mahatma Education Society's

Pillai College of Arts, Commerce & Science (Autonomous)

Affiliated to University of Mumbai

'NAAC Accredited 'A' grade (3 cycles)'
'Best College Award' by University of Mumbai
ISO 9001:2015 Certified

SYLLABUS

Program: Bachelor of Computer Application (B.C.A)

F. Y. B.C.A

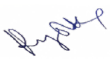
PCACS/BCA/AUTS/2025-26/FY

As per National Education Policy 2020

Academic Year 2025-26

Board of Studies in the Department of Computer Science

Sr. No.	Name of the	Details	Sign
1	Prof. Deepika Sharma	Chairperson (Head of Department of Information Technology & Computer Science), Vice Principal	
2	Dr. Gajanan Wader	Principal	
3.	Mrs.Munawira Kotyad Pillai, Director Pillai Center for Innovation & Research	Management Representative	Absent
4	Dr. Amiya Kumar Tripathy Director Center for GeoAI & ML, Professor, Computer Engineering, Don Bosco Institute of Technology, Mumbai	Subject Expert From Outside Parent University	
5	Dr.. Anjali Kulkarni CKT College, New Panvel	Vice Chancellor Nominee, University of Mumbai	
6	Mr. Tito Idicula, Director, Programming Hub	Alumni representative	
7	Mr. Anant Baddi, Security Solution Architect, cloud Google Google	Industry Representative (Industry/Corporate/Allied Sector)	Absent
8	Mr. Bhupendra Kesariya Professor,N. M. .College, Vile Parle	Subject Expert in Mathematics From Outside Parent University	
9	Mrs. Anju Somani	Faculty Specialization	

10	Mrs. Shubhangi Pawar	Faculty Specialization	
11	Mrs. Soly Zachariah	Faculty Specialization	
12	Mrs. Ramya S. Kumar	Faculty Specialization	
13	Mrs. Sujata Shahabade	Faculty Specialization	
14	Mrs. Sreevidya T.V.	Faculty Specialization	
15	Mr. Omkar Sherkhane	Faculty Specialization	
16	Mr. Abhijeet Salvi	Faculty Specialization	

1. INTRODUCTION

Bachelor of Computer Application is a three years undergraduate programme that has been designed meticulously to meet the requirements of dynamic I.T. industry. This programme aims at fostering concepts of Information technology and business technology in students and equip them with the required technical, logical, problem solving and soft skills, which prepare them for the corporate world. It also focuses on inculcating effective communication skills which a software professional must have.

No education is complete without incorporating social and moral values. This programme takes care of this aspect as well. The core courses of the program are supplemented by electives so that students can tailor the program according to their interest. State of art computer laboratories, in the campus, help students to practically implement the concepts learned. Qualified and experienced faculty members guide students in their project work. As we all know degrees in Computer Application lead to rewarding and lucrative careers, excellent placement and incubation assistance is provided.

2. Program outcomes

Sr No	PO Title	POs in brief
PO1	Core Knowledge	Develop a strong foundation in the core principles and theories of their chosen field of study to pursue a profession of choice by understanding fundamental concepts, methodologies, and key terminologies
PO2	Research Skills	Trigger the research aptitude by developing basic research skills, including the ability to conduct literature reviews, design experiments, collect and analyze data, and draw meaningful conclusions.
PO3	Communication Skills	Communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing and also ability to present their work through written, oral, and visual presentations, including an original research proposal in a clear and understandable manner to both technical and non-technical audiences.
PO4	Ethical and Professional Behavior	Understand and adhere to ethical standards by recognizing the importance of integrity, honesty and ethical responsibility in scientific research and professional practice.
PO5	Teamwork and Collaboration	Ability to work cohesively to achieve common goals, solve problems and contribute to the success of a project or task paving way to individual and collective growth.
PO6	Adaptability and Lifelong Learning	Engage themselves in lifelong learning to keep up with the pace of changing technology and interdisciplinary approach to provide better solutions and new ideas for the sustainable developments
PO7	Technical Skills	Acquisition of specialized technical skills and expertise relevant to the specific field of study i.e advanced laboratory techniques, computational skills, or other specialized methodologies.
PO8	Critical Thinking and Problem-Solving Skills	Graduates would be equipped with the ability to analyze information critically, think logically, and solve complex problems. Applying scientific methods, mathematical reasoning, and logical approaches to real-world situations.

3. Program Specific Outcomes

Sr No	PSOs in brief
PSO1	Understand the fundamentals and applications of programming, Data Structures, Databases, Networking, Internet of Things,Mobile Computing, Information security and Data Analytics.
PSO2	Effectively integrate I.T. based solution in the users domain after properly analyzing the requirements and the constraints.
PSO3	Unique Knowledge of Technology in Business Applications and Computational tools for simulation.
PSO4	Ability to comprehend and write effective project reports in a multidisciplinary environment in the context of changing technologies.

Course Structure

Semester I						
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures / Week**
ITS101	Core1	Python Programming	Theory	100	3	4
			Practical	50	1	2
MATH101	Core2	Mathematical and Statistical Techniques	Theory	100	2	4
			Practical	50	1	2
CA101	Core 3	Introduction to Business Technology	Theory	100	3	4
			Practical	50	1	2
COMM101	AEC	Effective Communication Skills	Theory	100	2	3
CA102	SEC	Problem Solving Techniques	Theory	100	2	3
HUM101	VAC	Intellectual Indian Heritage	Theory	100	3	3
PUIDC10	IDC	To Be taken from the Pool	Theory	100	4	3
Total				850	22	30
All Subjects having Field Project as part of Continuous Assessment-2						

Abbreviations:

DSC : Discipline Specific Core

GE : General Electives

AEC : Ability Enhancement Course

SEC : Skill Enhancement Course

VAC : Value Added Course

Semester II						
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures/ Week**
ITS151	Core	Core JAVA	Theory	100	3	4
			Practical	50	1	2
MATH 151	Core	Statistical Methods and testing of Hypothesis	Theory	100	2	4
			Practical	50	1	2
ITS152	Core	Web Programming	Theory	100	3	4
			Practical	50	1	2
INL10	AEC	Indian Languages (from the pool	Theory	100	2	3
ITS153	SEC	Networking Fundamentals	Theory	100	2	3
HUM 121	VAC	Human Values	Theory	100	3	3
PUIDC	IDC	To Be taken from the Pool	Theory	100	4	3
Total				850	22	30
All Subjects having Field Project as part of Continuous Assessment-2						

Abbreviations:

DSC : Discipline Specific Core
GE : General Electives
AEC : Ability Enhancement Course
SEC : Skill Enhancement Course
VAC : Value Added Course

SEMESTER I

BOS	Computer Science

Class	F.Y.B.C.A
Semester	I
Course Name	Python Programming
Course Code	ITS101
Type of course	Core
Level of the Subject	medium
Credit points	3 Theory+1 Practical

Course Objectives:

1. Develop proficiency in Python programming by mastering core concepts
2. Apply Python for data manipulation, visualization, and GUI development.

Unit No.	Name of Unit	Topic No.	Contents	Hours
Unit-1	Comprehensive Guide to Python: Basics, Control Structures, and String Handling	1.1	**Overview**: What is python? Features of python. Installation of python. Running Python program, Interactive Mode and Script Mode. Variables,Keywords, Datatype, Type conversion, Operators, Comments,input/output functions: input(), print()	15
		1.2	**Control Structure**:if, else and else if, Simple for loops in python, for loop using ranges. Use of while loops in python, Loop manipulation using continue, break and else.	
		1.3	**String Handling**: What is a String?String Characteristics(Immutable,Indexed,Iterable). Accessing String Elements : Indexing & Slicing, Looping Through Strings. Searching in String: find(), index(),count(). String Methods: upper(), lower(), title(), swapcase(), capitalize(), replace(), split(), join(), startswith(), endswith(),isalpha(), isdigit() . String Comparison, String Operations: Concatenation (+), Repetition (*) , Membership Testing (in, not in).	
Unit-2	Python Data Structures, Functions, and Modules	2.1	**Lists**: Introduction to List(What is a List ? Liste Characteristics,Creating a List), Updating and Accessing Elements((indexing, slicing, Nested List), traversing a List, Deleting elements from List :del ,remove() ,pop() methods List Operations,Built-in List functions: len(), max(), min(),sum(),clear(). List Methods:	15

			append(), extend(), insert(), remove(), pop(), index(), count(), sort(), reverse(). **Tuples**: Introduction to Tuples(What is a Tuple ? Tuple Characteristics,Creating Tuple) Accessing Values In Tuples: (indexing, slicing,Negative indexing: Nested Tuples).Tuple Assignment, Tuples as return values, packing and unpacking,Variable-length argument Tuples operation, Iteration, Built-inTupleFunctions:len(), max().min(),count(), sum(),sorted()..	
		2.2	**Dictionary**: What is a Dictionary?Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary,Dictionary comprehension, Properties of Dictionary , Built-In Dictionary Methods clear() ,copy() ,get(), items(),keys(), pop(), update(), values(). **Set**: Creating a Set, Access Set Items, Add Set Items(add(), update()), Remove Set Items (remove(),pop(),discard(),clear()), Loop in Sets, Set Operation: (union, intersection, difference, symmetric_difference)	
		2.3	**Functions**:What is a Function?Types of function, Defining-calling and returning (single and multiple) results from a function, return statement, Function Arguments:Positional arguments, Keyword arguments, Variable-Length Arguments**,**Default arguments, Recursive Functions. **Modules**: What is a module? Standard Library Modules (math, random, os), Creating Custom Modules How to create and save your own Python modules.	
Unit-3	Python Essentials: File Handling, Data Visualization, GUI Development,and AI-Driven Code Optimization	3.1	**File Handling**: Types of Files, Opening a Text Fi ,reading a File (read(),readline(),readlines()), Writing to a File (write(),writelines()), closing a file, Handling File Exceptions,file modes, seek () and tell() method, the Pickle module,read and write binary files(dumps(),loads())	15
		3.2	Matplotlib: Gain knowledge of python visualization libraries matplotlib, etc. create a	

			plot of retrieved data (Scatter plot, Histogram, Line chart, Bar Chart, Pie Chart)	
		3.3	Layout Management in Tkinter (pack, grid, place) GUI Programming using tkinter (widgets)- Button, , Entry, Frame, Label, List box, Radio Buttons. Optimize and improve the Python code with AI-driven solutions(use Microsoft Copilot, ,ChatGPT,Jupyter Notebook Extensions)	
			Total Hours	**45**

Course Outcomes:

1. Understand the fundamentals of Python programming, including its features, installation,using variables, keywords, and data types.
2. Apply control structures such as if, else, elif, for loops, while loops, and loop manipulation techniques (e.g., continue, break, and else) to solve programming problems.
3. Analyze and manipulate strings in Python using string operations, slicing, searching, counting, and comparison methods.
4. Demonstrate the use of standard Python library modules (e.g., math, random, os) and create custom Python modules for reusable code.
5. Implement file handling techniques for reading and writing data, working with different file types and modes
6. Visualize data using Python's matplotlib library, creating various types of plots such as scatter plots, histograms, line charts, bar charts, and pie charts for data analysis.

References:

1. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech, 2017
2. Python Made Easy: Beginners Guide to Programming by Gopal Singh
3. Data Visualization with Python, Mario Dobler, Tim Grobmann , Packt Publishing, 2019
4. Programming and Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane
5. Python Programming for Beginners by Pooja Sharma
6. Python Data Visualization Cookbook by Dr. Ashwin Pajankar
7. Mastering Data Visualization with Python by Pooja Sharma

Case Study

1	A library requires a software solution to efficiently manage its collection of books. The existing manual system is time-consuming and prone to errors. The library needs a digital solution that allows librarians to easily add new books, update existing ones, search for specific titles or authors, and remove books from the inventory.
2	Imagine you've been tasked with creating a simple temperature converter application

	using Python.The goal is to design a user-friendly interface where users can convert temperatures between Celsius and Fahrenheit. Here is a breakdown of the requirements: Requirements: Print a Sentence at the top saying "Temperature Converter" Ask users to input a temperature value. Take options from the user: if 1=Celsius to Fahrenheit as the input unit. 2=Fahrenheit to Celsius as the output unit. Perform the temperature conversion. Create a GUI window and add labels to display the converted temperature.

PRACTICALS

Practical No	Details
1.	**Control Flow with if, else, and Loops** Write a program to calculate the grade of a student based on marks entered. • Use if-elif-else conditions to assign grades (e.g., A, B, C, D). • Use a for loop to input marks for 5 subjects and calculate the average. • Use a while loop to ask the user if they want to calculate another student's grade
2	**String Manipulation** Create a program to analyze a user-provided string. • Count the occurrences of each vowel. • Reverse the string using slicing. • Check if the string is a palindrome. • Use string methods to convert the string to uppercase, lowercase, and title case.
3	**Lists and Their Operations** Create a shopping list application. • Add items to a list. • Remove an item if it is purchased (input from the user). • Sort the list alphabetically. • Print the list of items after each operation.
4	**Tuples and Their Applications** Create a program to handle student records. • Store student details (roll number, name, marks) in a tuple. • Use tuple unpacking to retrieve the details. • Create a function that accepts variable-length argument tuples and calculates the average marks of the students.
5	**Dictionary-Based Application** Build a phonebook application. • Add new contacts to the dictionary. • Search for a contact by name. • Update an existing contact's number. • Delete a contact. • Display all contacts in alphabetical order of names.

6	**Set Operations** Perform operations on two sets of student names. • Create sets for two classes. • Find the union of both sets (students in either class). • Find the intersection (students common to both classes). • Find the difference (students unique to one class). • Check if a student is part of a set using membership operators.
7	**Functions and Recursion** Write a program to calculate the factorial of a number using: • A normal function. • A recursive function.
8	**File Handling** write a program to demonstrate file handling by implementing a basic text file management system. perform following operation • Create a file. • Write data to the file. • Read data from the file. • Append data to the file. • Display the file content.
9	**Matplotlib Visualization** Create a data visualization program. • Create and display the following charts using Matplotlib: o Scatter plot for random points. o Bar chart to compare 5 values. o Pie chart for the distribution of 5 categories. o Line chart showing trends over time.
10	**GUI Programming with Tkinter** Build a basic calculator with a graphical interface. • Use Tkinter to create buttons for digits and operations (+, -, *, /). • Use an Entry widget to display input and output. • Arrange widgets using grid () layout.
	Total Hours :30

BOS	Computer Science
Class	F.Y. B.C.A
Semester	I
Course Name	Mathematical and Statistical Techniques
Course Code	MATH101
Type of Course	Core
Level of the Subject	Basic
Credit Points	2 Theory+1 Practical

Course Objectives:

1. To develop an interest in discrete concepts of mathematics.
2. To provide an understanding of daily use statistical techniques

Unit No.	Name of Unit	Topic No.	Contents	Hours
1	IKS and Introduction to linear algebra	1.1	Introduction, Addition, Subtraction Multiplication, Division using Vedic Mathematics, Duplex of any Digit Number Straight Squaring using Duplex Method Square Root Using Duplex Method	15
		1.2	Calendar- estimation using vedic maths, Definition, Types of matrices, algebra of matrices, Determinant of a matrix (up to 3 by 3 order), Eigen values & Eigen vectors.	
		1.3	Computing Terms of a Recursively Defined Sequence, Solving Recurrence Relations by Iteration	
		1.4	Definition, Magnitude of Vectors, Vector Arithmetic-Addition, Subtraction , Scalar Multiplication of Vectors , Product - Dot Product, Cross Product	
		2.1	Data collection methods: attribute, variable, discrete and continuous variable, Frequency distribution tables: Grouped and ungrouped frequency distribution tables	
		2.2	Measures of central tendency: Mean, Median, Quartiles, and mode for raw data, discrete, grouped frequency distribution.	

2	Introduction to statistics	2.3	Absolute & relative measures: Range, Quartile deviation, Mean deviation from mean , Variance and standard deviation, Relative measures: Coefficient of Range, Coefficient of Quartile Deviation, coefficient of variation for raw data, discrete and grouped frequency distribution	15
3	Correlation, Regression &	3.1	Correlation : Types of correlation; perfect positive, moderate positive, perfect negative, moderate negative and absolute no correlation with scatter diagram.	15
		3.2	Karl Pearson's coefficients of correlation, Spearman's Rank correlation coefficient with and without repeated rank	
		3.3	Regression equations of Y on X and X on Y using regression coefficients method . Properties of the regression equation.	
			Total Hours	**45**

Course outcomes:

1. Illustrate the uses and applications of vedic math in IKS.
2. Identifies the Eigenvectors and Eigenvalues , and identifies the rank of matrices .
3. Analyse and compare different sets of data. Also classify the data.
4. Calculate and interpret the various measures of central tendency,
5. Construct the lines of regression .
6. Estimate the relation between the variables

Reference Books:

1. Discrete Mathematics with applications, Susanna. S. Epp, Cengage Learning Publication, 4th edn.
2. Discrete Mathematics, Saymour Lipschutz, Marc Lipson, Tata MC Graw hill
3. Discrete Mathematics and its applications, Kennith H Rosen, Tata MC Graw hill
4. linear algebra , Gilbert strang
5. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
6. Vedic Mathematics Resources - VedicMaths.org

Case Study

1	**Relationship Between Study Hours and Exam Scores:** A university professor wants to investigate the relationship between the number of hours students study and their exam scores. To accomplish this, the professor collects data from a sample of 10 students. The table below shows the hours studied (independent variable, X) and the corresponding exam scores (dependent variable, Y) for each student:(Supporting

	data will be provided based on that evaluation questions has to be answered)
2	**Supermarket Sales** ABC Supermarket is analyzing its sales data for the past month. They are interested in understanding the average sales figures for different departments to better allocate resources and plan promotions. The following table summarizes the sales data for five departments (A, B, C, D, and E) for the month of March:(Supporting data will be provided based on that evaluation questions has to be answered.

PRACTICALS

Practical No.	Details
1.	Introduction to R-Software : Basic commands in R a. Mathematical and Statistical operations b. Dataframes c. Importing data from csv to R
2.	R program on Graphs and Diagram : a. Bar diagrams- simple, multiple and sub divided bar diagrams b. Pie chart c. Histogram
3.	R program on Matrix Operations : a. Addition, Subtraction, Multiplication, b. Rank of a matrix, transpose c. Inverse of a matrix
4	R program on Eigenvalues and Eigenvector a. Eigenvalues of a matrix b. Eigenvector of matrix
5	R program on Measures of Central Tendency: Mean , median, mode, quartiles of ungrouped data
6.	R program on Measures of Central Tendency: Mean , median, mode, quartiles of grouped data
7.	R program on Measure of Dispersion: Absolute & relative measures of grouped data
8.	R program on Measure of Dispersion: Absolute & relative measures of ungrouped data

9.	R program on Correlation & Scatter diagram: a. Karl Pearson's correlation coefficient b. Spearman's rank correlation coefficient c. Scatter diagram
10.	R program on regression a. Regression equation of Y on X b. Regression equation of X on Y c. Estimation
	Total No.of Hours : 30

BOS	Computer Science
Class	F.Y.B.C.A
Semester	I
Course Name	Introduction to Business Technology
Course Code	CA101
Type of course	Core
Level of the Subject	Basic
Credit Points	3 Theory+1 Practical

Course Objectives:

1. Students will be able to acquire knowledge on business culture
2. To develop the skill of Communication and exploring the web.

Unit No.	Name of Unit	Topic No.	Contents	Hours
1	Understanding business culture	1.1	Understanding Business Careers -The Culture of Business ,Succeeding at Work ,Business Law and Ethics ,Business Insurance	15
		1.2	Communicating through letters and email:Setting the Right Tone ,Business Letters ,Using Email	
		1.3	Communication through formal business documents:Formal Business Documents Researching a Formal Business Document, Writing a Formal Business Document .	
		1.4	Social media:Social websites,how social sites make money,Businesses use social sites for marketing.Controversies in social media,Recent developments in social media,Crowdfunding.Introducing Dreamweaver,Learning the interface, Defining a local site,Creating a website,Adding Content to a Site	
2	Presentations,Microsoft Excel	2.1	Communicating through presentations:Presentation Software , Creating a Presentation,Delivering the	15

			Presentation ,Using Charts,Transitions and Animations	
		2.2	Microsoft Excel:Perform Operations with Formulas and Functions :Summarize Data by using Functions,.Perform Conditional Operations by using Functions,Format and Modify Text by using Functions	
		2.3	Create Advanced Charts and Tables:.Create and Manage PivotTables,Create and Manage Pivot Charts	
3	Introduction to Database	3.1	Overview of Database Management Systems (DBMS) Introduction to MS Access and its Uses, Understanding the Access Interface, Creating and Opening a Database, Understanding Tables, Queries, Forms, and ReportsTables and Data Management-Creating and Designing Tables,Defining Data Types and Field Properties,Adding data,Setting Primary Keys and Indexing,Working with Records (Adding, Editing, and Deleting),Data Validation and Input Masks,Creating Relationships between Tables	15
		3.2	Queries and Data Retrieval-Introduction to Queries,Creating and Running Simple Queries,Using Criteria and Filters in Queries,Action Queries (Update, Append, Delete, Make-Table),Parameter Queries,SQL Queries (Basic Introduction)	
			Total Hours	**45**

Course Outcomes:

1. Identify the business communication technology
2. Illustrate different communication methods in business
3.Understand the controversies in social media
4.Analyze different types of presentations and excel operations
5. Develop the skills of MS Access
6. Create user-friendly forms for data entry and display, enhancing database interactivity and usability.

References:

1.Introduction to Business Technology ,Dr. Betty J. Brown ,McGraw Hill Education
2.https://edu.gcfglobal.org/en/business-communication/business-writing-essentials–
3.https://www.managebt.org/book/introduction/introduction-to-business-technology-standard/
4.Business Communication for Success , University of Minnesota
5.Microsoft Access 365 Step by Step, Joan Lambert, Microsoft Press
6.Mastering Excel: A Problem-Solving Approach,James Gips

Case Study:

1	ABC Company is a manufacturing company launched in 2000.They started their business on producing materials like engine,gearbox etc.By the year 2008,they observed the sales declined sharply due to the unavailability of transport vehicles.The company when discussed with stakeholders ,it came in observation that the report analysis in every financial year was not updated and shared with the stakeholders on time .With the reference of this case suggest the company
2	**SmartMart**, a growing retail chain, faced challenges in managing customer information, inventory, and sales data. With expansion into new locations, the manual data management system became insufficient, leading to delayed reporting, errors, and inefficiencies in customer engagement and inventory replenishment.
3	GreenLeaf Enterprises, a small organic farming business, faced challenges in managing its growing data for crop production, inventory, sales, and employee payroll. Initially, they relied on paper records and simple calculators, which proved inefficient as the business expanded. To address these issues, the company adopted Microsoft Excel as a tool for organizing and analyzing its data.

PRACTICALS

Practical No.	Details
1	Practical exercises in email writing
2	**PowerPoint** Demonstrate use of Microsoft Powerpoint by creating presentation of minimum 5 slides(use graphics, insert images, tables, bullets, videos, links, font formatting etc)
3	**Excel** i. Introduction to MS Excel files, Workbooks, Worksheets, Columns and Rows. Formatting Worksheets (AutoFill, Numeric formats, previewing worksheets.)

4	i. Header and Footers. Number, Commas and Decimal numeric formats. ii.Working with Formulas (Maximum, Minimum, Average, Count and Sum).Percentage Numeric Formats.
5	**Advanced Excel:** i. Conditional Formatting ,Sorting, Subtotal, AdvanceFiltering
6	i. Pivot Tables- Building Pivot Tables, Pivot Table regions, Rearranging Pivot Table , ii. What-if Analysis ,Conditional Functions
7	**Access** Create a database and Setting Primary Keys and Indexing
8	Creating Relationships Between Tables.Create a Courses table and an Enrollments table.Enforce referential integrity.
9	Queries and Data Retrieval- Introduction to Queries-Explore Query Design and Query Wizard. Creating and Running Simple Queries.Using Criteria and Filters
10	Create a Basic Data Entry Form-Use the Form Wizard,Add all fields,Test adding, editing, and deleting records
	Total Hours : 30

SEMESTER II

Class	F.Y.B.C.A.
Semester	II
Course Name	Core Java
Course Code	ITS151
Type of course Discipline Specific	Core
Level of the Subject	Medium
Credit Points	3 Theory+1 Practical

Course Objectives:

1.Understand and apply core object-oriented principles like Encapsulation, Inheritance, Polymorphism, and Abstraction
2. Recognize the need for exception handling in software development to improve program reliability and user experience.

.

Unit No.	Name of Unit	Topic No.	Contents	Hours
Unit-1	Introduction to Object-Oriented Programming and Core Java Concepts	**1.1**	Introduction to Oops concepts using read world problem.What is Object Oriented? Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism,	**15**
		1.2	Configuration of Java: How to install java, java development kit, Features of java. How to set a path in java? Setting the path environment variable. Java Compiler and Interpreter, structure of java program, data types, variables, constants, operators, type casting.	
		1.3	Control Flow Statements: if, if...else Statement, The switch...case Statement Iterative Statement: The while Loop, The do ... while Loop, The for Loop, The for each Loop, nested loops. Branching Statements: The break and continue & return statement.	

			introduction to Arrays,types of arrays,Array Initialization,Array Iteration,searching,sorting ,strings	
Unit-2	Java Programming: Classes, Objects, Constructors, and Exception Handling	**2.1**	Classes & Object: Defining a class,Instantiating Objects from a class,methods, accessing a method, method returning a value,method's arguments, variable arguments [Var args],static field and static methods. Constructor: uses of constructor, types of Constructor (default, parameterized, copy), constructor overloading, this keyword.	**15**
		2.2	Exception Handling: What is Exception in Java? What is Exception Handling? Hierarchy of Java Exception classes, Types of Java Exceptions, Java Exception Keywords (try, catch , finally and throw).	
		2.3	Collection Framework:Introduction, util Package interfaces, List interface and its classes,Arraylist,Vectors.	
Unit-3	Advanced Java Concepts: Packages, Inheritance, Polymorphism, and AI-Driven Code Optimization	**3.1**	Package: what is package , Creating Packages, Default Package, Importing Package. Access specifier(public, private,protected,default)	**15**
		3.2	Inheritance & polymorphism: Inheritance and Access Control,Types of inheritance. Method overloading, Method Overriding,super keyword	
		3.3	Abstract Classes: Abstract Classes, Abstract methods, How is an Interface different from an Abstract class? Interfaces: Interfaces, What is an Interface? Multiple Inheritance, functional interface, Lambda Expressions. Optimize and improve the java code with AI-driven solutions(use Microsoft Copilot, ,ChatGPT,Jupyter Notebook Extensions)	
			Total No. of Hours	**45**

Course Outcomes:

1.Develop expertise in writing and understanding Java code that applies fundamental programming principles effectively.
2.Explain different types of exceptions, ensuring that programs handle errors smoothly without abrupt failures.
3.Analyze how to solve complex problems by combining multiple control structures and loops for decision-making and repetition.
4.Illustrate the role of constructors in initializing object state.
5.Extend base classes to create hierarchical relationships and reuse code effectively.
6.Understand the concept of Java packages, create and import packages, and apply access specifiers to manage the visibility and organization of code effectively.

Reference:

1.”Core Java" by E. Balaguruswamy
2.Java :The Complete Reference -Herbert Schildt, Publisher -Tata McGraw Hill ,9th Edition.
3.Murach's Beginning Java with Netbeans -Joel Murach , Michael Urban,Publisher- SPD,1st Edition
4.Core Java, Volume I:Fundamentals-Horstmann,Publisher- Pearson ,9th Edition.
5.https://www.geeksforgeeks.org/
6."Java: A Beginner’s Guide" by Herbert Schildt

Case Study

1	RBI bank declares to give interest to all the bank's customers. Now each nationalized bank will give different rates of interest to its customers. Nationalized bank are SBI,PNB,BOB,IOB.RBI wants to see the rate of interest given by All the banks.RBI wants the best suitable plan to achieve this task with redundancy of data and data should be secure
2	A-Z company is a perfect service provider for all the IT and software development requirements. The team leverages their knowledge in completing the projected goals and makes it possible to build the ideas as per the market demands. Apart from focusing on just making a website, the team of experts always focus on designing a platform that can take the client’s business to another level.They always blend expertise, innovation & technology to design innovative masterpieces. Client satisfaction is what matters the most for the people at the A-Z company. The company is going to develop a Java project on the Student Management System

PRACTICALS

Practical No	Details
1	a)Write a Java program that takes a number as input and prints its multiplication table up to 10. b)Write a Java program to print the area and perimeter of a circle (use of constants).
2	Write a program to perform following tasks : a)Factorial b)Armstrong c)Prime Number d) Palindrome e)Create a program to print the day of the week based on a number (1 to 7)
3	Write a Java program to perform a)write a program to find the maximum and minimum of n elements. b)Create a program that searches for a given element in an array of size n. c)Write a program to add and multiply two matrices represented by 2D arrays.
4	a)Write a Java program to implement methods with variable length arguments b)Create a class Person where this keyword is used to differentiate between class variables and method parameters. c)Create a Counter class with a static field to count the number of objects created. Implement a static method to get the count.
5	Write a Java program to work with constructors, constructor overloading.
6	Write a Java program to implement exception handling by using try...catch & finally block.
7	Create a package called com.myapp and include a class Employee inside it. Access it from another Java class.
8	Write a Java program to create an **ArrayList** and perform add, remove, and iterate operations. Write a Java program to create a **Vector** and demonstrate its methods.
9	a)Write a Java program to implement different types of Inheritance. b)Create a base class Shape with a method area(). Override this method in subclasses like Rectangle and Circle. d).Create a class Child that calls the constructor of the parent class Parent using the super keyword.
10	a)Write a Java program to demonstrate the implementation of abstraction using abstract class and interface b)Create an interface Playable with a method play(). Implement this interface

	in classes Song and Video.
11	a)Write a program to implement multiple inheritance b)Write a Java program to work with lambda expressions.
	Total Hours:30

BOS	Computer Science
Class	F.Y.B.C.A
Semester	II
Course Name	Web Programming
Course Code	ITS152
Type of course	Core
Level of the Subject	Medium
Credit Points	3 Theory+1 Practical

Course Objectives:

1. Identify basic HTML tags to write HTML programs and use concepts such as Table, Forms, Navigation etc..
2. To design and implement dynamic web pages with validation using JavaScript objects.

Unit No.	Name of Unit	Topic No.	Contents	Hours
Unit-1	HTML 5,CSS	1.1	HTML5: Fundamental Elements of HTML, HTML Elements and Tags ,Organizing Text in HTML, Links and URLs in HTML, using lists and backgrounds, Tables in HTML,Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar.	15
		1.2	Images on a Web Page, Image Formats,Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page.	
		1.3	CSS: Understanding the Syntax of CSS, Types of CSS, CSS Selectors,Inserting CSS in an HTML Document, CSS properties to work with the background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element.	
Unit-2	Guide to JavaScript and JSON	2.1	JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of	15

			JavaScript – Variables, Operators, Control Flow Statements, Jumping Statements , Functions : Defining and Invoking a Function,Defining Function arguments, defining a Return Statement, Calling Functions,	
		2.2	Form Validation using JavaScript . Types of Form Validation Required Fields,Email Validation,Number Validation,Password Validation,Date Validation,Customizing Error Messages, Error Handling and Debugging, document object.	
		2.3	Events and Event Handlers : What Are Events,What Are Event Handlers? Defining Event Handlers, event : onClick, onDblClick, onBlur, onFocus, onSubmit.Popup Boxes : Alert, Confirm, Prompt. Introduction to JSON & Its Importance, JSON.stringify(), JSON.parse(), Reading & Writing JSON Data,Fetching JSON Data from APIs (fetch() with JSON) Handling JSON Objects & Arrays	
Unit-3	Mastering PHP: Variables, Forms, Database Integration,and AI-Enhanced Web Development	3.1	PHP: Variables , comment type, Program Flow, working with arrays, functions: with argument and return statement, String functions: (strlen(), strrev(), strpos(),str_replace(),substr(),strtoupper(),strtolower(),trim(), ltrim() rtrim(), str_repeat(), strcmp() Forms Handling: HTML forms and PHP, GET and POST methods, PHP Cookies and Sessions	15
		3.2	Connecting to MYSQL database, performing CRUD operation with PHP, using prepared statements and parameterized queries. Utilize AI tools to refine and improve existing code by uploading it to platforms like ChatGPT. Employ AI-driven solutions, such as Microsoft Copilot and ChatGPT, to create a fully functional end-to-end webpage.	
			Total Hours	**45**

Course outcomes:

1. Understand HTML Fundamentals and Navigation Techniques
2. Demonstrate the use of multimedia and interactive elements in HTML, such as images, audio, video, forms, and interactive elements, to create engaging web pages.
3. Apply CSS syntax, selectors, and properties to enhance the visual appeal of web pages.
4. Develop dynamic web page interactions using JavaScript by implementing control flow, event handling, and form validation techniques.
5. Analyze user input validation needs and construct effective JavaScript-based validation mechanisms with error handling and debugging.
6. Utilize PHP to build server-side logic, including form handling, data processing, and state management through cookies and sessions.

References:

1. Duckett, J. (2014). HTML & CSS: Design and Build Websites. Wiley.
2. McFarland, D. (2018). JavaScript & jQuery: The Missing Manual. O'Reilly Media.
3. Flanagan, D. (2011). JavaScript: The Definitive Guide (6th ed.). O'Reilly Media.
4. https://www.geeksforgeeks.org/
5. Robbins, J., & Robbins, A. (2016). Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 (4th ed.). O'Reilly Media.
6. https://www.w3schools.com

Case Study

1	Mr. X has developed a Food Delivery Application where the Home page has all the details of the Application where the user first has to register, for which one registration link has to be there which will redirect to the registration page. Where users can get access to the application after validating the data and give the solution what all validation can come up with to explain them in detail . After filling the form, the user will get a welcome message through the popup window. At the other side of the home page Navigation Bar will be provided which has four links (Home, Menu, Orders, Contact-Us, About Us).
2	Shopping Application has a Home page with all the details of the Application including Navigation Bar which has four links (Home, Product, Orders, Contact-Us, About Us) Give the solution where Product, Orders, Contact-Us has to be redirected to the next page. About Us has to jump on different sections of the same page. What will be the solution when a user will register for an application clicking a button? The system will give a message ‘Welcome!!!’ through a popup window.

PRACTICALS

Practical No.	Details
1	Design a Web Page in HTML That Makes a Use of Following Concepts: i) Text Formatting Tags ii) List Elements iii) Image Tag iii) Image Mapping
2	Design a Web Page in HTML That Makes a Use of Table Tag: i) Simple Table ii) Rowspan iii) Colspan iv) Form
3	Design a Web Page in HTML to perform i) Hyperlink ii) Navigation. iii) Multimedia
4	Design a Web Page to Perform CSS Properties: i) Inline CSS ii) Internal CSS iii) External CSS
5	Write a Javascript Code to perform i) Operators, ii) Control Flow Statements and iii) Functions.
6	Write a Javascript Code to perform Popup Boxes : i) Alert ii) Confirm iii) Prompt
7	Write a Javascript Code to perform Events : i) OnBlur ii) OnFocus iii) OnSelect iv) OnSubmit v) OnClick vi)OnDblClick
8	write a program Converts a JavaScript object into a JSON string.

	write a program to convert a JSON string into a JavaScript object
9	Write a PHP Code to perform Following Programs : i) If-else ii) Array iii) Functions iv) String Functions
10	Write a PHP Code to perform Following Programs : i) Cookies ii) Get and Post
11	Write a Javascript Code to perform Form Validation i)required fields,Validate email, phone number, and password formats using regular expressions. ii)Create error messages for invalid form input and display them dynamically.
12	Write a PHP Code to perform Following Programs **i)**Connect PHP to a MySQL database and perform basic CRUD operations (Create, Read, Update, Delete). ii)Use prepared statements and parameterized queries in PHP to prevent SQL injection. iii)Write PHP scripts to interact with MySQL databases, performing queries and displaying results on a webpage
	Total Hours:30

BOS	Computer Science
Class	F.Y. B.C.A
Semester	II
Course Name	Statistical Methods & Testing of Hypothesis
Course Code	MATH151
Type of Course	Core
Level of the Subject	Basic
Credit Points	2 Theory+1 Practical

Course Objectives:

1. Understand an interest in the concepts of ancient methods of learning Mathematics.
2. Inculcate interest in research through analyzing the data with the help of R.

Unit No.	Name of the Unit	Topic No.	Contents	Hours
1	IKS and Sampling distributions	1.1	Squares and square roots , Cubes and cube roots, Divisibility, Strategies for Enhanced Mental Calculations- Nikhilam Sutra Nikhilam Sutra,Urdhva Tiryak Sutra,Ekadhikena Purvena Sutra, Anurupye Sutra, Yavadunam Tavadunikritya Varga Samam	15
		1.2	Introduction, Factors that influence sampling distribution,Types of distributions- Sampling distribution of mean/ proportion	
		1.3	Binomial Distribution- Properties and problems based on Binomial distribution Poisson Distribution- Properties and problems based on Poisson distribution	
		1.4	Normal distribution-properties and problems based on Normal distribution, Central limit theorem, Chi square distribution -definition and properties, t distribution - definition and properties , F distribution -definition and properties	
		2.1	Hypothesis- Null and Alternative, Types of error in hypothesis testing, level of	

2	Testing of Hypothesis (Parametric test)		significance,One tailed two-tailed test, critical region, p-value, Confidence interval for mean and proportion	15
		2.2	Large sample test (z test)-single mean, two means, single proportion, two proportions	
		2.3	Small sample test(t test) one sample mean, paired t test, unpaired t test	
3	ANOVA and Chi-Square test	3.1	Application and importance of ANOVA	15
		3.2	One Way ANOVA - procedure and examples	
		3.3	Chi-square test of goodness of fit , Chi-square test for association, Chi square test for independence of attributes, Yates correction	
			Total Hours	**45**

Course Outcome:

1. Identify when to use a parametric method. Different parametric methods in estimation, testing, model fitting, and in analyses.
2. Develop the ability to analyze a problem and understand the appropriate statistical technique to analyze it.
3. Analyze the use of the inferential statistical tools to analyze a problem.
4. Apply Parametric statistical hypothesis testing to make a decision.
5. Explain the results obtained using statistical tools based on a problem scenario. and introduces ANOVA for analyzing a problem in higher level .
6. Understand the tricks to do the mathematical calculations with ease.

Reference:

1. Ross, S.M. (2006): A First course in probability. 6th Ed^{n} Pearson
2. Kulkarni, M.B., Ghatpande, S.B. and Gore, S.D. (1999): Common statistical tests. Satyajeet Prakashan, Pune
3. Gupta, S.C. and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
4. Gupta, S.C. and Kapoor, V.K. (4th Edition): Applied Statistics, S. Chand and Sons, New Delhi
5. Trivedi, K.S.(2009) : Probability, Statistics, Design of Experiments and Queuing theory, with applications of Computer Science, Prentice Hall of India, New Delhi
6. Statistical Methods , S.P. Gupta

Case Study:

1	**Testing the Mean Lifetime of Fluorescent Light Bulbs** A company manufactures fluorescent light bulbs and claims that the mean lifetime of their bulbs is 1600 hours. However, there are concerns about the actual mean lifetime being less than the claimed value. As a data analyst, you have been tasked with conducting a hypothesis test to determine whether there is sufficient evidence to support the claim that the mean lifetime of the company's bulbs is indeed 1600 hours. A sample of 400 fluorescent light bulbs produced by the company has been selected for analysis. The sample has a mean lifetime of 1570 hours with a standard deviation of 150 hours.(Based on the data , the student has to find the interpretations)
2	**Analyzing Customer Satisfaction Levels in a Restaurant Chain** A restaurant chain wants to assess the satisfaction levels of its customers across different locations. They have collected data on customer feedback regarding their dining experience, categorized into three satisfaction levels: "Satisfied," "Neutral," and "Dissatisfied." The restaurant chain aims to determine if there is a significant difference in customer satisfaction levels among its various locations. As a data analyst, you are tasked with conducting a Chi-square test to analyze the data and provide insights to the management. The dataset consists of customer feedback collected from five different restaurant locations. For each location, the number of customers falling into each satisfaction category (Satisfied, Neutral, Dissatisfied) is recorded. (Based on the data , the student has to find the interpretations)

PRACTICALS

S.N.	Topic
1	R program on Binomial distribution a. Finding binomial probabilities b. Finding cumulative probabilities c. Plotting the graph of pmf and cdf d. Fitting of binomial distribution
2	R program on Poisson distribution a. Finding poisson probabilities b. Finding cumulative probabilities c. Finding quantile values
3	R program on Normal distribution a. Generating random numbers b. Finding normal probabilities c. Graphical sketch of standard normal and normal variate pdf and cdf
4	R program on confidence interval a. Confidence interval for population means for large sample b. Confidence interval for population proportion for large sample

5	R program on one sample and two sample mean Z test a. Large sample test for one population mean b. Large sample test for two population means
6	R program on one sample and two sample proportion Z test a. Large sample test for one population Proportion b. Large sample test for two population Proportions
7	R program on unpaired t test a. Small sample test for one population mean b. Small sample test for difference of means c. Paired t test
8	R program on Chi square test a. Chi square test for goodness of fit b. Chi square test for independence of attributes c. Yates correction
9	R program on one way Anova a. Case study method b. Real data analysis
10	R program on Two way Anova a. Case study method b. Real data analysis
	Total Hours: 30