

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: Bachelors of Science (B. Sc.) in Computer Science**

## **F.Y.B.Sc.Computer Science**

PCACS/BSCCS/SYL/2024-25/FY

**As per National Education Policy  
Choice Based Credit & Grading System**

**Academic Year 2024-25**

*Pillai*

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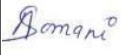







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**Board of Studies in the Department of Computer Science**

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.Mrs. 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. <u>Omkar Sherkhane</u>	Faculty Specialization	
16	Mr. Abhijeet Salvi	Faculty Specialization	

# **1. INTRODUCTION TO BACHELORS IN COMPUTER SCIENCE (C.S.) PROGRAM**

B.Sc. in Computer Science is a three years undergraduate programme that concentrates on creating links between theory and practice. Computer science is about understanding computer systems and networks at a deep level. It covers a wide variety of software and hardware technologies and their applications. Students will also gain practical problem solving and program design skills; Students learn how to think more carefully and how to solve problems more effectively. They will not only develop a diverse set of skills to prepare for their curriculum and for employment, but will also be encouraged to launch their own startups or venture into new types of careers using their interdisciplinary training. Our curriculum exposes students to modern advancements and new sub- fields of computer science. As we all know degrees in Computer Science lead to rewarding and lucrative careers, excellent placement and incubation assistance is provided.

### Program outcomes

Sr No	PSO Title	POs in brief
PO1	Industry knowledge	Graduates would be fully equipped with the industry relevant domain knowledge.
PO2	Modelling to complex activities.	Apply appropriate techniques, resources, and modern tools including prediction and modelling to complex activities.
PO3	Career opportunities	Graduates would be proficient to take up a career of their choice whether it is corporate leadership, entrepreneurship or higher studies.
PO4	Develop Innovative Ideas	Graduates would be capable of using technology for developing innovative ideas to solve problems.
PO5	Design of conceptual system	Apply mathematical foundations, algorithmic principles, and analysis techniques in the modeling and designing of computational systems
PO6	life- long learning	Engage themselves in lifelong learning to keep up with the pace of changing technology.
PO7	Soft skill Excellence	Graduates would be able to exhibit excellent soft skills and would be competent enough to work in teams to accomplish the desired goal.
PO8	Ethical responsibilities	Take ethical responsibilities, human and professional values and make their contribution to the society.

### Program Specific Outcomes

Sr No	PSOs in brief
PSO1	Professionally trained in the areas of programming, multimedia, animation, web designing, Internet of things, networking and mobile app development.
PSO2	Ability to comprehend and write effective project reports in a multidisciplinary environment in the context of changing technologies.
PSO3	Develop an ability to use appropriate techniques, skills and tools required for computing problems.
PSO4	Ability to provide socially acceptable technical solutions to complex computer science problems with the application of modern and appropriate techniques.

## Course Structure

Semester I						
Course Code	Course Type	Course Title	Theory/ Practical	Marks	Credits	Lectures/ Week
PUSCS101	MAJ	Mathematical and Statistical Techniques	Theory	100	2	4
PUSCS102	MAJ	Python programming	Theory	100	2	4
PUSCS103	DISCMIN	Database Management System	Theory	100	2	4
PUSCS104	SEC	PROBLEM SOLVING AND DESIGN THINKING	Theory	100	2	4
PUSCS105P	MAJ	Practicals(PUSCS101)	Practical	50	2	2
PUSCS106P	MAJ	Practicals(PUSCS102) + Practicals(PUSCS103)	Practical	100	2	2
PUVAC101	VAC	Human values/C.C	Theory	100	2	3
PUAEC101	AEC	Communication Skills	Practical	100	2	3
PUIKS101	IKS	To be taken from Pool	Theory	100	2	2
PUIDC10	IDC	To be taken from Pool	Theory	100	2	2
		Total		950	22	32
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**

## Course Structure

Semester II						
Course Code	Course Type	Course Title	Theory/ Practical	Marks	Credits	Lectures/ Week
PUSCS201	MAJ	Statistical Methods and testing of Hypothesis	Theory	100	2	4
PUSCS202	MAJ	Core java	Theory	100	2	4
PUSCS203	DISCMIN/ OE1	Web Programming	Theory	100	2	4
PUSCS204	SEC	Computer Organization and Architecture	Theory/ Practical	100	2	4
PUSCS205P	MAJ	Practicals(PUSIT201)	Practical	50	2	2
PUSCS206P	MAJ	Practicals(PUSIT202) + Practicals(PUSIT203)	Practical	100	2	2
PUVAC201	VAC	Environmental Management And Sustainability	Theory	100	2	2
PUAEC201	AEC	Languages(To be taken from pool)	Theory/Pra ctical	100	2	3
PUIKS201	IKS	To be taken from pool	Theory	100	2	2
PUIDC20	IDC	BACK END PROGRAMMING	Theory/ Practical	100	2	2
		Total		950	22	31
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**

## Evaluation Pattern

Marking Code	Marking Scheme
A	60 Marks Final Exam, 20 Marks Internal Exam, 20 Marks Project.
B	50 Marks Continuous Exam, 50 Marks Practical Exam.
C	100 marks distributed within report /case study/ project/ presentation etc.
D	50 Marks Practical Examination.

### SEMESTER I

Course Code	Course Type	Course Title	Evaluation Pattern
PUSCS101	MAJ	Mathematical and Statistical Techniques	A
PUSCS102	MAJ	Python programming	A
PUSCS103	DISCMIN	Database Management System	A
PUSCS104	SEC	PROBLEM SOLVING AND DESIGN THINKING	C
PUSCS105P	MAJ	Practicals(PUSCS101)	D
PUSCS106P	MAJ	Practicals(PUSCS102) + Practical(PUSCS103)	D
PUVAC101	VAC	Human values/C.C	C
PUAEC101	AEC	To be taken from the Pool	C



## SEMESTER II

<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Evaluation Pattern</b>
PUSCS201	MAJ	Statistical Methods and testing of Hypothesis	A
PUSCS202	MAJ	Core Java	A
PUSCS203	DISCMIN	Web Programming	A
PUSCS204	SEC	Computer Organization and Architecture	C
PUSCS205P	MAJ	Practicals(PUSIT201)	D
PUSCS206P	MAJ	Practicals(PUSIT202) + Practical(PUSIT203)	D
PUVAC201	VAC	Environmental Management And Sustainability	C
PUAEC201	AEC	To Be taken from the Pool	C

# **Semester I**

BOS	Computer Science
Class	F.Y. B.Sc. CS
Semester	I
Course Name	Mathematical and Statistical Techniques
Course Code	PUSCS101
Type of Course	Major
Level of the Subject	Basic
Credit Points	4 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	1.1	Introduction, Addition, Subtraction Multiplication ,Division using Vedic Mathematics	10
		1.2	Duplex of any Digit Number Straight Squaring using Duplex Method Square Root Using Duplex Method	
		1.3	Calendar- estimation using vedic math	
2	Introduction to linear algebra	2.1	Definition, Types of matrices, algebra of matrices, Determinant of a matrix (up to 3 by 3 order), Eigen values & Eigen vectors.	10
		2.2	Computing Terms of a Recursively Defined Sequence, Solving Recurrence Relations by Iteration , Recursion Tree Method	
		2.3	Definition, Magnitude of Vectors, Vector Arithmetic-Addition, Subtraction , Scalar Multiplication of Vectors , Product - Dot Product, Cross Product	

		3.1	Data collection methods: attribute, variable, discrete and continuous variable, Frequency distribution tables: Grouped and ungrouped frequency distribution tables	
3	Introduction to statistics	3.2	Measures of central tendency: Mean, Median, Quartiles, and mode for raw data, discrete, grouped frequency distribution.	10
		3.3	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	
4	Correlation, Regression &	4.1	Correlation : Types of correlation; perfect positive, moderate positive, perfect negative, moderate negative and absolute no correlation with scatter diagram.	10
		4.2	Karl Pearson's coefficients of correlation, Spearman's Rank correlation coefficient with and without repeated rank	
		4.3	Regression equations of Y on X and X on Y using regression coefficients method . Properties of the regression equation.	
<b>Total No. of Lectures</b>				<b>40</b>

**Course outcomes:**

1. Identify the uses and applications of vedic math in IKS.
2. Recognises 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. Constructing the lines of regression.
6. Estimating the relation between the variables

**References:**

1. Discrete Mathematics with applications, Susanna. S. Epp, Cengage Learning
2. Publication, 4<sup>th</sup> edn.
3. Discrete Mathematics, Seymour Lipschutz, Marc Lipson, Tata MC Graw hill
3. Discrete Mathematics and its applications, Kenneth 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

**Case Study:**

1	<p><b>Relationship Between Study Hours and Exam Scores</b></p> <p>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)</p>
2	<p><b>Supermarket Sales</b></p> <p>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)</p>

**Practicals**

	<b>Details</b>	
1.	Introduction to R-Software : Basic commands in R	2
2.	Graphs and Diagram : Bar , Histogram, Pie, frequency polygon	2
3.	Matrix Operations : Addition, Subtraction, Multiplication,Power of a matrix	2
4	Rank & Inverse of Matrices	2
5.	Measures of Central Tendency: Mean , median, mode, quartiles of ungrouped data	2
6.	Measures of Central Tendency: Mean , median, mode, quartiles of grouped data	2
7.	Measure of Dispersion: Absolute & relative measures of grouped data	2
8.	Measure of Dispersion: Absolute & relative measures of ungrouped data	2
9.	Correlation & Scatter diagram: Karl Pearson's correlation coefficient	2
10.	Regression -line of regressions	2
	Total Lectures	20

BOS	Computer Science
Class	F.Y.B.Sc.C.S
Semester	I
Course Name	Python Programming
Course Code	PUSCS102
Type of Course	Major
Level of the Subject	Medium
Credits	4 Theory + 1 Practical

**Course Objectives:**

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications, how to use lists, tuples, and dictionaries in Python programs.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	Introduction, Conditional and Looping statements	1.1	Overview: What is Python? Interpreted languages, Advantages and disadvantages, Obtaining and installing Python , Writing your first 'Hello World!' program	10
		1.2	Variables, Comments, Data Types, Indentation, Declaring and using Numeric data types: int, float, complex, Using string data type and string operations, Operators	
		1.3	Conditionals and Loops: if statement, else Statement, elif Statement, while loop, for loop, break, continue, pass Statement, else Statement.	
2	Collections	2.1	Lists: Creating lists using range() function, Updating the elements of the list	10
		2.2	sets and tuples: Creating and accessing Set elements, Basic operations on Set , Functions to process Set elements.	
		2.3	Dictionaries: Creating aDictionary Accessing Values in a dictionary	

			Updating ,Deleting elements from dictionaries,Built in dictionary method	
3	Modules and arrays	3.1	Modules: Creating our own modules and Functions and using them, Rename a module, Built-in modules, Arrays: Advantages of Array, Creatingan Array, Importing the array module Processing the arrays	
		3.2	Functions: Defining –calling returning (single and multiple) results from a function, Arbitrary arguments , Keyword arguments, Default arguments,Arbitrary keyword argument,recursion.	
		3.3	Files: Types of Files, Creating and Reading Data reading And writing binary files ,The pickle module,reading and writing CSV files.	
4	Regular Expression Visualization libraries and GUI Programming	4.1	Regular Expressiong: Using special expression Methods,named groups in python regular ,Visualization Expression ,Regular Expressionswith glob Libraries and GUI module. Methods, Named Groups in Python. Regular Expressions, Regular. Expression with glob Module	10
		4.2	Visualization library: Gain knowledge of Python visualization libraries: matplotlib, ggplot Seaborn, bokeh, geoplolib, etc., Create a plot of retrieved data	
		4.3	Graphics and GUI Programming – Drawing using Turtle, Tkinter and Python, Other GUIs	
	Total no of Lectures:			40

### Course Outcomes:

1. Understand the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements .
2. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets
3. Illustrating the functionality of breaking down the task and reusing the code using functions.
4. Apply the functionality to store/retrieve the input and output data on the permanent basis.
5. Identify the commonly used operations on regular expressions.

6. Create the GUI applications to solve real-life problems and Develop the various graphs to visualize the data.

**References:**

1. Core Python Programming , Dr. R. Nageswara Rao, dreamtech, 2017
2. Fundamentals of Python: First Programs, Kenneth A. Lambert, CENGAGE Learning, 2012
3. Introduction to Computer Science Using Python, Charles Dierbach, Wiley India Pvt.Ltd
4. <https://www.geeksforgeeks.org/python-gui-tkinter/>
5. <https://www.geeksforgeeks.org/turtle-programming-python/>
6. Data Visualization with Python, Mario Dobler, Tim Grobmann , Packt Publishing, 2019
7. <https://www.w3schools.com/python/>

Case Studies	
1	<p>ABC tuitions class has a batch of 10 students for math subjects . Two tests have been conducted in the month of August which they have stored in the register manually in the tabular format : Name, Marks in Test1, Test 2.</p> <p>Now to automate the above process, teacher want to use the Python language. Answer following questions and write code for the same in python.</p> <p>ABC Tuitions conducts math tests for a batch of 10 students. The test scores are traditionally stored in a manual register in tabular format, including columns for Name, Marks in Test1, and Marks in Test2. To streamline this process and improve efficiency, the teacher wants to automate the test score management using Python.</p>
2	<p>Imagine XYZ, a job seeker with distinct preferences shaping his career decisions. XYZ's job choices are intricately tied to both salary considerations and preferred locations. XYZ's story begins with a strong affinity for Mumbai. This city holds a special place in his heart, and he's inclined to accept a job offer there if the salary meets his expectations. Specifically, XYZ would readily accept a job in Mumbai if the offered salary is around 50,000/- per month. On the flip side, XYZ has a stark dislike for Delhi. However, he's open to reconsidering his stance if the compensation is significantly higher. For Delhi, XYZ sets his threshold at a salary of 100,000/- per month. If a company is willing to pay him this amount, he would be willing to overlook his aversion to Delhi and join the company there. Now, XYZ's preferences take a turn when it comes to Chennai. He views Chennai as a favorable option, particularly if the salary offered is above 100,000/-. This higher salary threshold makes Chennai an attractive destination for XYZ, signaling his readiness to relocate there for the right job opportunity. In summary, XYZ's job decisions are guided by his salary expectations and location preferences. Mumbai holds a special allure for him, Delhi requires a substantial salary incentive to consider, and Chennai becomes a top choice with an attractive salary offer above his threshold. This narrative illustrates how personal preferences and financial considerations shape an individual's career choices and job prospects.</p>



## Practicals

Practical No	Details	
1.	a.	Installing python and setting up the environment. Simple statements like printing the names, numbers, mathematical calculations, etc.
	b.	Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
	c.	Programs using break and continue statements.
	d.	WAP to check if the entered number is Armstrong number or not
	e.	WAP to print the following pattern: <div style="margin-left: 40px;">1 12 123</div>
2.	a.	WAP for calculating simple and compound interest
	b.	WAP to accept percentage of a student and display its grade accordingly
	c.	WAP to accept a string(sentence) and returns a string having first letter of each word in capital letter
	d.	WAP that counts the number of alphabets and digits, uppercase, lowercase letters in the string entered
3.	a.	Write a Python program to implement a stack and queue using a list datastructure.
	b.	Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5.
	c.	WAP to display cumulative elements of a given list: For eg: List is[10,20,30,40] Output: [10,30,60,100]
	d.	WAP to remove all odd numbers from a given list.
	e.	WAP to accept values from a user and create a tuple
4.	a. Write a Python script to sort (ascending and descending) a dictionary by value. b. Write a Python script to concatenate the following dictionaries to create a new one. Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}	
5.	Write a Python function sin(x, n) to calculate the value of sin(x) using its Taylor series expansion up to n terms. Compare the values of sin(x) for different values of n with the correct value	

6.	a.	Write a Python program based on importing and executing built-in functions from the time, math and random modules
	b.	Write a recursive Python program to test if a string is a palindrome or not
7.	a.	Write a Python program to read an entire text file
	b.	Write a Python program to append text to a file and display the text.
	c.	Write a Python program to read last n lines of a file
8.		<p>a.To check whether a string has alphanumeric characters or not.</p> <p>b.To replace all the occurrences of letter 'ai' in the string with '**', accept the string from the user.</p> <p>c.To display the starting index for the substring 'general' in string  “ Python is an interpreted high-level general-purpose programming language“</p> <p>d. show the functionality of split(), search(), sub(), findall() functions.</p>
9.		Create a graphical application that accepts user inputs, performs some operation on them, and then writes the output on the screen. For example, write a small calculator. Use the tkinter library.
10.	a.	Write a Python program to plot the function $y = 2x+3$ using the pyplot or matplotlib or any python visualization libraries.
	b.	Write a Python program to plot the function $y = x^2$ using the pyplot or matplotlib or any python visualization libraries.
		<b>TOTAL NO OF LECTURES 20</b>

BOS	Computer Science
Class	F.Y. B.Sc. C.S
Semester	I
Subject Name	Database Management System
Subject Code	PUSCS103
Type of Course	Minor
Level of the Subject	Basic
Credit Points	4 Theory + 1 Practical

**Course Objectives:**

1. Introduction of the concept of the DBMS with respect to the relational model,
2. Specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	Introduction to DBMS and Data Models	1.1	Introduction to DBMS : Data, Database, Application of DBMS ,DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction/ Data independence,	10
		1.2	DBMS Architecture, Client/Server Architecture, Three –Tier architecture Data models - ( relational, hierarchical, network Object Oriented ).	
		1.3	Entity Relationship Model – ER diagram Entities and types, attributes and types, entity sets, relations and Notations, relationship sets, aggregation / generalization.	
2	Introduction to Database Languages and Constraints	2.1	DDL Statements :Creating Databases, Using Databases, data types, Creating Tables Altering Tables(alter with add columns, alter to drop columns), Renaming Tables, Dropping Tables.	10
		2.2	DML Statements : insert, select, update, delete, unique records, conditional select, Clauses-where, aggregate functions (count, min, max, avg, sum), group by clause, having clause, order by, distinct	

		2.3	Relational Constraints - primary key, referential integrity(foreign key), unique constraint, Not Null constraint, Check constraint, default constraint.	
3	Normalization and Join Operation	3.1	Schema refinement and Normal forms(Normalization):Functional dependencies(Anomalies), first, second, third, and BCNF normal forms based on primary keys.	10
		3.2	Relational Algebra and Join : fetching operations (selection, projection) Joining Tables –equi join(With ansi, non ansi, using clause), natural joins, inner join, outer join (left outer, right outer, full outer), not equi join, cross join.	
		3.3	Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA	
4	Subqueries, View and Database Functions	4.1	Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now)	10
		4.2	Subqueries – subqueries with IN, NOT IN, Nested query, query to find second highest salary, third highest salary.	
		4.3	Views - Introduction to View, storing complex queries, creating, altering dropping the view, Create view through Join and Subquery Operation.	
			<b>Total No. of Lectures</b>	<b>40</b>

### Course Outcomes:

1. Describe the basic concept of DBMS and the DBMS Architecture.
2. Develop the skills of Database Languages with DDL And DML Commands.
3. Identify how to make use of Constraints to limit/restrict data.
4. Apply the Normalization concept while designing the database.
5. Choose various Join Operations according to situations.
6. Design and create databases using Subqueries and View.

### References:

1. Ramez Elmasri & Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, Sixth Edition, 2010
2. Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill, 2007
3. Joel Murach, Murach's MySQL, Murach, 2012
3. Database System Concepts, Korth

4. <https://www.geeksforgeeks.org>
5. Robert Sheldon, Geoff Moes, Beginning MySQL, Wrox Press, 2005.

**Case studies :**

<b>1</b>	Design E-R-Data Model Based on following case study. Company has Employees, departments, and projects . Company is organized into departments , Department controls a number of projects, Number of employees working with multiple projects, Employee: store each employee’s name, Contact number, address, salary, sex (gender), and birth date , Keep track of each employee belongs to department also notate the relationship amongst each relation also predict the attributes of each entity.
<b>2</b>	Assume you have been asked to design the database structure for a job site. What NORMALIZED table data model / table design would you recommended for storing the personal data of the candidates like name , address, and phone number and their skill in multiple languages so as to ensure that when a company searches based on a particular set of skills, the query is quick to return the result. Note that each candidate would have multiple Skills.(Hint : You will need to have 3 tables in the design).

**Practicals**

Practicals No	Title
1	For given scenario, Draw E-R diagram and convert entities and relationships to table
2	Write relational algebra queries on the tables created in Practical-1
3	Perform the following: a. Creating Tables (With and Without Constraints) b. Inserting/Updating/Deleting Records in a Table c. Saving (Commit) and Undoing (rollback)
4	Perform the following: a. Altering a Table b. Dropping/Truncating/Renaming Tables c. Backing up / Restoring a Database
5	Perform the following: a. Simple Queries withAggregate functions b. Queries with Aggregate functions (group by and having clause)
6	Perform Queries involving a. Date Functions
	b. String Functions
	c. Math Functions
7	a. Join Queries
	b. Inner Join

	c.	Outer Join
8		Subqueries With IN clause With EXISTS clause
9	a	Views Creating Views (with and without check option) ·
	b	Dropping views
	c	Selecting from a view
10		DCL statements Granting and revoking permissions
		Total no of Lectures :20

# Semester II

BOS	Computer Science
Class	F.Y. B.Sc. CS
Semester	II
Course Name	Statistical Methods & Testing of Hypothesis
Course Code	PUSCS201
Type of Course	Major
Level of the Subject	Basic
Credit Points	4 Theory + 1 Practical

**Course Objectives:**

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

Unit No.	Name of the Unit	Topic No.	Name of Topic	Hours
1	IKS	1.1	Squares and square roots , Cubes and cube roots	10
		1.2	Divisibility	
		1.3	Strategies for Enhanced Mental Calculations- Nikhilam Sutra Nikhilam Sutra,Urdhva Tiryak Sutra,Ekadhikena Purvena Sutra, Anurupye Sutra, Yavadunam Tavadunikritya Varga Samam	
2	Sampling Distributions	2.1	Introduction, Factors that influence sampling distribution,Types of distributions-Sampling distribution of mean/ proportion	10
		2.2	Binomial Distribution- Properties and problems based on Binomial distribution	
			Poisson Distribution- Properties and problems based on Poisson distribution	
		2.3	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	



3	Testing of Hypothesis (Parametric test)	3.1	Hypothesis- Null and Alternative, Types of error in hypothesis testing, level of significance, One tailed two-tailed test, critical region, p-value, Confidence interval for mean and proportion	10
		3.2	Large sample test (z test)-single mean, two means, single proportion, two proportions	
		3.3	Small sample test(t test) one sample mean, paired t test, unpaired t test	
4	ANOVA and Chi-Square test	4.1	Application and importance of ANOVA	10
		4.2	One Way ANOVA - procedure and examples	
		4.3	Chi-square test of goodness of fit , Chisquare test for association, Chi square test for independence of attributes, Yates correction	
<b>Total number of Lectures</b>				<b>40</b>

**Course Outcomes:**

1. Identify when to use a parametric method. Different parametric methods in estimation, testing, model fitting, and in analyses.
2. Develops the ability to analyze a problem and understand the appropriate statistical technique to analyze it.
3. Develops 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. Understands the tricks to do the mathematical calculations with ease.

**Reference Books:**

1. Ross, S.M. (2006): A First course in probability. 6th Ed<sup>n</sup> 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

### Case Studies:

<b>1</b>	<p><b>Testing the Mean Lifetime of Fluorescent Light Bulbs</b></p> <p>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.</p> <p>( Based on the data , the student has to find the interpretations )</p>
<b>2</b>	<p><b>Analyzing Customer Satisfaction Levels in a Restaurant Chain</b></p> <p>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 )</p>

### Practicals

S.N.	Topic	HOURS
1	Basic inbuilt commands in R for testing of hypothesis	2
2	R program on Binomial distribution	2
3	R program on Poisson distribution	2
4	R program on Normal distribution	2
5	R program on one sample and two sample mean Z test	2
6	R program on one sample and two sample proportion Z test	2
7	R program on unpaired t test	2
8	R program on paired t test	2
9	R program on Chi square test	2
10	R program on ANOVA	2
	Total no of Lectures	20

BOS	Computer Science
Class	F.Y.B.Sc.C.S.
Semester	II
Subject Name	Core Java
Subject Code	PUSCS202
Type of Course	Major
Level of the Subject	Medium
Credits	4 Theory + 1 Practical

**Course Objectives:**

1. To understand basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. To understand the principles of inheritance, packages and interfaces, Collection Framework, GUI concepts

Unit No.	Name of Unit	Topic No.	Content	Hours
1	Fundamentals of Java	1.1	Introduction: java development kit, The Java Virtual Machine, JVM Components, Features of java. How to set a path in java? Setting the path environment variable, Java Compiler And Interpreter, java programs, main (), public, static, void, string [] args, keywords, Comments, variables and Constants: variable declaration, types of variable, constants.	10
			Data types and operators: primitive	
		1.2	data types, Object Reference Types, Strings, Auto boxing and unboxing, operators , arrays.	
		1.3	Control Flow Statements: If, If...Else Statement, The Switch...Case Statement Iterations: The While Loop, The Do ... While Loop, The For Loop, The For each Loop, Labelled Statements, The Break And Continue, Statements, The Return Statement.	

2	Classes , Object , Inheritance , Abstract classes and interfaces.	2.1	Classes & Object: defining a class, Instantiating Objects from A class, class methods, accessing A method, method returning a value, method's arguments, method overloading, variable arguments[Varargs], constructor, static field and methods, this keyword, final keyword, garbage collection. Inheritance: Inheritance and Access	10
		2.2	Control, types of inheritance, Default Base Class Constructors, super keyword, Method Overriding. Abstract Classes And Interfaces:	
		2.3	Abstract Classes, Abstract methods, Interfaces, What Is An Interface? How Is An Interface Different from an abstract class? Multiple Inheritance,Lambda Expressions, type Annotations Packages & MultiThreading: Creating	
3	Packages , MultiThreading , Exceptions and Collection Framework.	3.1	Packages, Default Package, Importing package. Multithreading,thread creation,thread life cycle.	10
		3.2	Exceptions: Introduction, Pre Defined Exceptions , Try-Catch-Finally ,Throws, throw , User Defined Exception. Collection Framework: Introduction, util	
		3.3	Package interfaces, List interface & its classes ,	
4	Socket Programming & GUI	4.1	Socket Programming : Url class UrlConnection class, Socket class, ServerSocket class, Example.	10
4.2		EventHandling: Event-Delegation-Model, Listeners. Layout Manager : BorderLayout, FlowLayout, GridLayout.		
4.3		Swing: introduction of swing components, hierarchy, Swing components: JLabel, JTextField and JPasswordField, JTextAres, JButton, JCheckBox, JRadioButton		
Total Lectures				40

**Course Outcomes:**

1. Identify basic Java language syntax and semantics to write Java programs and use concepts such as Data type and variables.
2. To understand the basic concept of Logical Statements And Control Flow Statements.
3. Examine the factors of Class And Object And determine the concept of Inheritance, package and interfaces.
4. Analyze the change in Threading Concept, and Exceptions and Apply Multithreading and Exception Handling.
5. Evaluate the role of Socket Programming and Event Handling.
6. To learn and create advanced standalone GUI concepts.

**References:**

1. Core Java 8 for Beginners- vaishali Shah,Sharanam Shah,publisher- SPD,1st Edition 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.javatpoint.com/>
6. <https://www.tutorialspoint.com/java/index.htm>

**Case Studies:**

1	<p>Chairman of an ABC society, located at Vashti, maintains information of all the flat owners in the society such as flat number, name of the owner, parking slot number, in a register. He also keep record all the flat owners who rented their house with details such as Tenant name and surname and phone number.</p> <p>Now Society want to atomize their manual system to handle all the information smoothly and access each information easily. The new system should allow Chairman to add new Tenant information and display information about who is tenant in which flat, using which parking slot etc.</p>
2	<p>Mr. Amit has a small book shop in Panvel area. The shop has a collection of different books of different categories like arts, commerce, competitive exams with their title, author, and publisher and cost and number of copies.</p> <p>The owner wants to automate their manual system and keep track of their books, transactions. The automated shop management system should allow the owner to add books and manage the information of number of book sold of a particular category</p>

## Practicals

	Details
1	Write a Java program that takes a number as input and prints its multiplication table upto 10. Write a Java program to print the area and perimeter of a circle.
2	Write a Java program to reverse a string and also check whether it is a palindrome or not. Write a java program using string function
3	Write a Java program to count the letters, spaces, numbers and other characters of an input string Find the smallest and largest element from the array
4	Designed a class that demonstrates the use of variable arguments Designed a class that demonstrates the use of constructor . Write a java program to implement method overloading . Write a java program to demonstrate the implementation of abstract class.
5	Write a java program to implement single level inheritance. Write a java program to implement method overriding . Write a java program to implement multiple inheritance
6	Create a package, Add the necessary classes and import the package in java class
7	Write a java program to implement the concept of ArrayList. Write a java program to implement the concept of Vector.
8	Write a java program to implement exception handling Write a java program to implement the concept of multithreading.
9	Design a chatting application by using Socket programming.
10	Design a swing program to print the factorial for an input value . Design a swing application that contains the interface to add student information and display the same. Design a calculator based on swing application.
	<b>Total No. Of. Lectures 20</b>

BOS	Computer Science
Class	F.Y.B.Sc.C.S
Semester	II
Subject Name	Web Programming
Subject Code	PUSCS203
Type of Course	Discipline Minor
Level of the Subject	Basic
Credits	4 Theory + 1 Practical

**Course Objectives:**

1. To provide insight into emerging technologies to design and develop state of - the art web applications using client-side scripting, server-side scripting, and
2. Understanding of database connectivity.

Unit No.	Name of Unit	Topic No.	Name of Topic	Hours
1	HTML5:	1.1	Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML,	10
		1.2	Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors,	
		1.3	FORMs in HTML, Interactive Elements,	
			Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page	
		1.4	CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element.	

2	JavaScript	2.1	<b>JavaScript:</b> Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements	10
		2.2	Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions with Timer,	
		2.3	JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document , Cookies, Document Object Model, Form Validation using JavaScript	
3	XML, JSON, PHP	3.1	<b>XML:</b> Comparing XML with HTML, Advantages and Disadvantages of XML, <b>Introduction to JSON :</b> Benefits of JSON JSON Syntax, JSON Data Types,JSON - Objects	10
		3.2	<b>PHP:</b> Variables and Operators, Program Flow, Arrays, Working with Files and Directories,	
		3.3	Working with Databases, Working with Cookies, Sessions and Headers	
4	Introduction to Bootstrap and AI	4.1	What is Bootstrap, Downloading Bootstrap, Bootstrap Grid, Bootstrap Text, Bootstrap Table, Bootstrap Alerts, Bootstrap Buttons, Navigation Bar.	10
		4.2	Using Microsoft Designer for designing web pageelements (logo, assets, etc.)Using chatgpt to understand the structure and code of existing web pages.(Type any web page Url in chatgpt and ask to give it's code)	
		4.3	Uploading existing code base on chat gpt to optimize it and improve Create an end to end functional webpage completely using A.I (use chatgpt, Microsoft Bing,mid journey, and pika labs for video).Using Microsoft Designer for designing web page elements (logo, assets, etc.)	
<b>Total No. of Lectures</b>				<b>40</b>



**Course Outcomes :**

1. Describe fundamentals of web
2. Introduce the creation of static webpage using HTML
3. Apply the features of CSS in web development
4. Analyze the functions of JavaScript that can be used for dynamic webpage creation tool
5. Evaluate use of Ajax , XML and PHP as a server side programming language
6. Outline the principles behind using MySQL as a backend DBMS with PHP

**References:**

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press
2. Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India.
3. PHP: A Beginners Guide, Vikram Vaswani, TMH
4. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY
5. Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd.
6. Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O’Reilly
7. PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley.

**Case Studies:**

1	<p>Mr. X has developed a Food Delivery Application where the Home page has all the details of the Application where user first has to register, for which one registration link has to be there which will redirect to the registration page 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).</p>
2	<p>ABC University wants to streamline its student management process. They need a web-based system that allows administrators to manage student information efficiently. This system should enable tasks such as student registration, course enrollment, grade management, and generating academic reports.</p> <p>User Authentication: Implement secure user authentication for administrators, professors, and students.</p> <p>Student Registration: Allow students to register by providing necessary personal information.</p> <p>Course Management: Enable administrators to add, edit, and delete courses. Students should be able to view available courses and enroll in them.</p> <p>Grade Management: Professors should be able to enter and update grades for students enrolled in their courses.</p> <p>Report Generation: Generate academic reports such as student transcripts, course-wise performance reports, and grade sheets.</p> <p>User Interface: Design an intuitive and user-friendly interface for all users, ensuring accessibility and responsiveness across devices.</p>

### Practicals

	Details
1	Design a webpage that makes use of a. Document Structure Tags b. Various Text Formatting Tags c. List Tags d. Image and Image Maps
2	Design a webpage that makes use of a. Table tags b. Form Tags (forms with various form elements) c. Navigation across multiple pages d. Embedded Multimedia elements
3	Design a webpage that makes use of Cascading Style Sheets with a. CSS properties to change the background of a Page b. CSS properties to change Fonts and Text Styles c. CSS properties for positioning an element
4	Write JavaScript code for a. Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number b. Validating the various Form Elements
5	Write JavaScript code for a. Demonstrating different JavaScript Objects such as String, RegExp, Math, Date b. Demonstrating different JavaScript Objects such as Window, Navigator, History, Location, Document, c. Storing and Retrieving Cookies
6	a. Create a xml file and display its data on web page b. Create JSON file and display it
7	Write PHP scripts for a. Retrieving data from HTML forms b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number c. Working with Arrays d. Working with Files (Reading / Writing)
8	Write PHP scripts for a. Working with Databases (Storing Records / Repriving Records and Display them) b. Storing and Retrieving Cookies c. Storing and Retrieving Sessions
9	Practical on AI implementation using Chat gpt,
10	Microsoft Bing , Microsoft Designer tools for web programming
	TOTAL LECTURES :20

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