

# **UNIVERSITY OF MUMBAI**



**Syllabus for Semester V and Semester VI  
Program: B.Sc.**

**Course: Computer Programming and  
System Analysis**

**(APPLIED COMPONENT)**

**(CBCS)**

**With effect from 2018-19**

## Course Code USACCS501

### UNIT I RELATIONAL DATA BASE MANAGEMENT SYSTEM – 15 Lectures

1. **Introduction to Data base Concepts:** Database, Overview of data base management system. Data base Languages- Data Definition Languages (DDL) and Data Manipulation Languages (DML).
2. Entity Relation Model : Entity, attributes, keys, relations, Designing ER diagram, integrity Constraints over relations, conversion of ER to relations with and without constraints.
3. SQL Commands and functions
  - a) Creating and altering tables: CREATE statement with constraints like KEY, CHECK, DEFAULT, ALTER and DROP statement.
  - b) Handling data using SQL: selecting data using SELECT statement, FROM clause, WHERE clause, HAVING clause, ORDERBY, GROUP BY, DISTINCT and ALL predicates, Adding data with INSERT statement, changing data with UPDATE statement, removing data with DELETE statement.
  - c) Functions: Aggregate functions- AVG, SUM, MIN, MAX and COUNT, Date functions- ADD\_MONTHS(), CURRENT\_DATE(), LAST\_DAY(), MONTHS\_BETWEEN(), NEXT\_DAY(). String functions- LOWER(), UPPER(), LTRIM(), RTRIM(), TRIM(), INSERT(), RIGHT(), LEFT(), LENGTH(), SUBSTR(). Numeric functions: ABS(), EXP(), LOG(), SQRT(), POWER(), SIGN(), ROUND(number).
  - d) Joining tables: Inner, outer and cross joins, union.

### UNIT II INTRODUCTION TO PL/SQL – 15 Lectures

1. **Fundamentals of PL/SQL:** Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements,
2. **PL/SQL Data Types:** Number Types, Character Types, Boolean Type. Date time and Interval types.
3. **Overview of PL/SQL Control Structures:** Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IF-THEN-ELSIF Statement, CASE Statement,
4. **Iterative Control:** LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements.

### UNIT III INTRODUCTION TO JAVA PROGRAMMING – 15 Lectures

1. **Object-Oriented approach:** Features of object-orientations: Abstraction, Inheritance, Encapsulation and Polymorphism.
2. **Introduction:** History of Java features, different types of Java programs, Differentiate Java with C. Java Virtual Machine.
3. **Java Basics:** Variables and data types, declaring variables, literals numeric, Boolean, character and string literals, keywords, type conversion and casting. Standard default values. Java Operators, Loops and Controls
4. **Classes:** Defining a class, creating instance and class members: creating object of a class, accessing instance variables of a class, creating method, naming method of a class, accessing method of a class, overloading method, 'this' keyword, constructor and Finalizer: Basic Constructor, parameterized constructor, calling another constructor, finalize() method, overloading constructor.
5. **Arrays:** one and two – dimensional array, declaring array variables, creating array objects, accessing array elements.
6. **Access control:** public access, friendly access, protected access, private access.

#### **UNIT IV Inheritance, Exception Handling**

- a) **Inheritance:** Various types so inheritance, super and sub classes, keywords- 'extends', 'super', over riding method, final and abstract class: final variables and methods, final classes, abstract methods and classes. Concepts of inter face.
- b) **Exception Handling and Packages:** Need for Exceptional Hndling, Exception Handling techniques: try and catch, multiple catch statements, finally block, us age of throw and throws. Concept of packages. Inter class method: parseInt().

#### **References:**

1. Data base management system, RamKrishnam, Gehrke, McGraw-Hill
2. Ivan Bayross, "SQL, PL/SQL – The Programming languages of Oracle" B.P.B. Publications, 3<sup>rd</sup> Revised Edition.
3. George Koch and Kevin Loney, ORACLE "The complete Reference", Tata McGraw Hill, New Delhi.
4. Elmasri and Navathe, "Fundamentals of Database Systems" Pearson Education.
5. Peter Roband Coronel, "Database System, Design, Implementation and Management", Thomson Learning.
6. C.J. Date, Longman, "Introduction database system", Pearson Education.
7. Jeffrey D. Ullman, Jennifer Widsom, "A First Course in Database Systems", Pearson Education.
8. Martin Gruber, "Understanding SQL", B.P.B. Publications.
9. Michael Abbey, Micheal. Corey, Ian Abramson, Oracle8i- A Beginner's Guide, Tata McGraw- Hill.

10. Programming with Java: a Primer 4<sup>th</sup> Edition by E. Balagurusamy, Tata McGraw Hill.
11. Java the complete Reference, 8<sup>th</sup> Edition, Herbert Schildt, Tata McGraw Hill.

**Additional References:**

1. Eric Jend rock, Jennifer Ball, D Carson and others, The Java EE5 Tutorial, Pearson Education, Third Edition 2003.
2. Ivan Bayross, Web Enabled Commercial Applications Development using Java 2, BPB Publications. Revised Edition, 2006.
3. Joe Wiggles worth and Paula Mc Millan, Java Programming: Advanced Topics, Thomson Course Technology (SPPD), Third Edition 2004.

The Java Tutorials of Sun Microsystems Inc .<http://docs.oracle.com/javase/tutorial>

**Suggested Practicals**

1. Creating a single table with/without constraints and executing queries. Queries containing aggregate, string and date functions fired on a single table.
2. Updating tables, altering table structure and deleting table Creating and altering a single table and executing queries. Joining tables and processing queries.
3. Writing PL/SQL Blocks with basic programming constructs.
4. Writing PL/SQL Blocks with control structures.
5. Write a Java program to create a Java class:(a)without instance variables and methods,(b)with instance variables and without methods,(c)with out instance variables and with methods.(d) with instance variables and methods.
6. Write a Java program that illustrates the concepts of one, two dimension arrays.
7. Write a Java program that illustrates the concepts of Java class that includes(a)construct or with and with out parameters (b) Over loading methods.
8. Write a Java program to demonstrate inheritance by creating suitable classes.
9. Write a program that illustrates the error handling using exception handling.

## **SEMESTER VI**

**Course code USACCS601**

**UNIT I JAVAAPPLETSANDGRAPHICSPROGRAMMING- 15 LECTURES**

1. **Applets:** Difference of applet and application, creating applets, applet life cycle, passing parameters to applets.
2. **Graphics, Fonts and Color:** The graphics class, painting, repainting and updating an applet, sizing graphics. Font class, draw graphical figures-lines and rectangle, circle and ellipse, drawing arcs, drawing polygons. Working with Colors: Color methods, setting the paint mode.
3. **AWT package:** Containers: Frame and Dialog classes, Components: Label; Button; Checkbox; Text Field, Text Area.

## UNIT II PYTHON 3.x

## 15 LECTURES

1. **Introduction:** The Python Programming Language, History, features, Installing Python.  
Running Code in the Interactive Shell, IDLE. Input, Processing, and Output , Editing, Saving, and Running a Script, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging.
2. **Data types and expressions:** Variables and the Assignment Statement , Program Comments and Docstrings . Data Types-Numericintegers & Floating-point numbers. Boolean, string. Mathematical operators +, - \*, \*\* , %. PEMDAS.Arithmetic expressions, Mixed-Mode Arithmetic and type Conversion, type( ). Input( ), print( ), program comments. id( ), int( ), str( ), float( ).
3. **Loops and selection statements:** Definite Iteration: The for Loop, Executing statements a given number of times , Specifying the steps usingrange( ) , Loops that count down, Boolean and Comparison operators and Expressions, Conditional and alternative statements- Chained and Nested Conditionals: if, if-else, if-elif-else, nested if, nested if-else. Compound Boolean Expressions , Conditional Iteration: The while Loop –with True condition, the break Statement. Random Numbers. Loop Logic, errors, and testing.

Reference Fundamentals of Python First programs 2<sup>nd</sup> edition by Kenneth A Lambert chapter 1,2,3

## Unit III STRINGS, LIST AND DICTIONARIES. 15 LECTURES

1. **Strings, Lists, Tuple, Dictionary:** Accessing characters, indexing, slicing, replacing.Concatenation (+), Repetition (\*).Searching a substring with the ‘in’ Operator, Traversing string using while and for. String methods- find, join, split, lower, upper. len( ).
2. Lists – Accessing and slicing, Basic Operations (Comparison, +),List membership and for loop.Replacing element (list is mutable). List methods- append, extend, insert, pop, sort. Max( ), min( ). Tuples.  
Dictionaries-Creating a Dictionary, Adding keys and replacing Values , dictionary - key( ), value( ), get( ), pop( ) , Traversing a Dictionary.  
Math module: sin(), cos(),exp(), sqrt(), constants- pi, e.
3. **Design with functions :** Defining Simple Functions- Parameters and Arguments, the return Statement, tuple as return value. Boolean Functions. Defining a main function. Defining and tracing recursive functions.
4. **Exception handling:** try- except.

Reference Fundamentals of Python First programs 2<sup>nd</sup> edition by Kenneth A Lambert chapter 4,5,6.

## UNIT IV DOING MATH WITH PYTHON 15 LECTURES

1. **Working with Numbers:** Calculating the Factors of an Integer, Generating Multiplication Tables , converting units of Measurement ,Finding the roots of a Quadratic Equation
2. **Algebra and Symbolic Math with SymPy:** symbolic math using the SymPy library.  
Defining Symbols and Symbolic Operations, factorizing and expanding expressions, Substituting in Values, Converting strings to mathematical expressions. Solving equations, Solving Quadratic equations, Solving for one variable in terms of others, Solving a system of linear equations, Plotting using SymPy , Plotting expressions input by the user, Plotting multiple functions .

Reference Doing math with Python by AmitSaha (Internet source) chapter 1, 4

Software – <http://continuum.io/downloads>.Anaconda 3.x

### References:

1. Programming with Java:A Primer 4<sup>th</sup> Edition by E.Balagurusamy, Tata McGraw Hill.
2. JavaTheCompleteReference,8thEdition,HerbertSchildt,TataMcGrawHill
3. Fundamentals of Python First programs 2<sup>nd</sup> edition - Kenneth A Lambert, Cengage Learning India.
4. Doing Math with Python - Amit Saha, No starch ptress,

### Additional References:

5. Eric Jendrock, JenniferBall, DCarsonandothers,TheJavaEE5Tutorial, PearsonEducation,Third Edition,2003.
6. Ivan Bay Ross, Web Enabled Commercial Applications Development UsingJava2, BPB Publications, Revised Edition, 2006
7. Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology(SPD),ThirdEdition,2004
8. The Java Tutorials of Sun Microsystems Inc. <http://docs.oracle.com/javase/tutorial>
9. Problem solving and Python programming- E. Balgurusamy, TataMcGrawHill.

### Suggested Practical:

1. Write a program that demonstrates the use of input from the user using parse Int().
2. Write a Java applet to demonstrate graphics, Font and Color classes.
3. Write a Java program to illustrate AWT package.
4. Preparing investment report by calculating compound interest, computing approximate value of  $\pi$  by using the  $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$  (Gottfried Leibniz)
5. Convert decimal to binary, octal using string, Write the encrypted text of each of the following words using a Caesar cipher with a distance value of 3.
6. Hexadecimal to binary using dictionary, finding median of list of numbers.
7. Enhanced Multiplication Table Generator, Unit Converter, Fraction Calculator .
8. Factor Finder, Graphical Equation Solver
9. Summing a Series, Solving Single-Variable Inequalities

**Theory:** At the end of the semester, examination of three hours duration and 100 marks based on the four units shall be held for each course.

Pattern of **Theory question** paper at the end of the semester for **each course**: There shall be Five compulsory Questions of 20 marks each with internal option. Question 1 based on Unit I, Question 2 based on Unit II, Question 3 based on Unit III, Question 4 based on Unit IV and Question 5 based on all four Units combined.

Q1 to Q4 pattern

(a) Attempt any one out of two (08 Marks)

(b) Attempt any two out of four (12 Marks)

Q5 Attempt any four out of eight (20 Marks)

### **Semester End Practical Examination (Total 100 marks)**

**Semester V:** Total evaluation is of 100 marks-

- |                                   |           |
|-----------------------------------|-----------|
| (a) Question on Unit 1 and Unit 2 | -40 Marks |
| (b) Question on Unit 3 and Unit 4 | -40 Marks |
| (c) Certified Journal             | -10 Marks |
| (d) Viva Voce                     | -10 Marks |

**Semester VI:** Total evaluation is of 100 marks-

- |                                   |           |
|-----------------------------------|-----------|
| (a) Question on Unit 1 and Unit 2 | -40 Marks |
| (b) Question on Unit 3 and Unit 4 | -40 Marks |
| (c) Certified Journal             | -10 Marks |
| (d) Viva Voce                     | -10 Marks |

1. The questions to be asked in the practical examination shall be from the list of practical experiments mentioned in the practical topics. A few simple modifications may be expected during the examination.
2. The semester end practical examination on the machine will be of THREE hours.
3. Students should carry a certified journal with a minimum of 06 practicals (mentioned in the practical topics) at the time of examination.
4. Number of students per batch for the regular practical should not exceed 20. Not more than two students are allowed to do practical experiment on one computer at a time.

### **Workload**

**Theory** : 4 lectures per week .

**Practicals**: 2 practicals each of 2 lecture periods per week per batch. Two lecture periods of the practicals shall be conducted in succession together on a single day.