KOLHAN UNIVERSITY

Chaibasa, Jharkhand, India

Syllabus for
Four Year Undergraduate Programme (FYUGP)
of

Bachelor of Computer Application (BCA)

Semester - 3

With Effect From
Academic Year 2022 - 2023

As Per Revised Curriculum and Credit Framework for the FYUGP under the provisions of NEP - 2020

Table of Contents

Course Structure (Semester – III) for Four Year Undergraduate Programme (FYUGP) of Bachelor of Computer Applications (BCA)

Sem.	Paper Code	Paper Title	L–T–P	Credits	Contact Hours
III	AEC–3	Language and Communication Skills *(To be selected by the students from the list of available options)*		2	
	SEC–3	Skill Enhancement Course – 3		3	
	MDC–3	Multi–Disciplinary Course – 3 *(To be selected by the students from the list of available options)*		3	
	MN–1B	Minor From Discipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–4 (Theory)	Relational Database Management System	3–0–0	3	45
	MJ–5 (Theory)	Java Programming Language – I	3–0–0	3	45
	MJ (Practical–3)	RDBMS (SQL) and Java Programming – I Lab	0–0–2	2	60
Total Credits				**20**	

Abbreviations:
L–T–P (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course), **MN–1** (Minor From Discipline–1), **MN–2** (Minor From Vocational Studies/Discipline–2), **IAP** (Internship/Apprenticeship/Project), **MJ** (Major Disciplinary/Interdisciplinary Courses)

MJ–4 (Theory): Relational Database Management System

3 Credits | 45 Minimum Contact Hour | Semester III

Objectives:

The objective of the course is to provide an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve efficiently, and effectively information from a DBMS. It also exposes the students to advanced database concepts.

The main objectives of the course are as follows:

- Provide an introduction to the management of database systems.
- Understand the fundamentals of relational systems including data models, database architectures, and database manipulations**.**
- To know about the database requirements and determine the entities involved in the system and their relationship to one another.
- To know about manipulation of a database using SQL
- Understand Normalization techniques.

Learning Outcomes:

At the end of the course, students will be able to:

- Describe the fundamental elements of Relational Database Management Systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra, and SQL.
- Design ER-models to represent simple database application scenarios.
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th + Pr
45	N/A	3	N/A	3	N/A	10+5=15	N/A	60	N/A	75	N/A	30	N/A	75+N/A=75

Unit	Topic	Minimum Class Hours
I	Introduction to Databases	10
II	Database Design and Schema	10
III	Structured Query Language (SQL)	15
IV	Database Querying and Optimization	10
	Total	**45**

Detailed Syllabus

Unit I: Introduction to Databases **(10 Hours)**

Introduction to Database and Database Users, Overview of Database Management Systems, Relational Database Concepts and Components, Relational Model and Relational Algebra, Relational Database Management System Architecture.

Unit II: Database Design and Schema **(10 Hours)**

Entity-relationship (ER) Modeling, Relational Schema Design, Functional Dependencies and Normalization (1NF, 2NF, 3NF, BCNF, 4NF), Database Constraints and Integrity.

Unit III: Structured Query Language (SQL) **(15 Hours)**

Introduction to SQL, SQL Data Types, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Transaction Control Language (TCL), Views, Indexes, and Stored Procedures, Scalar (Non-Aggregate) SQL Functions - String, Numeric and Date functions.

Unit IV: Database Querying and Optimization **(10 Hours)**

Basic and Advanced SQL Queries, Joins and Subqueries, Aggregate Functions and Grouping, Query Optimization Techniques.

Recommended Books:

- Abraham Silberschatz, Henry F. Korth, S. Sudharshan; **Database System Concepts** (7th Edition); Tata McGraw Hill, 2019
- Elmasri and Navathe; **Fundamentals of Database Systems** (7th Edition); Addison – Wesley, 2016

Further Readings:

- C.J. Date, A. Kannan, S. Swamynatham; **An Introduction to Database Systems** (8th Edition); Pearson education, 2009
- Raghu Ramakrishnan and Johannes Gehrke; **Database Management Systems** (3rd Edition); McGraw-Hill, 2003
- Ivan Bayross; **PL/SQL Programming**; BPB
- SQL and PL/SQL Tutorial – **https://www.w3schools.com/sql/, http://www.plsqltutorial.com/**

MJ–5 (Theory): Java Programming Language-I

3 Credits | 45 Minimum Class Hours | Semester III

Objectives:

The Java Programming Language course is designed to provide students with a comprehensive understanding of the Java programming language and its application in software development. The course aims to equip students with the necessary skills to design, implement, and debug Java programs. Students will learn the fundamental concepts of object-oriented programming and gain hands-on experience in developing Java applications. The main objectives of the course are as follows–

- Understand the basic concepts of Java programming language.
- Design and implement Java programs using object-oriented principles.
- Apply control structures, data types, and operators in Java programming.
- Use Arrays for data storage and manipulation.
- Apply packages to organize the group of classes, interfaces etc.

Learning Outcomes:

By the end of the course, students will be able to:

- Design and implement Java programs that demonstrate a clear understanding of object-oriented programming principles.
- Apply control structures, data types, and operators effectively in Java programming to solve problems.
- Utilize arrays for efficient data storage, retrieval, and manipulation.
- Implement packages to organize classes and interfaces into a single unit.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th + Pr
45	N/A	3	N/A	3	N/A	10+5=15	N/A	60	N/A	75	N/A	30	N/A	75+N/A=75

Unit	Topic	Minimum Class Hours
I	Introduction and Fundamentals of Java	15
II	Arrays and Strings	10
III	Class, Objects and Methods	15
IV	Packages	05
	Total	**45**

Detailed Syllabus

Unit I: Introduction and Fundamentals of Java (15 Hours)

Introduction to Java and its features, Java Runtime Environment, Java Virtual Machine, Java Development Kit, Java Program Structure, Tokens- Keywords, Identifiers, Constants, Primitive and reference data types in Java, Variable declaration & initialization, Types of variables such as local, instance, and static variables, Input/ Output in Java, Java Operators and Expressions, Operator Precedence and Associativity, Type Conversion in Expressions, Mathematical Functions, Wrapper classes.

Control Structures: Decision-making, Branching and Looping statements.

Unit II: Arrays and Strings (10 Hours)

Array: Introduction, One Dimensional Arrays, Declaration, Creation, Initialization of Arrays, Two Dimensional Arrays.

String: Fundamentals of Characters and Strings, The String Class and its methods, String Operations.

Unit III: Class, Objects and Methods (15 Hours)

Introduction, Defining a Class, Fields declaration, Method declaration, Creating object, Accessing class members, Access or Visibility Modifier, this keyword, Method overloading, Constructors, Constructor overloading, Garbage Collection, The Finalize ( ) Method.

Inheritance and Polymorphism: Inheritance Basics, Super and Sub class, Types of Inheritance, Overriding methods, super keyword, final keyword, Static and Dynamic Binding, Abstract methods and classes, Compile-time Polymorphism and Runtime Polymorphism.

Interfaces: Defining Interfaces, Implementing Interfaces, Extending Interfaces, Accessing Interface variable, Multiple Inheritance through Interfaces.

Unit IV: Packages (5 Hours)

Introduction, Java API Packages, Naming Convention, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes.

Recommended Books:

- E. Balagurusamy; **Programming with JAVA**; McGraw Hill, New Delhi
- Joel Murach, Michael Urban; **Murach's Beginning Java with Net Beans**; SPD

Further readings:

- Herbert Schildt; **Java:The Complete Reference**; McGraw Hill
- Raj Kumar Buyya; **Object Oriented Programming with JAVA**; McGraw Hill
- Ken Arnold, James Gosling; **The Java Programming Language**; Addison Wisely
- Wiley; **Java 6 Programming Black Book**; Kogent Learning Solutions

MJ (Practical-3): RDBMS (SQL) and Java Programming-I Lab

2 Credits | 60 Minimum Class Hours | Semester III

Objectives:

The main objectives of the course are as follows–

- To know about the database requirements and determine the entities involved in the system and their relationship to one another.
- To know about the manipulation of database using SQL commands.
- To teach the students basics of JAVA programs and its execution.
- Use Arrays for data storage and manipulation.
- To organize classes and interfaces in to a single unit using packages.
- To make the students learn concepts Object Oriented Programming.

Learning Outcomes:

After completion of this course, a student will be able to–

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- Gain knowledge on how to use SQL for Creating, Modifying and Accessing tables in Database.
- Implement Order by and Group by clauses.
- Use Java compiler and other platform to write and execute java program.
- Utilize arrays for efficient data storage, retrieval, and manipulation.
- Understand and Apply Object oriented features and Java concepts.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th	Pr	Th + Pr
N/A	60	N/A	3	N/A	2	N/A	N/A	N/A	50	N/A	50	N/A	20	N/A+50=50

<u>Marks Distribution of End Semester Practical Examination</u>

● Experiments – 30 Marks ● Viva-Voce – 10 Marks ● Practical File – 10 Marks

Experiment List

Group – 'A': RDBMS (SQL)

Unit I: ***CREATE***, ***ALTER*** and ***DROP*** Statements	
1.	Create a table **Employee** with the following fields: (Employee_Id, First_Name, Last_Name, Hire_Date, Job_Id, Salary, Manager_Id, Department_Id) Use appropriate data type and perform following task- (a) Add a new field 'Address Char(10)'. (b) Modify the size of Address column to 20. (c) Insert any 5 records into the table. (d) Insert a record in Employee_Id, First_Name and Salary field only.

	(e) Display the structure of Employee table. (f) List out details of all employees. (g) Remove the field 'Address' from the table. (h) Copy Employee table to Emp_backup. (i) Remove the table Employee from the database. Change the name of the table from Emp_backup to Employee.
Unit II: *UPDATE* and *DELETE* Statements	
2.	Create an Emp table with the following fields: (EmpNo, EmpName, Job, Basic, DA, HRA, PF, GrossPay, NetPay) (Calculate DA as 30% of Basic and HRA as 40% of Basic and PF as 12.5% of Basic) (a) Insert Five Records in the following fields (EmpNo, EmpName, Job, Basic) (b) Calculate DA, HRA, PF, GrossPay (Basic+DA+HRA) and NetPay (GrossPay-PF) of all employees. (c) Display all records. (d) If NetPay is less than <Rs. 10,000 add Rs. 1200 as special allowances. (e) Delete all 'Clerks' having Basic 5000 or less.
Unit III: Integrity Constrains	
3.	Create a table named Library with appropriate data type of following structure: (Book_id, Title, Author, Subject, Publisher, Quantity, Price, Student_id) Apply following constraints on the field (i) Book_id must be Primary Key (ii) Title must be Unique (iii) Quantity should be more than 100 (iv) Price should be between Rs. 10 and Rs. 5000 (a) View all the constraints from the data dictionary (b) Add Foreign Key constraints to Student_id column which references to Student(Student_id). [Create Student(Roll, Name, Book_id(PK)) before adding the Foreign Key constraints] (c) Describe the structure of the table. (d) Insert records to verify the constraints.
Unit V: *SELECT* Statement	
4.	A company wishes to maintain a database to automate its operations. Company is divided into certain departments and each department consists of employees. The following two tables describes the automation schemas: Dept (deptno, dname, loc) Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno) (a) Create above tables with appropriate data types (b) Insert details of three departments and details of 5 employees. (c) List the employee's name and salary, whose experience is greater than 10 years. (d) Display unique jobs from the table. (e) Display employees of department no. 20 and 30 who have salary between 20000 and 30000.

<table>
<tr><td>5.</td><td>Consider the table
Dept (deptno, dname, loc)
Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno)
created earlier, write following query:
(a) To list all employee who do not have commission.
(b) To list all ‘Salesman’ of dept. 30 who have commission.
(c) To list employee name and annual salary (sal*12).
(d) To list the name of all employees whose name begins with letter ‘Raj’.
(e) Display empno, ename, deptno and dname of all employee.
(f) List the name of those employees who earn more than all of the employees of ‘Sales’ dept.</td></tr>
<tr><td colspan="2"><b>Unit VI: <i>ORDER BY</i> and <i>GROUP BY</i> Clause, Aggregate Functions</b></td></tr>
<tr><td>6.</td><td>Create a table Library with appropriate data type of following structure:
(Book_id, Title, Author, Subject, Publisher, Quantity, Price)
(a) Insert any ten records
(b) Calculate total quantity of books of each subject.
(c) Calculate average price of books of each publisher.
(d) Display total quantity, maximum and minimum price of subjects ‘Java’ and ‘Python’.
(e) Display list of all the books with price more than 300 in ascending order of price.
(f) List Author wise count of books in alphabetical order.</td></tr>
<tr><td colspan="2"><b>Unit VII: Join and Sub-Query</b></td></tr>
<tr><td>7.</td><td>Consider the table
Dept (deptno, dname, loc)
Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno)
created earlier, write following query:
(a) Display the manager who is having maximum number of employees working under him?
(b) List the names of employees, who take highest salary in their departments.
(c) Create a view Emp_Dept, which contains Employee name, job, salary and department name.</td></tr>
<tr><td colspan="2"><b>Unit IV: <i>ROLLBACK, COMMIT, GRANT</i> and <i>REVOKE</i> Statement</b></td></tr>
<tr><td>8.</td><td>Create Teacher table with the following fields (Name, DeptNo, Date_of_joining, DeptName, Location, Salary)
(a) Insert five records.
(b) Give Increment of 25% salary for Mathematics Department.
(c) Perform Rollback command.
(d) Give Increment of 15% salary for Commerce Department.
(e) Perform commit command.</td></tr>
<tr><td>9.</td><td>(a) Create a new user ‘ku’ having password ‘ku123’
(b) Grant all privileges to the user ‘ku’
(c) Create a table BCA(adm_id, name)
(d) Revoke all privileges from the user ‘ku’
(e) Grant only CREATE and SELECT privilege from user ‘ku’ on table BCA
(f) Revoke SELECT privilege from user ‘ku’ from table BCA.</td></tr>
</table>

Group – 'B': Java Programming – I

Unit I: Data Types, Operators and Expressions, Selection and Loop Statements

1.	Write a program to input and display different types of data values using Scanner or Stream class.
2.	Write a program to create a simple calculator which can perform basic arithmetic operations like addition, subtraction, multiplication or division, exponent (x^y), and square root depending upon the user input.
3.	Write a program to convert primitive to wrapper class and wrapper to primitive.
4.	Write a program to input length of three sides of a triangle. Then check if these sides will form a triangle or not. If sides form a triangle, then display the type of the triangle with its area and perimeter.
5.	Write a program to find factorial of a number. Input the number as command line argument.
6.	Write a menu-based program to check Prime, Armstrong, and Perfect number.
7.	Write a menu-based program to convert following – • Decimal to Binary Number • Binary to Decimal Number

Unit II: Arrays, Strings

8.	Write a java program to check whether the elements of an array are sorted or not. If sorted, display the order, otherwise sort elements in ascending order or descending order as per user's choice.
9.	Write a program to input order of two matrices and check if it satisfies the condition for product of the matrices or not. If it satisfies the condition then find the product of the matrices. *(Hint: Two matrices can be multiplied if and only if they satisfy the following condition:* *The number of columns present in the first matrix should be equal to the number of rows present in the second matrix.)*
10.	Write a program to input a string and display number of vowels and consonant in each word. For example, if the string is "Kolhan University Chaibasa", then the output will be – Kolhan: Vowels = 2, Consonants = 4 University: Vowels = 4, Consonants = 6 Chaibasa: Vowels = 4, Consonants = 4

Unit III: Class, Objects and Methods

11.	Write a program in Java with class Rectangle with the data fields width, length, area and color. The length, width and area are of double type and color is of string type .The methods are set_ length () , set_width (), set_ color(), and find_ area (). Create two object of Rectangle and compare their area and color. If area and color both are same for the objects then display "Matching Rectangles" otherwise display "Non matching Rectangle".
12.	Create a class Account with two overloaded constructors. First constructor is used for initializing, name of account holder, account number and initial amount in account. Second constructor is used for initializing name of account holder, account number, addresses, type of account and current balance. Account class is having methods Deposit (), Withdraw (), and Get_Balance(). Make necessary assumption for data members and return types of the methods. Create objects of Account class and use them.
13.	Write a Java program to create a shape class and derive, square and circle classes from shape class. Define appropriate constructor for all the three classes. Define a method Area( ) to calculate

	area of circle and square in respective class. Assume PI = 3.14 and declare it as a final variable in circle class.
14.	Define an Employee class with suitable attributes having getSalary() method, which returns salary withdrawn by a particular employee. Write a class Manager which extends a class Employee, override the getSalary() method, which will return salary of manager by adding traveling _allowance, house rent allowance etc. Use default and parameterized constructors to initialize data.
15.	Write a java program which creates an interface having 2 methods add () and sub(). Create a class which implements the above interface for addition and subtraction of two numbers respectively.
16.	Write a program to demonstrate the multiple inheritance using interfaces.
Unit IV: Packages	
17.	Create and implement a package having two public classes.

Note: Additional lab assignments may be included based on topics covered in the theory paper.