

COMMON POOL OF GENERIC ELECTIVES (GE) COURSES

(For all the Generic Elective courses offered by your department, please put it in the format provided below)

GENERIC ELECTIVES (GE-3a): Database Management Systems

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
GE3a Database Management Systems	4	3	0	1	Pass in Class XII	NIL	Computer Science

Learning Objectives

The course introduces the students to the fundamentals of database management system and its applications. Emphasis is given on the popular relational database system. Students will learn about the importance of database structure and its designing using Entity Relationship diagram and formal approach using normalization. Basic concepts of file indexing and transaction processing will be taught. The course would give students hands-on practice of structured query language to create, manipulate and implement a relational database.

Learning outcomes

On successful completion of the course, students will be able to:

- Use relational database management software to create and manipulate the database.
- Create conceptual data models using entity relationship diagrams for modeling real-life situations and map it to corresponding relational database schema.
- Use the concept of functional dependencies to remove redundancy and update anomalies.
- Apply normalization theory to get a normalized database scheme to get anomalies free database.
- Write queries in relational algebra.
- Implement relational databases and formulate queries for data retrieval and data update problems using SQL .

- Learn the importance of index structures and concurrent execution of transactions in database systems.

SYLLABUS OF GE-3a

Unit 1 (5 hours)

Introduction to Database: Database, characteristics of database approach, data models, database management system, three-schema architecture, components of DBMS, data independence, and file system approach vs database system approach.

Unit 2 (8 hours)

Entity Relationship Modeling: Conceptual data modeling - motivation, entities, entity types, attributes, relationships, relationship types, constraints on relationship, Entity Relationship diagram as conceptual data model.

Unit 3 (11 hours)

Relational Data Model: Data anomalies, Relational Data Model - Characteristics of a relation, schema-instance distinction, types of keys, relational integrity constraints. Relational algebra operators like selection, projection, cartesian product, join and write simple queries using them.

Unit 4 (10 hours)

Structured Query Language (SQL): DDL to create database and tables, table constraints, DML, Querying in SQL to retrieve data from the database, aggregation functions group by and having clauses, generate and query views.

Unit 5 (11 hours)

Database Design: Mapping an Entity Relationship diagram to corresponding relational database scheme, functional dependencies and Normal forms, 1NF, 2NF, and 3NF decompositions and desirable properties of them.

Essential/recommended readings

1. Elmasri, R., Navathe, B. S., *Fundamentals of Database Systems*, 7th Edition, Pearson Education, 2016.
2. Murach J., *Murach's MySQL*, 3rd Edition, Pearson, 2019.

Additional References

1. Connolly T. M., Begg C. E. *Database Systems: A Practical Approach to Design, Implementation, and Management*, 6th edition, Pearson, 2019.
2. Ramakrishnan R., Gehrke J. *Database Management Systems*, 3rd Edition, McGraw-Hill, 2014.
3. Silberschatz A., Korth H.F., Sudarshan S. *Database System Concepts*, 7th Edition, McGraw Hill, 2019.

Suggested Practical List (If any): (30 Hours)

Practical exercises based on a given schema.

Create and use the following student-course database schema for a college to answer the given queries using the standalone SQL editor.

STUDENT	<u>Roll No</u>	StudentName	CourseID	DOB
	Char(6)	Varchar(20)	Varchar(10)	Date

COURSE	<u>CID</u>	CourseName	Course Type	Teacher-in-charge	TotalSeats	Duration
	Char(6)	Varchar(20)	Char(8)	Varchar(15)	Unsigned int	Unsigned int

ADMISSION	<u>Roll No</u>	<u>CID</u>	DateOfAdmission
	Char(6)	Char(6)	Date

Here Rollno (ADMISSION) and CID (ADMISSION) are foreign keys. Note that course type may have two values viz. Fulltime and Parttime and a student may enroll in any number of courses

1. Retrieve names of students enrolled in any course.
2. Retrieve names of students enrolled in at least one part time course.
3. Retrieve students' names starting with letter 'A'.
4. Retrieve students' details studying in courses 'computer science' or 'chemistry'.
5. Retrieve students' names whose roll no either starts with 'X' or 'Z' and ends with '9'
6. Find course details with more than N students enrolled where N is to be input by the user.
7. Update student table for modifying a student name.
8. Find course names in which more than five students have enrolled
9. Find the name of youngest student enrolled in course 'BSc(P)CS'
10. Find the name of most popular society (on the basis of enrolled students)
11. Find the name of two popular part time courses (on the basis of enrolled students)
12. Find the student names who are admitted to full time courses only.
13. Find course names in which more than 30 students took admission
14. Find names of all students who took admission to any course and course names in which at least one student has enrolled
15. Find course names such that its teacher-in-charge has a name with 'Gupta' in it and the course is full time.
16. Find the course names in which the number of enrolled students is only 10% of its total seats.
17. Display the vacant seats for each course
18. Increment Total Seats of each course by 10%
19. Add enrollment fees paid ('yes'/'No') field in the enrollment table.
20. Update date of admission of all the courses by 1 year.
21. Create a view to keep track of course names with the total number of students enrolled in it.
22. Count the number of courses with more than 5 students enrolled for each type of course.

23. Add column Mobile number in student table with default value '9999999999'
24. Find the total number of students whose age is > 18 years.
25. Find names of students who are born in 2001 and are admitted to at least one part time course.
26. Count all courses having 'science' in the name and starting with the word 'BSc'.

GENERIC ELECTIVES (GE-3b): Java Programming

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
GE3b:Java Programming	4	3	0	1	Pass in Class XII	NIL	Computer Science

Learning Objectives

This course is designed to develop understanding of object-oriented programming concepts like Classes, Objects, Inheritance and Polymorphism using Java. The course provides understanding of multithreading and exception handling in Java. It also introduces how to create Java applications with graphical user interface (GUI).

Learning outcomes

On completion of this course, the student will be able to:

- Understand the object-oriented concepts – Classes, Objects, Inheritance, Polymorphism– for problem solving.
- Create and handle multithreading.
- Handle program exceptions.
- Handle input/output through files.
- Create Java applications with graphical user interface (GUI).

SYLLABUS OF GE-3b

Unit 1 (6 hours)

Introductory Concepts: program, identifiers, variables, constants, primitive data types, expressions, Naming Conventions, Type casting, operators, control statements, structured data types, arrays, functions.

Unit 2 (13 hours)

Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, Anonymous block, Static Data members, overloading and overriding, Usage of super and this keyword, Abstract classes, Interfaces and Packages, Access modifiers, Object class

Unit 3 (11 hours)

Multithreading: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization, Sync Code Block, Overriding Synced Methods, Thread Communication, wait, notify and notify all.

Unit 4 (8 hours)

Introduction to Exception handling: Exception and Error, Throw, try and catch Blocks, Exception handlers, java.lang Exceptions, Built-InExceptions.

Unit 5 (7 hours)

Introduction to File Handling: Byte Stream, Character Stream, File I/O Basics, File Operations, Serialization.

Essential/recommended readings

1. Cay S. Horstmann, *Core Java - Vol. I – Fundamentals*, 10th edition, Pearson, 2017.
2. James Gosling, Bill Joy, Guy L. Steele Jr, Gilad Bracha, Alex Buckley, *The Java Language Specification, Java SE 7th edition*, Addison-Wesley, 2011

Additional References

1. Herbert Schildt, *Java: The Complete Reference*, 10th edition, McGraw-Hill Education, 2018.
2. Richard Johnson, *An Introduction to Java Programming and Object-Oriented Application Development*, Thomson Learning, 2006.
3. Kathy Sierra and Bert Bates, *Head First Java*, 3rd edition, O'Reilly, 2022.

Suggested Practical List (If any): (30 Hours)

Practical exercises such as

1. Create a java program to implement stack and queue concept.
2. Write a program to take input from command line arguments.
3. Write a java program to show static and dynamic polymorphism.

4. Write a java program to show multiple inheritance using interfaces.
5. Write a program in java to show the chaining of execution of construction.
6. Write a java program to show multithreaded producer and consumer application.
7. write a program in java to synchronize the multithreaded application
8. Create a customized exception and also make use of all the exception keywords.
9. Write a program to show different ways to get input from user
10. Design a form using AWT components and Frame container.