Computer Science Minor

w.e.f AY 2024-25 onwards

Course Structure

Year	Semester	Paper	Title of the Course	No. of Hrs./ Week	No. of Credits
2	IV	3	Database Management System - (T)	3	3
			Database Management System - (P)	2	1
		4	Object Oriented Software Engineering - (T)	3	3
			Object Oriented Software Engineering - (P)	2	1

Theory   **Credits: 3**   **3 hrs/week**

Learning Objectives:

To familiarize with concepts of database design

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

1. Differentiate between database systems and file based systems
2. Design a database using ER model
3. Use relational model in database design
4. Use SQL commands for creating and manipulating data stored in databases.
5. Write PL/SQL programs to work with databases.

UNIT-I

Overview of Database Management System: Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of database, costs and risks of database approach.

UNIT-II

Entity-Relationship Model: Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EERmodel), generalization and specialization, advantages of ER modeling.

UNIT-III

Relational Model: Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, Functional dependencies and normal forms upto 3rd normal form.

UNIT- IV

Structured Query Language: Introduction, Commands in SQL, Data Types in SQL, Data Definition Language, Data Manipulation Language, Selection Operation, Projection Operation, Aggregate functions, Join Operation, Set Operations, Sub Query, Views.

UNIT-V

PL/SQL: Introduction, Shortcomings of SQL, Structure of PL/SQL ,PL/SQL Language Elements, Data Types, Operators and their Precedence, Control Structures, Steps to Create a PL/SQL, Program, Procedure, Function, Database Triggers, Types of Triggers.

Text Books:

1. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne (7th Edition) Wiley India Edition.

Reference Books

1. Database Management Systems by Raghu Ramakrishnan, McGrawhill
2. Principles of Database Systems by J. D. Ullman
3. Fundamentals of Database Systems by R. Elmasri and S. Navathe
4. SQL: The Ultimate Beginners Guide by Steve Tale.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Seminar Presentation on Database Management Systems

Evaluation Method: Depth of research, clarity of explanations, ability to address questions and engage the audience.
Unit 2: Activity: Case Study on EER model

Evaluation Method: Identification of inheritance relationships, effective use of generalization and specialization, and adherence to constraints.

Unit 3: Activity: Exercise on Normalization: Assign students a set of unnormalized tables and have them normalize the tables to third normal form

Evaluation Method: Normalized table designs, identification of functional dependencies, adherence to normalization rules, and elimination of anomalies.

Unit 4: Activity: Competition on SQL Query Writing

Evaluation Method: Query correctness, efficiency, proper use of SQL commands, ability to handle complex scenarios, and creativity in query formulation.
Unit 5: Activity: Peer Review of PL/SQLcode

Evaluation Method: Peer evaluation of code quality, adherence to coding standards, proper use of language elements, and logic.

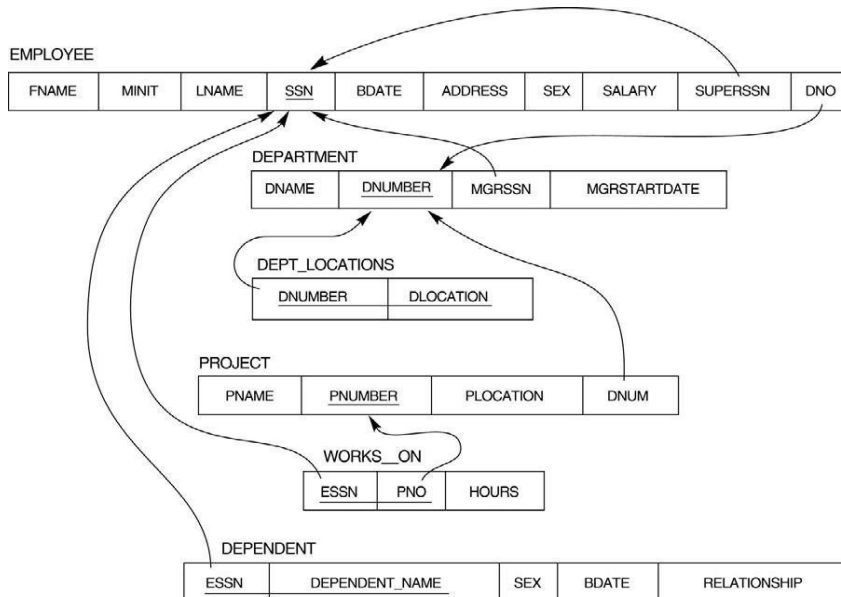**Practicals**   **Credits: 1**   **2 hrs/week**

List of Experiments:
1. Draw ER diagram for hospital administration

2. Creation of college database and establish relationships between tables

3. Relational database schema of a company is given in the following figure.

Relational Database Schema-COMPANY

Questions to be performed on above schema

1. Create above tables with relevant Primary Key, Foreign Key and other constraints
2. Populate the tables with data
3. Display all the details of all employees working in the company.
4. Display ssn, lname, fname, address of employees who work in department no 7.
5. Retrieve the Birthdate and Address of the employee whose name is 'Franklin T. Wong'
6. Retrieve the name and salary of every employee
7. Retrieve all distinct salary values
8. Retrieve all employee names whose address is in 'Bellaire'
9. Retrieve all employees who were born during the 1950s
10. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)

11. Retrieve the names of all employees who do not have supervisors
12. Retrieve SSN and department name for all employees
13. Retrieve the name and address of all employees who work for the 'Research' department
14. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.
15. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
16. Retrieve all combinations of Employee Name and Department Name
17. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.
18. Increase the salary of all employees working on the 'Product X' project by 15%. Retrieve employee name and increased salary of these employees.
19. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
20. Select the names of employees whose salary does not match with salary of any employee in department 10.
21. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
22. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
23. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
24. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
25. Delete all dependents of employee whose ssn is '123456789'.
26. Perform a query using alter command to drop/add field and a constraint in Employee table.

SRI VENKATESWARA UNIVERSITY::TIRUPATI
Computer Science Minor
II year IV Semester
Course 3: DataBase Management System
(w.e.f. 2024-25)
MODEL QUESTION PAPER

Time: **3 Hours**   Max. Marks: **75**

PART-A

Answer any **FIVE** of the following. Each Question Carries 5 marks.   (5X5=25)

1. **Short answer question from unit-I**
2. **Short answer question from unit-I**
3. **Short answer question from unit-II**
4. **Short answer question from unit-II**
5. **Short answer question from unit-III**
6. **Short answer question from unit-III**
7. **Short answer question from unit-IV**
8. **Short answer question from unit-IV**
9. **Short answer question from unit-V**
10. **Short answer question from unit-V**

PART-B

Answer any **FIVE** of the following. Each Question Carries 10 marks.   (5X10=50)

11.   **a) Essay question from Unit-I**
                        OR
        b) Essay question from Unit-I

12.   **a) Essay question from Unit-II**
                        OR
        b) Essay question from Unit-II

13.   **a) Essay question from Unit-III**
                        OR
        b) Essay question from Unit-III

14.   **a) Essay question from Unit-IV**
                        OR
        b) Essay question from Unit-IV

15.   **a) Essay question from Unit-V**
                        OR
        b) Essay question from Unit-V

Theory	**Credits: 3**	**3 hrs/week**

Course Objectives:
To introduce Object-oriented software engineering (OOSE) - which is a popular technical approach to analyzing, designing an application, system, or business by applying the object-oriented paradigm and visual modeling

Course Outcomes:
Upon successful completion of the course, a student will be able to:
1. Understand and apply the fundamental principles of Object-Oriented Programming (OOP) concepts and Unified Modeling Language (UML) basics, in the development of software solutions.
2. Analyze and specify software requirements, develop use cases and scenarios, apply object-oriented analysis and design (OOAD) principles
3. Familiar with the concept of test-driven development (TDD) and its practical implementation
4. Analyze and Evaluate Software Maintenance and Evolution Strategies
5. Apply Advanced Object-Oriented Software Engineering Concepts

UNIT-I
Introduction to Object-Oriented Programming: Overview of software engineering, Introduction to Object-Oriented Programming (OOP) concepts (classes, objects, inheritance, polymorphism), Unified Modelling Language (UML) basics, Introduction to software development process and Software Development Life Cycle (SDLC).

UNIT-II
Requirements Analysis and Design: Requirements analysis and specification, Use cases and scenarios, Object-oriented analysis and design (OOAD), Design patterns, UML modeling techniques (class diagrams, sequence diagrams, state machine diagrams, activity diagrams)

UNIT-III
Software Construction and Testing: Software construction basics, Object-oriented design principles, Software testing basics (unit testing, integration testing, system testing), Test-driven development (TDD).

UNIT-IV
Software Maintenance and Evolution: Software maintenance basics, refactoring techniques Software version control, Code review and inspection, Software evolution and reengineering

UNIT-V
Advanced Topics in Object-Oriented Software Engineering: Model-driven engineering (MDE), Aspect-oriented programming (AOP), Component-based software engineering (CBSE), Service- oriented architecture (SOA), Agile software development.

Text Book(s)
1. An Introduction to Object-Oriented Analysis and Design and the Unified Process, 3rd Edition, Craig Larman, Prentice-Hall.

2. Programming in Java by Sachin Malhotra, Oxford University Press

Reference Books
1. Requirements engineering: processes and techniques, G.Kotonya and, I.Sommerville, 1998, Wiley

2. Design Patterns, E.Gamma, R. Helm, R. Johnson, and J. Vlissides

3. The Unified Modeling Language Reference Manual, J. Rumbaugh, I.Jacobson and G. Booch, Addison Wesley

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:
Unit 1: Activity: Group Activity: Design and implement a small OOP project
Evaluation Method: Presentation evaluation rubric, Project evaluation based on OOP principles.
Unit 2: Activity: Use Case Scenario Presentation & Peer Activity: Review and provide feedback on each other's use casediagrams
Evaluation Method: Presentation evaluation rubric, Peer feedback assessment.
Unit 3: Activity: Poster Presentation: Illustrate TDD principles and benefits
Evaluation Method: Poster presentation evaluation
Unit 4: Activity: Peer Activity: Analyze and discuss different maintenance strategies
Evaluation Method: Peer discussion participation evaluation
Unit 5: Activity: Seminar on Design Patterns
Evaluation Method: Depth of research, clarity of explanations, ability to address questions and engage the audience.

Practicals   **Credits: 1**   **2 hrs/week**

Suggested Software Tools: StarUML/UMLGraph/Topcased/Umberollo/ArgoUML/ Eclipse IDE,
Visual Paradigm for UML/Rational Software Architect/Any other Open Source Tool
List of Experiments:
Select domain of interest (e.g. College Management System) and identify multi-tier software
application to work on (e.g. Online Fee Collection). Analyze, design and develop this application using
OOSE approach:

1. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt
chart).

2. Understanding of System modeling: Data model i.e. ER – Diagram and draw the ER Diagram with
generalization, specialization and aggregation of specified problem statement

3. Understanding of System modeling: Functional modeling: DFD level 0 i.e. Context Diagram and
draw it

4. Understanding of System modeling: Functional modeling: DFD level 1 and DFD level 2 and draw
it.

5. Identify use cases and develop the use case model.

6. Identify the business activities and develop an UML Activity diagram.

7. Identity the conceptual classes and develop a domain model with UML Class diagram.

8. Using the identified scenarios find the interaction between objects and represent them using UML
Interaction diagrams.

9. Draw the state chart diagram.

10. Identify the user interface, domain objects, and technical services. Draw the partial layered, logical
architecture diagram with UML package diagram notation.

11. Implement the technical services layer.

12. Implement the domain objects layer.

13. Implement the user interface layer.

14. Draw component and deployment diagrams.

Time: **3 Hours**   Max. Marks: **75**

PART-A
Answer any **FIVE** of the following. Each Question Carries 5 marks.   (5X5=25)
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2. **Short answer question from unit-I**
3. **Short answer question from unit-II**
4. **Short answer question from unit-II**
5. **Short answer question from unit-III**
6. **Short answer question from unit-III**
7. **Short answer question from unit-IV**
8. **Short answer question from unit-IV**
9. **Short answer question from unit-V**
10. **Short answer question from unit-V**

PART-B
Answer any **FIVE** of the following. Each Question Carries 10 marks.   (5X10=50)

11.   **a) Essay question from Unit-I**
                      OR
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12.   **a) Essay question from Unit-II**
                      OR
       b) Essay question from Unit-II

13.   **a) Essay question from Unit-III**
                      OR
       b) Essay question from Unit-III

14.   **a) Essay question from Unit-IV**
                      OR
       b) Essay question from Unit-IV

15.   **a) Essay question from Unit-V**
                      OR
       b) Essay question from Unit-V