

S.Y.B.Sc. Computer Science Theory paper-II
Semester – I

CS-212-Relational Database Management System
(Compulsory Course)

Total Lectures: 48

Objective:-

- To teach fundamental concepts of RDBMS (PL/PgSQL)
- To teach principles of databases
- To teach database management operations
- To teach data security and its importance
- To teach client server architecture

Prerequisites: Knowledge of DBMS

1. Relational Database Design [14]

1.1 Preliminaries

Functional Dependencies

Basic concepts : Closure of a set of functional dependencies, Closure of attribute set, Canonical cover, Decomposition.

1.2 PL/PgSQL: Datatypes, Language structure

1.3 Controlling the program flow, conditional statements, loops

1.4 Views

1.5 Stored Functions, Stored Procedures

1.6 Handling errors and exceptions

1.7 Cursors

1.8 Triggers

2 Transaction Concepts and concurrency control [14]

2.1 Describe a transaction, properties of transaction, state of the transaction.

2.2 Executing transactions concurrently associated problem in concurrent execution.

2.3 Schedules, types of schedules, concept of Serializability, precedencegraph for Serializability.

2.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations.

2.5 Basic timestamp method for concurrency, Thomas Write Rule.

2.6 Locks with multiple granularity, dynamic database concurrency (Phantom Problem).

2.7 Timestamps versus locking.

2.8 Deadlock handling methods

2.8.1 Detection and Recovery (Wait for graph).

2.8.2 Prevention algorithms (Wound-wait, Wait-die)

3 Database Integrity and Security Concepts [8]

3.1 Domain constraints

3.2 Referential Integrity

3.3 Introduction to database security concepts

3.4 Methods for database security

3.4.1 Discretionary access control method

3.4.2 Mandatory access control and role base access control for multilevel security.

3.5 Use of views in security enforcement.

3.6 Overview of encryption technique for security.

3.7 Statistical database security.

4 Crash Recovery [8]

4.1 Failure classification

4.2 Recovery concepts

4.3 Log base recovery techniques (Deferred and Immediate update)

4.4 Checkpoints

4.5 Recovery with concurrent transactions (Rollback, checkpoints, commit)

4.6 Database backup and recovery from catastrophic failure.

5. Client-Server Technology [4]

5.1 Describe client-server computing.

5.2 Evolution of Client - Server information systems.

5.3 Client – Server Architecture benefits.

5.4 Client Server Architecture

- Components, Principles, Client Components
- Communication middleware components
- Database middleware components
- Client Server Databases

References:-

1. Fundamentals of Database Systems (4th Ed) By: Elmasri and Navathe
2. Database System Concepts (4th Ed) By: Korth, Sudarshan, Silberschatz
3. Practical PostgreSQL O'REILLY
4. Beginning Databases with PostgreSQL, From Novice to Professional, 2nd Edition By Richard Stones , Neil Matthew, Apress

S.Y.B.Sc.Computer Science Theory paper-II

Semester – II

CS - 222: Software Engineering

Total Lectures : 48

Objectives:-

- To teach basics of System Analysis and Design.
- To teach principles of Software Engineering
- To teach various process models used in practice
- To know about the system engineering and requirement engineering
- To build analysis model

Prerequisites: Basic knowledge of DBMS

1. System Concepts [5] (R1 : Chapter 1 & R3 : Chapter 1)

1.1 System Definition

1.2 Characteristics of a System : Organization, Subsystem, Interaction, Interdependence, Integration, Central objective, Standards, Black-box

1.3 Elements of a system : Outputs, Inputs, Processor(s), Control, Feedback, Environment, Boundaries, Interface.

1.4 Types of Systems : Physical & Abstract Systems, Open & Closed Systems, Computer-based Systems (MIS : Management Information System & DSS : Decision Support System)

2. Software and Software Engineering [5] (R2 : Chapter 1)

2.1 The Nature of Software

2.1.1 Defining Software

2.1.2 Software Application Domains

2.1.3 Legacy Software

2.2 Software Engineering

2.3 The Software Process

- 2.4 Software Engineering Practice**
 - 2.4.1 The Essence of Practice**
 - 2.4.2 General Principles**
- 2.5 Software Myths**
- 3. System Development Life Cycle (SDLC) [8] (R3 : Chapter 1)**
 - 3.1 Introduction**
 - 3.2 Activities of SDLC**
 - 3.2.1 Preliminary Investigation (Request Clarification, Feasibility Study, Request Approval)**
 - 3.2.2 Determination of System Requirements**
 - 3.2.3 Design of System**
 - 3.2.4 Development of Software**
 - 3.2.5 System Testing (Unit Testing, Integration testing, System Testing)**
 - 3.2.6 System Implementation & Evaluation**
 - 3.2.7 System Maintenance**
- 4. Process Models [6] (R2 : Chapter 2)**
 - 4.1 A Generic Process Model**
 - 4.2 Prescriptive Process Models**
 - 4.2.1 The Waterfall Model**
 - 4.2.2 Incremental Process Models**
 - 4.2.3 Evolutionary Process Models**
 - 4.2.3.1 Prototyping**
 - 4.2.3.2 Spiral Model**
 - 4.2.4 Concurrent Models**
- 5. Requirements Engineering [8] (R2 : Chapter 5)**
 - 5.1 Introduction**
 - 5.2 Requirements Engineering Tasks**

- 5.2.1 Inception
- 5.2.2 Elicitation
- 5.2.3 Elaboration
- 5.2.4 Negotiation
- 5.2.5 Specification
- 5.2.6 Validation
- 5.2.7 Requirements Management
- 5.3 Initiating the Requirements Engineering Process
 - 5.3.1 Identifying the Stakeholders
 - 5.3.2 Recognizing Multiple Viewpoints
 - 5.3.3 Working toward Collaboration
- 5.4 Fact Finding Techniques (**R3 : Chapter 3**)
 - 5.4.1 Interview
 - 5.4.2 Questionnaire
 - 5.4.3 Record Review
 - 5.4.4 Observation
- 6. Structured Analysis Development Strategy [10] (R3 : Chapter 4)**
 - 6.1 Structured Analysis
 - 6.1.1 What is Structured Analysis?
 - 6.1.2 Components of Structured Analysis
 - 6.1.3 What is Data Flow Analysis?
 - 6.2 Features & Tools of Data Flow Analysis
 - 6.2.1 Logical Data Flow Diagram (Logical DFD)
 - 6.2.1.1 Notations
 - 6.2.1.2 Drawing a Context Diagram
 - 6.2.1.3 Exploding A Context diagram into Greater detail (1st level, 2nd Level DFD etc...)

6.2.1.4 Evaluating Data Flow Diagram for Correctness

6.2.2 A Data Dictionary

6.2.2.1 What is a Data Dictionary?

6.2.2.2 Why is a Data Dictionary Important?

6.2.2.3 What does a Data Dictionary Record?

7. An Agile View of Process [6] (R2 : Chapter 3)

7.1 What is an Agility?

7.2 What is an Agile Process?

7.2.1 The Politics of Agile Development

7.2.2 Human Factors

7.3 Agile Process Models

7.3.1 Extreme Programming (XP)

7.3.2 Adaptive Software Development (ASD)

7.3.3 Dynamic Systems Development Method (DSDM)

Reference Books :

R1 : System Analysis and Design (Second Edition) by Elias M. Awad, Galgotia Publications Pvt. Ltd.

R2 : Software Engineering : A Practitioner's Approach (Seventh Edition) by Roger S. Pressman, McGraw Hill International Edition.

R3 : Analysis and Design of Information Systems (Second Edition) by James A. Senn, McGraw Hill International Editions.