

IT6405 Database Systems II

(Compulsory)

INTRODUCTION

Database System II is one of the compulsory courses in Semester 6. This course is built on the knowledge gained through the Database System I. Aim of this course is to gain the knowledge on advanced database technologies.

CREDITS: 3

LEARNING OUTCOMES

After successful completion of this course, students will be able to:

- create stored procedures and triggers
- describe data storage & access and manipulate query processing techniques
- demonstrate transaction processing techniques of database systems
- determine designs for distributed databases

MINOR MODIFICATIONS

When minor modifications are made to this syllabus, those will be reflected in the Virtual Learning Environment (VLE) and the latest version can be downloaded from the relevant course page of VLE. Please inform your suggestions and comments through the VLE.

<http://vle.bit.lk>

ONLINE LEARNING MATERIALS AND ACTIVITIES

You can access all learning materials and this syllabus in the VLE: <http://vle.bit.lk>, if you are a registered student of BIT degree program. It is very important to participate in learning activities given in the VLE to learn this subject.

FINAL EXAMINATION

Final exam of the course will be held at the end of the semester. It is a two hour structured written paper.

OUTLINE OF SYLLABUS

Topic	Hours
1-Stored Procedures and Triggers	06
2- Data Storage and Querying	15
3- Transaction Management	15
4- Distributed Databases	09
Total for the subject	45

REQUIRED MATERIALS**Main Reading**

Ref 1: Elmasri, Navathe, Somayajulu, and Gupta, "Fundamentals of Database Systems", 5th Edition, Pearson Education (2008)

Note: 6th Edition released in 2011

Supplementary Reading

Ref 2: Silberschatz A., Korth H.F. and Sudarshan S., "Database System Concepts", 5th Edition, McGraw Hill (2006).

Note: 6th Edition released in 2010

Ref 3: Ramakrishnan, Gehrke, "Database Management Systems", 3rd edition, McGraw Hill

DETAILED SYLLABUS:

Section 1: Stored Procedures and Triggers (06hrs.) [REF1: Chapter 1, 5, 13, 26]

Instructional Objectives

- Write stored procedures and triggers in SQL

Material /Sub Topics

- 1.1 Constraints and triggers (03hrs) [REF1: Chapter 1, 5, 26, pg. 21, 132, 933-945]
- 1.2 Database stored procedures (03hrs) [REF1: Chapter 13, pg. 473-475]

Section 2: Data Storage and Querying (15hrs) [REF1: Part 4: Chapters 13-15, REF3: Chapter 20]

Instructional Objectives

- Explain basics of physical file structures used in database systems
- Outline how file access methods are used in database systems
- Evaluate execution strategies and apply optimisation techniques
- Identify tuning and physical design issues of database systems

Material /Sub Topics

- 2.1. File Structures (02hrs) [REF1:Chapter 13, REF2:Chapter 12]
 - 2.1.1. Heap files [REF1 pg:484-485]
 - 2.1.2. Sorted files [REF1 pg:485-488]
- 2.2. Indexing Files (04hrs) [REF1: Chapter 14, REF2: Chapter 12, REF3: Chapter 8]
 - 2.2.1. Single-level [REF1 pg:514]
 - 2.4.2.1 Primary indexes [REF1 pg:515-517]
 - 2.4.2.2 Clustering indexes [REF1 pg:517-520, REF 3 pg:292-295]
 - 2.4.2.3 Secondary indexes [REF1 pg:520-522]
 - 2.2.2. Multiple-level [REF1 pg: 524-527]
 - 2.2.3. B+ -trees [REF1 pg: 527-528]
 - 2.2.4. Index-only evaluation [REF3 pg:293, 662-663]
 - 2.2.5. Composite search keys [REF3 pg:295-299]
 - 2.2.6. Index definition in SQL [REF2 pg: 523-524]
- 2.3. Query Processing and Optimisation (06hrs) [REF1: Chapter 15]

- 2.3.1. Introduction to query processing [REF1 pg: 551-554]
- 2.3.2. External sorting [REF1 pg: 554-555]
- 2.3.3. SELECT operation [REF1 pg: 556-557]
- 2.3.4. JOIN operation [REF1 pg:559-560]
- 2.3.5. PROJECT and SET operations [REF1 pg: 567]
- 2.3.6. Aggregate operations and Outer Joins [REF1 pg: 568]
- 2.3.7. Combining operations using pipelining [REF1 pg: 570]
- 2.3.8. Query optimisation using heuristics [REF1 pg: 570-580]
- 2.4. Physical Database Design and Tuning (04 hrs) [REF3: Chapter 20]
 - 2.4.1. Introduction to Physical Database design (REF3 pg:650-653)
 - 2.4.1.1 Index selection (REF3 pg: 653-659)
 - 2.4.2. Introduction to Database Tuning (REF3 pg: 667-671)
 - 2.4.2.1 Overview of index tuning [REF3 pg: 667-669]
 - 2.4.2.2 Overview of conceptual schema tuning [REF3 pg: 669-670]
 - 2.4.2.3 Overview of queries and views tuning [REF3 pg: 670-671]

Section 3: Transaction Management (15hrs) [REF1: Part 5:Chapter 17-19]

Instructional Objectives

- Analyse transaction schedules
- Apply concurrency control techniques
- Apply database recovery techniques

Material /Sub Topics

- 3.1. Transaction Processing Concepts (06hrs) [REF1: Chapter 17]
 - 3.1.1. Properties [REF1 pg: 621-622]
 - 3.1.2. Schedules [REF1 pg: 623]
 - 3.1.3. Serializability [REF1 626-636]
 - 3.1.4. Transaction support in SQL [REF1 636-638]
- 3.2. Concurrency Control Techniques (06hrs.) [REF1: Chapter 18]
 - 3.2.1. Two-phase locking [REF1 pg: 644-651]
 - 3.2.2. Timestamp ordering [REF1 pg: 654-656]
- 3.3. Database Recovery Techniques (04hrs.) [REF1: Chapter 19]
 - 3.3.1. Recovery concepts [REF1 pg: 671-678]
 - 3.3.2. Deferred update [REF1 pg: 678]
 - 3.3.3. Immediate update [REF1 pg: 683]

Section 4: Distributed Databases (09hrs.) [REF1: Chapter 25]**Instructional Objectives**

- Describe distributed database architecture
- Produce designs for distributed database systems
- Recognise different categories of distributed database systems

Material /Sub Topics

- 4.1. Distributed database concepts (02hrs) [REF1: Chapter 25]
 - 4.2.1. System Architecture [REF1 pg: 876-881]
- 4.2. Distributed database design (04hrs) [REF1: Chapter 25]
 - 4.2.1. Fragmentation [REF1 pg: 882-884]
 - 4.2.1.1 Horizontal [REF1 pg: 883]
 - 4.2.1.2 Vertical [REF1 pg: 883-884]
 - 4.2.1.3 Mixed (Hybrid) [REF1 pg: 884]
 - 4.2.2 Replication and allocation [REF1 pg: 885-889]
- 4.3. Types of distributed database systems (03hrs) [REF1: Chapter 25:pg: 889-892]
 - 4.3.1. Federated database systems
 - 4.3.2 Multi-database systems