Database Management Systems (DS1105)

Lecturer: Mrs. Kumudu Wijerathna

Lectures: 30hrs	Practical: 30hrs	Independent learning: 62hrs	Assessments: 8hrs

Quizzes (02): 20%	Assignments (maximum 02): 20%	End Semester Exam: 60%

Basic Points:

- A database system is a collection of interrelated components which used to store.
- Manual File System: **Duplicate**, **Inconsistent**, **Difficulty** in access, Data **isolation**, **Integrity** problems (hard to update, add, delete), **Uncontrolled** concurrent access, **Security.**
- A database system is a high-level definition of the structure and relationship between stored data, a database or databases, users and the hardware or operating system used for the storage
- **Aim** of a db system is to achieve a highly organized collection of data, along with appropriate tools and applications that facilitate processing and access to that data
- DBMS is a collection of programs that enables users to create and maintain a database.
- General-purpose software system that facilities the process of defining, constructing, manipulating and sharing databases among various users and applications.
- A database is designed to represent a specific portion of the real world, called the mini world which include all the entities, relationships, and constraints relevant to a particular domain (such as a school, hospital or business). The data stored in the database reflects the current state of this mini world and any changes in the real world are mirrored by updates to the database, ensuring accuracy and relevance

Database processing

Compiled Raw Data

--> data **Appending**, data **cleansing**, data **de-duplication**, data **verification**, data **validation**, data **segmentation**, **hygiene & maintenance**

--> **updated** data, **correct** data, **complete** data

Database Users
- Administrators
- Designers
- End User
- System Analysts, Programmers

Advantages
- Controlling redundancy
- Improving data consistency
- Restricting unauthorized access
- Sharing of data
- Providing multiple user interfaces
- Representing complex relationships among data
- Enforcing standards and integrity constraints
- Providing backup and recovery
- Increasing concurrency

Disadvantages
- Complexity
- Cost
- Additional Hardware
- Cost of conversion
- Performance
- Higher impact of failures

Classification of DBMS (according to the data model)
- Relational Model
- Network Model
- Hierarchical Model
- Object Data Model
- Object-relational Model

Classification of DBMS (according to the number of users)
- Single User Systems
- Multi user systems

Classification of DBMS (according to the distribution)
- Centralized
- De-Centralized

Characteristics of Database System

- Support ACID Properties
    - Any DBMS can support ACID (Atomicity, Consistency, Isolation, and Durability) properties
- Concurrent Use of Database
    - Many users can access the data at the same time
- Insulation between Data and Program
    - Any changes in the data do not have any effect on the application software
- Transactions
    - Only be completed or uncompleted
- Data Persistence
    - If a system failure happens in between any transaction, then it will be rolled back or fully completed, but the data will never be at risk
- Backup and Recovery
    - Enables more effectiveness
- Data Integrity
    - Protects unauthorized access to the database and makes it more secure
    - Integrity ensures the quality and reliability of the database system.
- Multiple Views
    - Users can have multiple views of the database depending on their department and interests.

Atomicity – Ensures that a transaction is treated as a single unit, so either all operations succeed or none do.

Consistency – Guarantees that a transaction brings the database from one valid state to another, maintaining data integrity.

Isolation – Prevents concurrent transactions from interfering with each other, ensuring accurate and independent execution.

Durability - Makes sure that once a transaction is committed, its changes are permanently saved,even if the system crashes.