

# COMP5143

## Advanced Database Management System

*Fall 2015*

**Computer Science Department  
Prairie View A&M University**

**Mary Heejin Kim (aka Heejin Lim), Ph.D.**

## Welcome to COMP5143

- Instructor: Dr. Mary Heejin Kim
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- Class Time: Tuesday 6:00 - 8:50 pm  
S.R. Collins, Room #210
- Office Hours: Tuesday 5:00 - 6:00 pm or by Appointment

## About the Course

- Prerequisite

- Graduate standing or Instructor permission

- Textbook (required)

Title: **Database Systems: A practical approach to design, implementation, and management**

Author: Thomas M. Connolly, Carolyn E. Begg.

Sixth edition. Publisher: Addison-Wesley. ISBN-13: 9780132943260

- Reference

Title: **Database System Concepts**

Author: Avi Silberschatz, Henry F. Korth and S. Sudarshan

Sixth edition. Publisher: McGraw-Hill. ISBN 0-07-352332-1

## Evaluation

Instrument	Value (points or percentages)	Total
Assignments	3 assignments (4 points each)	12
Quizzes	2 Quizzes (7 points each)	14
Project	Team Project	20
Mid Term Exam	24	24
Final Exam	30	30
<b>Total</b>		<b>100</b>

- Team Project:

- 3 or 4 team members
- Database system design & building

# Chapter 1

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## Introduction to Databases

\* Most slides are from Pearson education      Pearson Education © 2014

## Chapter 1 - Objectives

- Some common uses of database systems.
- Characteristics of file-based systems.
- Problems with file-based approach.
- Meaning of the term database.
- Meaning of the term Database Management System (DBMS).

# Chapter 1 - Objectives

- **Typical functions of a DBMS.**
- **Major components of the DBMS environment.**
- **Personnel involved in the DBMS environment.**
- **History of the development of DBMSs.**
- **Advantages and disadvantages of DBMSs.**

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# Examples of Database Applications

- Purchases from the supermarket
- Purchases using your credit card
- Booking a holiday at the travel agents
- Using the local library
- Taking out insurance
- Renting a video
- Using the Internet
- Studying at university

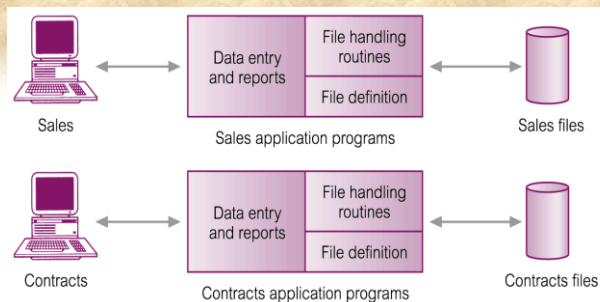
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# File-Based Systems

- Collection of application programs that perform services for the end users (e.g. reports).
- Each program defines and manages its own data.

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## File-Based Processing



**Figure 1.5**  
File-based processing.

### Sales Files

**PropertyForRent** (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

**PrivateOwner** (ownerNo, fName, lName, address, telNo)

**Client** (clientNo, fName, lName, address, telNo, prefType, maxRent)

### Contracts Files

**Lease** (leaseNo, propertyNo, clientNo, rent, paymentMethod, deposit, paid, rentStart, rentFinish, duration)

**PropertyForRent** (propertyNo, street, city, postcode, rent)

**Client** (clientNo, fName, lName, address, telNo)

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## Limitations of File-Based Approach

- Separation and isolation of data
  - ✓ Each program maintains its own set of data.
  - ✓ Users of one program may be unaware of potentially useful data held by other programs.
- Duplication of data
  - ✓ Same data is held by different programs.
  - ✓ Wasted space and potentially different values and/or different formats for the same item.

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## Limitations of File-Based Approach

- Data dependence
  - ✓ File structure is defined in the program code.
- Incompatible file formats
  - ✓ Programs are written in different languages, and so cannot easily access each other's files.
- Fixed Queries/Proliferation of application programs
  - ✓ Programs are written to satisfy particular functions.
  - ✓ Any new requirement needs a new program.

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# Database Approach

- Arose because:
  - ✓ Definition of data was embedded in application programs, rather than being stored separately and independently.
  - ✓ No control over access and manipulation of data beyond that imposed by application programs.
- Result:
  - ✓ the database and Database Management System (DBMS).

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# Database

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

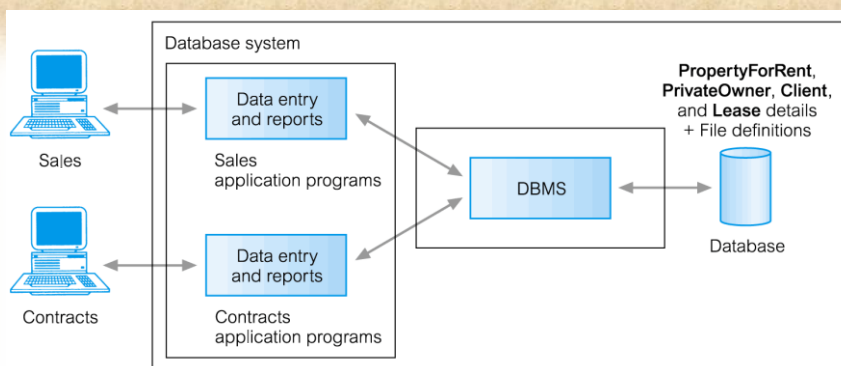
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# Database Management System (DBMS)

- A software system that enables users to define, create, maintain, and control access to the database.
- (Database) application program: a computer program that interacts with database by issuing an appropriate request (SQL statement) to the DBMS.

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# Database Management System (DBMS)



**PropertyForRent** (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

**PrivateOwner** (ownerNo, fName, lName, address, telNo)

**Client** (clientNo, fName, lName, address, telNo, prefType, maxRent)

**Lease** (leaseNo, propertyNo, clientNo, paymentMethod, deposit, paid, rentStart, rentF nish)

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# Database Approach

- Data definition language (DDL).
  - ✓ Permits specification of data types, structures and any data constraints.
  - ✓ All specifications are stored in the database.
- Data manipulation language (DML).
  - ✓ General enquiry facility (query language) of the data.

# Database Approach

- Controlled access to database may include:
  - ✓ a security system
  - ✓ an integrity system
  - ✓ a concurrency control system
  - ✓ a recovery control system
  - ✓ a user-accessible catalogue

# Views

- Allows each user to have his or her own view of the database.
- A view is essentially some subset of the database.

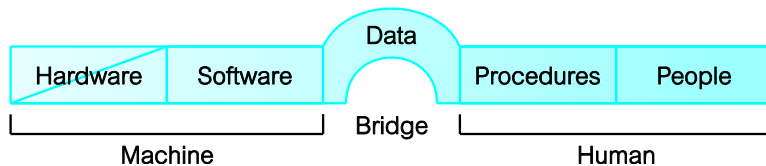
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## Views - Benefits

- Reduce complexity
- Provide a level of security
- Provide a mechanism to customize the appearance of the database
- Present a consistent, unchanging picture of the structure of the database, even if the underlying database is changed

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## Components of DBMS Environment



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## Components of DBMS Environment

- Hardware
  - ✓ Can range from a PC to a network of computers.
- Software
  - ✓ DBMS, operating system, network software (if necessary) and also the application programs.
- Data
  - ✓ Used by the organization and a description of this data called the schema.

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## Components of DBMS Environment

- Procedures
  - ✓ Instructions and rules that should be applied to the design and use of the database and DBMS.
- People

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## Roles in the Database Environment

- Data Administrator (DA)
- Database Administrator (DBA)
- Database Designers (Logical and Physical)
- Application Programmers
- End Users (naive and sophisticated)

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# History of Database Systems

- First-generation
  - ✓ Hierarchical and Network
- Second generation
  - ✓ Relational
- Third generation
  - ✓ Object-Relational
  - ✓ Object-Oriented

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# Advantages of DBMSs

- Control of data redundancy
- Data consistency
- More information from the same amount of data
- Sharing of data
- Improved data integrity
- Improved security
- Enforcement of standards
- Economy of scale

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## Advantages of DBMSs

- Balance conflicting requirements
- Improved data accessibility and responsiveness
- Increased productivity
- Improved maintenance through data independence
- Increased concurrency
- Improved backup and recovery services

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## Disadvantages of DBMSs

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

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