

CS210 – Lecture 3

Part 1 - Introduction to Database

1. What is a database?

A database is a collection of related information.

2. Tables

A table is a container into which data is stored. A table is a collection of data about a specific topic, such as students or doctors. Tables organize data into **columns** (called **fields**) and **rows** (called **records**).

The following is an example of a table called "**Books**":

book_id	book_name	author_name	price	publishing_date
1	Java 2	IBM	\$200.00	1/3/2000
2	Access	Microsoft	\$150.00	2/11/2001
3	Lotus Approach	Sun	\$300.00	3/1/2000
4	Paradox 4	IBM	\$350.00	10/4/2002
5	dBASE III	SAMS	\$400.00	5/1/2003
6	Foxpro	Sun	\$150.00	11/2/2000
7	Visual Basic 6.0	Microsoft	\$200.00	4/1/2001
8	3D Graphics	SAMS	\$400.00	5/2/2000
9	Internet	IBM	\$400.00	3/5/1999
10	C++	Microsoft	\$500.00	5/2/2002
11	My Data	SAMS	\$10.00	1/2/2011

Figure 1.4: The Books table

3. Records

A record is a row in a table and is a set of values defined by fields.

4. Fields

A field is a column in a table and defines a data type for a set of values in a table. For example, the "*Books*" table includes the fields: Book_Id, Book_Name, AUTHOR, and Price.

5. The Relational Database

A relational database stores data in separate tables allowing relationships to be defined between tables.

Database for Faculty of Science will contain the following tables:

- Students
- Courses
- Departments
- Faculty Members
- Teaching Assistants
- Graduation Projects
- Staff
- Workers

6. Relational Database Management System (RDBMS)

RDBMS is a program that lets you create, update, and manage a relational database. MySQL is an example of this.

7. What is metadata?

Metadata is essentially data about other data (data that describes data).

Exercise 1

Show the metadata for the following table *Students*.

Id	Major	Minor
12	CS	Stat
19	Stat	CS
26	Math	CS
37	Stat	CS

Solution

The metadata for the given table (table structure) is shown below; it contains the fields, their data types, and the constraints/format if exist.

Field Name	Data type	Constraint/Format
ID	Number	Primary Key
Major	String	
Minor	String	

8. Simple data types

Strings

A string is a sequence of one or more characters. Strings can be **fixed-length strings** or **variable-length strings**:

Fixed-length strings

A fixed-length string will always store the specified length declared for the data type. If the actual string-length is less than the specified length, the value is padded with spaces. For example, the value "Hello" in a CHAR(8) variable would be stored as "Hello" plus three space characters. Fixed-length strings are generally only used for short length strings.

Variable-length strings

A variable-length string allows storage into a data type as the actual length of the string, as long as a maximum limit is not exceeded. The length of the string is variable because when storing a string of length less than the width specified by the data type, the string is not padded. Only the actual string value is stored.

9. Primary key

A primary key is used to uniquely identify each record in a table.

To select a specific field as a primary key, it must satisfy the following properties:

- Duplicate values are not allowed.
- Null values (empty values) are not allowed