

COMP-3150 CHAPTERS 1 TO 3: LECTURE NOTES 1

Chapter 1: Databases and Database Users

Chapter 2: Database System Concepts and Architecture

Chapter 3: Data Modeling Using the Entity-Relationship (ER) Model.

Fall 2021 Comp 3150 online recordings can be downloaded from the black board virtual classroom for the class of the day. The links below are the recordings of similar classes in Fall 2020 that I uploaded to one drive in case you prefer to review these.

Links to any posted recorded in-class lectures for Chapters 1 classes done on Sept. 10, 2020; Sept. 15, 2020 and Sept. 17, 2020 (similar to Fall 2021's Sep. 9, 2021, Sep. 14, 2021 and Sep. 16, 2021) will be found below:

1. Link on one drive to recorded lecture of Thursday, Sept. 10, 2020 (similar to Sep. 9, 2021) is provided below:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwind-sor_ca/EZEPDc4uw6VHlb3pf9AutR0B4ZmCT6wMih9N80kPswcytQ

2. Links on one drive to recorded lecture of Tuesday, Sept. 15, 2020 (similar to Sep. 14, 2021) (saved in three recorded sessions to break down the files) is provided below in sequences 1, 2, 3:

Frist Recording 1 of 3:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwind-sor_ca/ETCuXrEk7s5Js1ZNlk_sqAIBwFK7ax6C73JhI_FTGHSEOG

Second Recording 2 of 3:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwind-sor_ca/EdQmL55ElchBhsvNn_zom0QB3A2-IWHhiJVeDt2zM4AMiQ

Second Recording 3 of 3:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwindsor_ca/EX_U1box7vNMi-vlmH70uaLIB2e6gH5q9DuKEZ_mAOiri_A

3. Links on one drive to recorded lecture of Thursday, Sept. 17, 2020 (similar to Sep. 16, 2021) (saved in two recorded sessions to break down the files) is provided below in sequences 1, 2:

Frist Recording 1 of 2:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwindsor_ca/EYiiqr-pzDIOld5PRN40nwsBxwrao6rxtsmbx9_D2F0pLQ?e=Sa3fSP

Second Recording 2 of 2:

https://uwin365-my.sharepoint.com/:v:/g/personal/cezeife_uwindsor_ca/EdLyaIB_4wxEnIzkcelUplQBpxqe8-R6MOE1IDUoWX_BLw?e=sGxVSj

The following questions on basic database concepts discussed in Chapter 1 of Comp 3150 text book, are in-class questions for students to ponder and answer as I teach.

- The answers to the questions are found also by reviewing the Comp 3150, posted power point slide notes for Chapter 1 and being in class.
- Students are advised to review Chapters 1 to 3 of course book and Comp 3150 posted slide notes before and after each class.
- I will also go over the Slide notes in class with examples and integrate them into the class lectures, which also posted in the More course material link on black board.

1. WHAT IS a DATABASE?

2. WHAT ARE EXAMPLES OF DATABASES?

3. HOW ARE DATABASES DEFINED AND BUILT?

4. WHO ARE DATABASE USERS?

5. WHAT IS A MINI WORLD?

6. WHAT IS A DATABASE MANAGEMENT SYSTEM (DBMS)?

7. WHAT IS A DATA MODEL?

8. WHAT ARE ENTITIES AND RELATIONSHIPS?

9. WHAT ARE INTEGRITY CONSTRAINTS (ICs)?

10. WHAT IS ENTITY-RELATIONSHIP MODEL FOR A DATABASE?

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An Example simple database Problem.
You are asked to define a simple student record database for keeping track of student grades in courses they take.

Solution

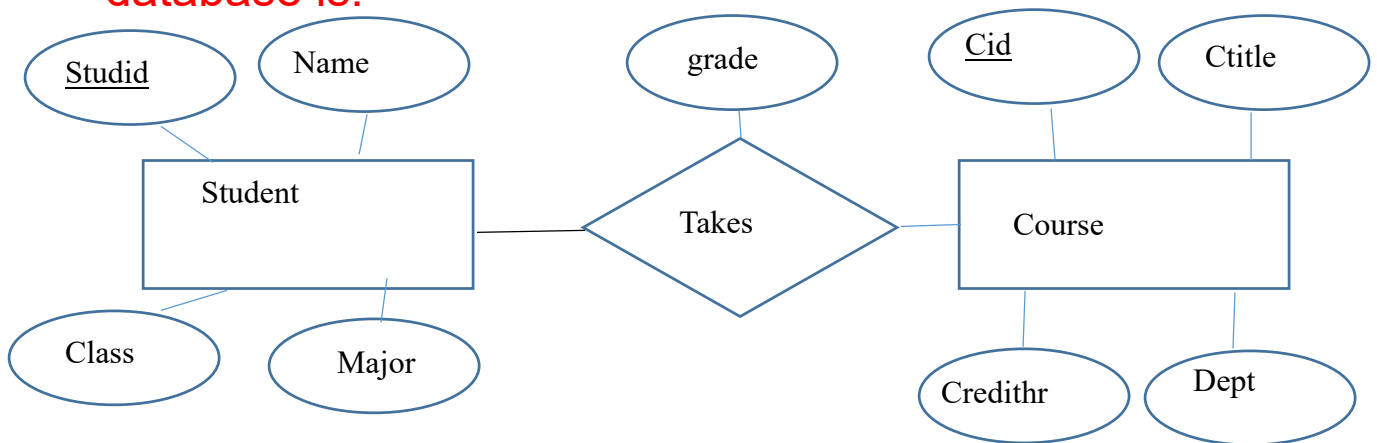
1. Start by identifying the entities and relationships between these entities in the problem definition.

2. **Entities** in the problem definition are:
Student (Studid, Name, Class, Major)
Course (Cid, Ctitle, Credithr, Dept)

Relationship between these entities is/are:

Takes (Studid, Cid, grade)

3. An example Entity-Relationship model for this database is:



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Continuing with Slide 9 of posted Ch 1 Course Slide Notes

- On slide 9, an example database for a University information system is defined in terms of entities and relationships from the mini world requirements description of the database to be built. Your job as a database designer is to define and design the database from the requirements description given in the book and summarized below:

- University Mini-world description for University database to be designed is:

Students take sections of specific courses and receive grades for each taken course. Courses have pre-requisite courses. Instructors teach sections of courses. Courses are offered by Departments. Students major in Departments.

- Solution:

To solve, we identify all entities (main players in the world) in the mini-world. We also identify all relationships (activities between entities) between entities (either explicitly or implicitly within an entity schema)

On Slide 9, some identified Entities are:

1. Students
2. Courses
3. Sections (of Courses)
4. Departments

5. Instructors

** Other entity is pre-requisite

Some Relationships are:

1. Sections belong to specific courses

(represented implicitly in file Section as a foreign key attribute Course_number where integrity constraint must be honored)

2. Students take Sections

(represented explicitly as Grade_Report file. Similar to Takes relationship link in our earlier 3 table example)

3. Courses have Pre-requisite Courses

(represented explicitly as Prerequisite file)

4. Instructors teach Sections

(Not included in Fig. 1.2 for simplicity)

5. Courses are offered by Departments

(represented implicitly in file Course as a foreign key attribute Department where integrity constraint must be honored)

6. Students major in Departments

(represented implicitly in file Student as a foreign key attribute Major where integrity constraint must be honored)

- Slide 11 shows an instance or state of this University database as Fig. 1.2.
- Database once designed, can be queried. Example queries to this Database are:
 1. List the pre-requisites ('pre-requisite' course_name and prerequisite_number) of the data structure course (Course_number, Course_name)

Result of Query is

Course_name	Course_number	Course_number	Course_name
Data Structures	CS3320	CS1310	Intro to CS

To answer the query 1, you need to visit the files Course and Prerequisite.

- 2. Get all students (names) who took the database course (section_identifier, course_number).

Result of Query is

Name	Section_identifier	Course_number
Brown	135	CS3380

- The tables involved in this query are Student, Course_number, Sections, Grade_Report, Prerequisite.

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- On slide 12, main characteristics of the database approach are discussed.
- Five characteristics were summarized. Understand what they stand for.
They are:
 1. Self-describing nature using the system catalogue (meta-data).
 2. Program-data separation through 3 levels architecture (different views of database data):
external level (views, eg. Individual user queries),
conceptual level (eg, the logical database schemas we designed in Fig 1.2),
physical level (e.g, how the data is actually stored on physical disk. Includes data structures like indexes for fast retrieval).

- 3. Data model provision. That is the data structure of the database (eg. Relational, object-oriented).
- 4. Allowing multiple view of data to be seen.
- 5. Multi-user transaction processing providing concurrency control, recovery services, data permanence.
- Slide 16 Discusses 5 Types of Database users
- 1. Database Administrators.
- 2. Database Designers
- 3. Database end users
- 4. System Analysts
- 5. DBMS software and system builders

Etc. Refer to Ch. 1 Slides for Historical development of Database technology from hierarchical and network databases management systems, relational DBMSs, object-oriented DBMSs, web DBMS with XML data model, extended database capabilities (eg., data mining and data warehousing), Big data and NOSQL DBMSs.