



1814ict/2814ict/7003ict/1011ICT:
Data Management/
Database Design/
Applied Computing

Weekly Workshop/ Lab 2.2 Activities

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Activity Set 1: Identify integrity constraints [Group Activity]**[10 min]****1. Integrity constraints**

For the following database tables answer questions (a)-(b) below:

Database name: Ch03_BeneCo		
Table name: EMPLOYEE		
EMP_CODE	EMP_LNAME	JOB_CODE
14	Rudell	2
15	McDade	1
16	Ruellardo	1
17	Smith	3
20	Smith	2
Table name: BENEFIT		
EMP_CODE	PLAN_CODE	
15	2	
15	3	
16	1	
17	1	
17	3	
17	4	
20	3	
Table name: JOB		
JOB_CODE	JOB_DESCRIPTION	
1	Clerical	
2	Technical	
3	Managerial	
Table name: PLAN		
PLAN_CODE	PLAN_DESCRIPTION	
1	Term life	
2	Stock purchase	
3	Long-term disability	
4	Dental	

a) Do the tables exhibit **entity integrity**? Answer yes or no and then explain your answer.

[5 min]

TABLE	ENTITY INTEGRITY	EXPLANATION
EMPLOYEE		
BENEFIT		
JOB		
PLAN		

b) Do the tables exhibit **referential integrity**? Answer yes or no and then explain your answer. Write NA (Not Applicable) if the table does not have a foreign key.

[5 min]

TABLE	REFERENTIAL INTEGRITY	EXPLANATION
EMPLOYEE		
BENEFIT		
JOB		
PLAN		

Note: Remember SIX (6) Steps to develop an ERD from Week 2 lecture

FOLLOW for PARTS 2 & 3 below

Step 1: Find all possible **entities** [look for *nouns*].

Step 2: Draw entities with **attributes**, add primary keys.

Step 3: Find & show **relationships** [find *verbs*] one by one between entities.

Step 4: Find & show **connectivity** one by one between entities.

Step 5: Find & show **participation** one by one between entities.

Step 6: **Insert Foreign keys** and **Revise** above Steps 1 to 5 to ensure your ERD is complete.

Note: The ERD solution to any case study may vary depending on the **assumptions** you may make. Your assumptions should not contradict any facts already given in the case study. Please write your assumptions in the ERD that you submit into your learning journals.

2. Develop an ERD for the following business rules

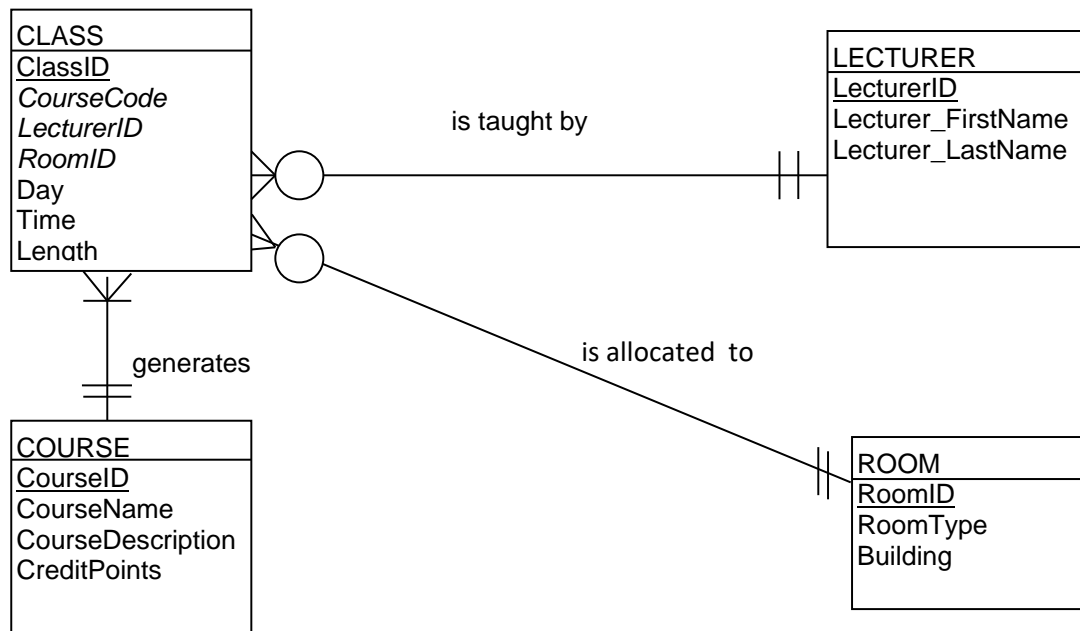
United Broke Artists (UBA) is a broker for not-so-famous painters. UBA maintains a small network database to track **painters**, **paintings**, and **galleries**. A painting is painted by a particular artist, and that painting is exhibited in a particular gallery. A gallery can exhibit many paintings, but each painting can be exhibited in only one gallery. Similarly, a painting is painted by a single painter, but each painter can paint many paintings. Using PAINTER, PAINTING, and GALLERY, in terms of a relational database:

- What tables would you create, and what would the table components be? [*Find out table names and their column headings / fields.*] **[5 min]**
- Draw a conceptual ERD for the case study? **[3 min]**
- Using the conceptual model above, create a logical ERD. [*Create an appropriate collection of attributes for each of the entities. Make sure you use the appropriate naming conventions to name the attributes.*] **[7 min]**

Activity Set 3: Creating a database at MySQL [Individual Activity] [25 min]

Consider the following ER diagram and Database Schema

ER Diagram



Relational database Schema:

Entity	Field Name	Datatype	Length	Description
ROOM	RoomID	VARCHAR	4	PRIMARY KEY
	RoomType	TEXT	30	
	Building	VARCHAR	4	
LECTURER	LecturerID	INT (AUTO)	11	PRIMARY KEY
	LecturerFirstName	TEXT	30	
	LecturerSurname	TEXT	30	
COURSE	CourseID	VARCHAR	8	PRIMARY KEY
	CourseName	TEXT	30	
	Description	TEXT	100	
	CreditPoints	INT	11	
CLASS	ClassID	INT	11	PRIMARY KEY,
	CourseID	VARCHAR	8	FOREIGN KEY REFERENCES COURSE (CourseID)
	LecturerID	INT	11	FOREIGN KEY REFERENCES LECTURER(LecturerID)
	RoomID	VARCHAR	4	FOREIGN KEY REFERENCES ROOM (RoomID)
	Day	CHAR	4	
	Time	TIME	3	%insert start time
	Length	INT		%insert length in minutes

NOTE: To continue the rest of the tasks in this lab, you need to consider the following concepts and terms that are used in the above Database schema table:

- **Primary key (PK)** – Primary key attribute(s) are unique. i.e. for every entity one field should uniquely identified each entry within the table. Primary key attributes are UNDERLINED in the E-R diagram.
- **Foreign key (FK)** – is a Primary key from one entity that is used in another entity to form the relationship between the entities. Normally: primary key from the 1 end of a relationship is the foreign key at the *many* end.
- **Datatype** simply determines the way in which data is stored in the database:
 - **Char** – is used for a fixed number of characters by the defined length.
 - **VarChar** – is used for a variable number of characters up to and including the defined length.
 - **Text** – is used when you are not sure of the maximum length of a string
 - If your strings will never exceed some upper limit of characters, then go with `VARCHAR` because it will be faster and more efficient.
 - **INT** – is used for
 - whole numbers (Integer)INT
 - whenever a number needs to increase automatically (you need to check 'AUTO INCREMENT' or 'A_I' check box).

- **Time** – is used for time!
- **Length** refers to the number of characters used to store data.

For more information on datatypes for mysql you may read:

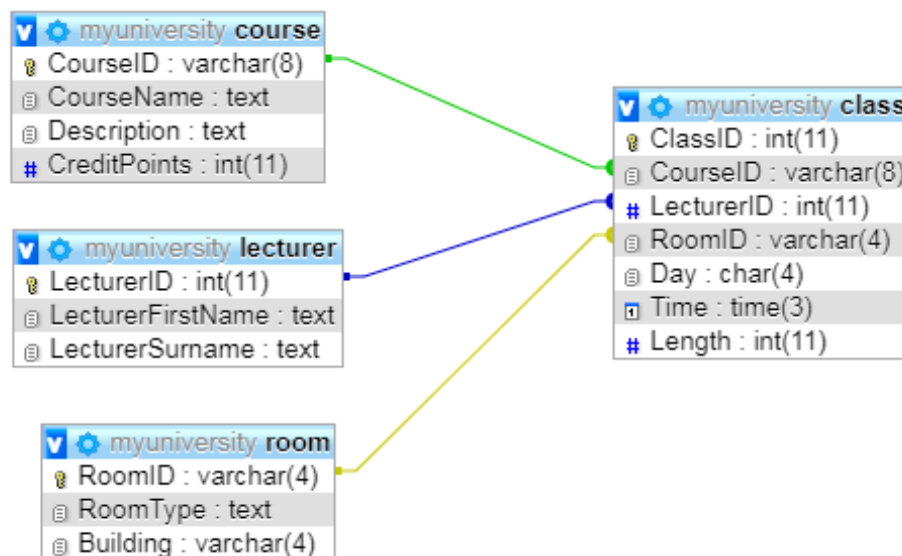
<http://www.tutorialspoint.com/mysql/mysql-data-types.htm>

- 1) After considering the above ER diagram and the information provided in the Database Schema Implement them by using MySQL. To do this you need to:
 - a) **Create a new database:** In the text box entitled **Create database** enter *MyUniversity* and click on the **Create** button
 - b) **Use the newly created database:** click on *MyUniversity* in the list of database names
 - c) **Create the tables:** For creating each of the tables in the Database Schema you need to follow the instructions as ordered below:
 - i) In the **Create table** on database *MyUniversity* text box enter the name of the table (eg Lecturer) and the number of fields (eg 3 for Lecturer) and then click **Go**.
 - ii) Fill in the details for each of the fields, using the Database Schema provided above, including the Column name, Type, Length (if provided/required), and Index (for primary keys only). **Tick the AUTO_INCREMENT (A_I)** box if this is shown in the schema. Leave other entries empty if information is not supplied.
 - iii) Click on the **Save** button **[ignore errors if you see your table has been created, or ask your tutor]**
 - iv) If you have filled in the details correctly your table (e.g., Lecturer) will have been created.
 - v) Click on the Database name (*MyUniversity*) in the left hand column and repeat Steps (b) and (c)(i to iv) for each of the remaining tables. **[ask your tutor to help if needed]**
 - d) **Create the relationships between the tables:** The tables in this example have relationships between them and you can create the relationships between the tables within the database. To create the relationship between **Lecturer and Class** as well as **Class and Room** you need to:
 - i) Open the table **Class** and view it's **Structure**
 - ii) For **each foreign key** (e.g. *LecturerID*, *CourseID* and *RoomID*) click on the **Index** button. A message such as "An index has been added on *LecturerID*" will be displayed. **Do this each foreign key in Class table separately to create three indices.**
 - iii) Click on the **Relation View** located at the top/bottom of the table columns (fields).
 - iv) For the column *LecturerID* select *MyUniversity > Lecturer > LecturerID* and for the column *RoomID* select *MyUniversity > Room > RoomID*. Click on **Add constraint** to make relation for each FK. For example, for three FKs in Class table, this will be like:

- v) Click on **Save**.

- vi) A window will be displayed showing the underlying SQL commands to perform the changes and a message saying “Your SQL query has been executed successfully”. Click on the **structure** icon to get back to your table.
- e) Viewing the relationships between tables:
 - i) click on **MyUniversity** in the list of database names
 - ii) Click on the **More** tab (this step might not be necessary if the **Designer** tab is already displayed) and select **Designer**– this provides a visual representation of the database, its entities, the relationships between them and the attributes.

You can see the **three entities** and **three 1:M** relationships as:



Note: The notations above are a bit different from the Crow's Foot model.

- 2) Inserting data into a table: Insert data into each of the tables. To do this you need to:
 - a) Click on the database name in the left hand column (**MyUniversity**) – this will display all of the tables currently in the database.
 - b) Insert a new row of data: **The order that you insert the data is important.** Insert data into *Course, Room and Lecturer respectively first and then add data into Class* – this is because of the relationships between the tables.

For example, enter at least two rows in each table as follows (**insert only values shown below**):

Course table:

CourseID	CourseName	Description	CreditPoints
1804ICT	Data Management	Database design and implementation	10
7003ICT	Database Management	Database design and implementation	10

Lecturer table:

LecturerID	LecturerFirstName	LecturerSurname
12345	Mohammad	Awrangjeb
14343	John	Patrick

Room table:

RoomID	Type	Building
1.17	Laboratory	N53
1.18	Laboratory	N44
244	Seminar room	N78
2_20	Academic room	N22
2_34	Laboratory	N44
Ttr1	Lecture theatre	N22

Finally, Class table:

ClassID	CourseID	LecturerID	RoomID	Day	Time	Length
1237	1804ICT	12345	2_20	Wed	15:00:00.000	120
6885	7003ICT	14343	2_34	Thu	11:00:00.000	120

To insert data into a table: (insert only values shown above)

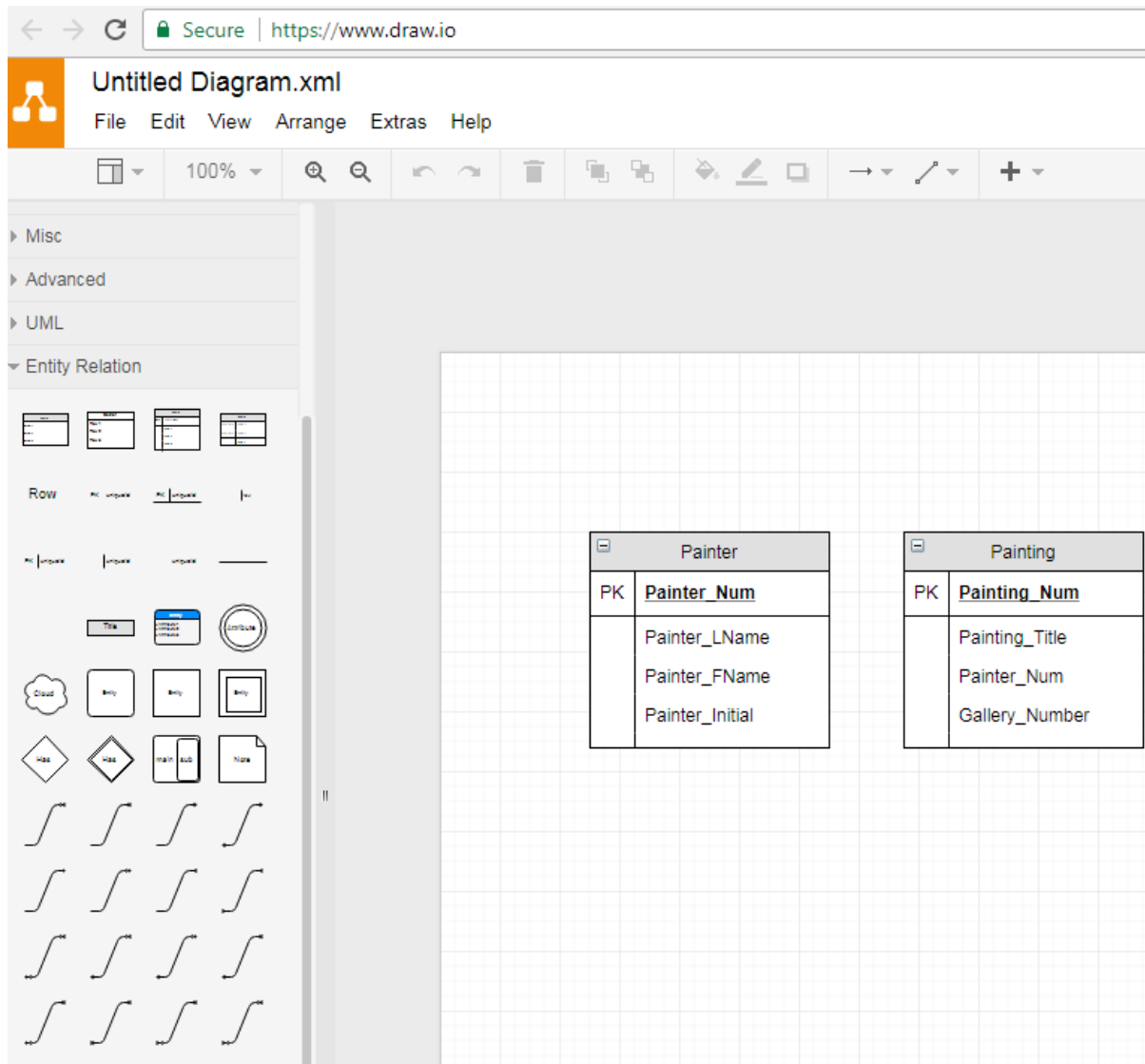
- i) Select the table by clicking on its name in the list of tables.
 - ii) Click on the **Insert** tab shown at the top of the table.
 - iii) Enter details into the *Value* section of the table provided.
 - iv) For each foreign key in Class (*LecturerID*, *CourseID* and *RoomID*) a drop-down list is provided of the values of the Primary Keys from the relevant table. Select a value from the drop-down list to insert into the relevant entry.
 - v) Click **Save** to insert the data into the table.
 - vi) If you click on the **Browse** tab you will be able to view the data that you have inserted into the table.
- 3) Export the database and save to your USB drive to use in the next week.

Note: In order to successfully continue your next weeks' labs, you need to ensure that you have developed all the skills that were introduced in this lab.

Activity Set 4: Use draw.io to draw ERD [Individual Activity] [15 min]

It is advised that you use an appropriate (offline or online) software (e.g., MS PowerPoint, www.draw.io etc.) to draw your ERD in **Assignment Part 1**. So, practice at your own time. The instruction to use the above software is provided with **Week 3 concept** materials under 'Extra Resources'.

- In this activity, use www.draw.io to draw the ERD you developed in **Activity 2(c)** above.
- *In case, time cannot be managed during the lab, the instruction video is available on the course site. Please watch the video and draw the ERD at your own time.*
- *You can also use any other online/offline software to draw ERD but must be in Crow's Foot notations.*



- Continue drawing your next ERDs in www.draw.io or any other software of your choice.