

## Database Fundamentals

### LabSheet 3 – Create ERD's using the GUI tool: MySQL workbench

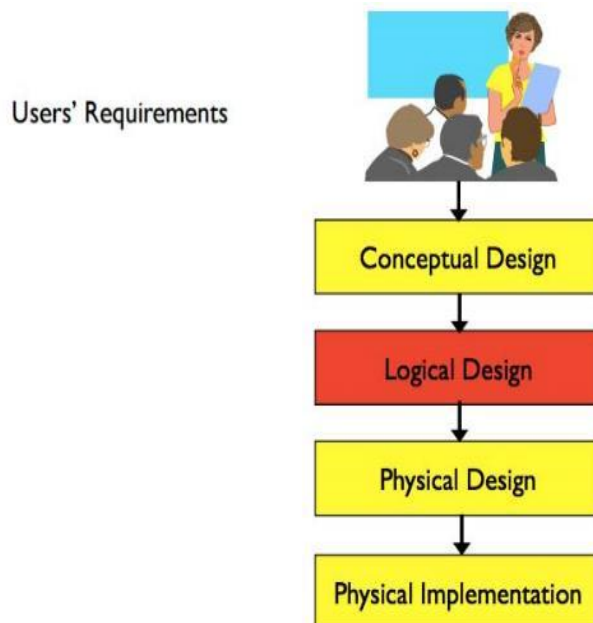
In MySQL Workbench create the ERDs, one in the practice session and 2 for lab questions.

Take the screenshots of 3 ERDs (1 practice and 2 questions) to a word document (B000xxxstudentnamelab3.doc)

- Copy the ERD files and the word document to a zip file (B000xxxstudentnamelab3.zip) and upload to Moodle.
- [All work must be uploaded before leaving the lab](#)
- PLEASE go through practice session before attempting the lab questions.

## ER model

An ER model is typically drawn at up to three levels of abstraction: Conceptual, Logical and Physical data models



ERD features added at different level of abstraction:

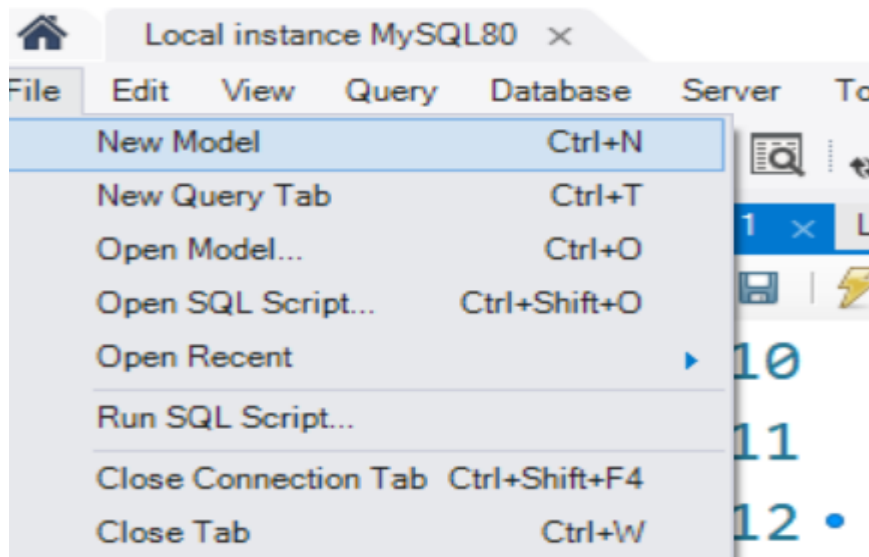
Feature	Conceptual	Logical	Physical
Entity Names	✓	✓	
Entity Relationships	✓	✓	
Attributes		✓	
Primary Keys		✓	✓
Foreign Keys		✓	✓
Table Names			✓
Column Names			✓
Column Data Types			✓

### Note:

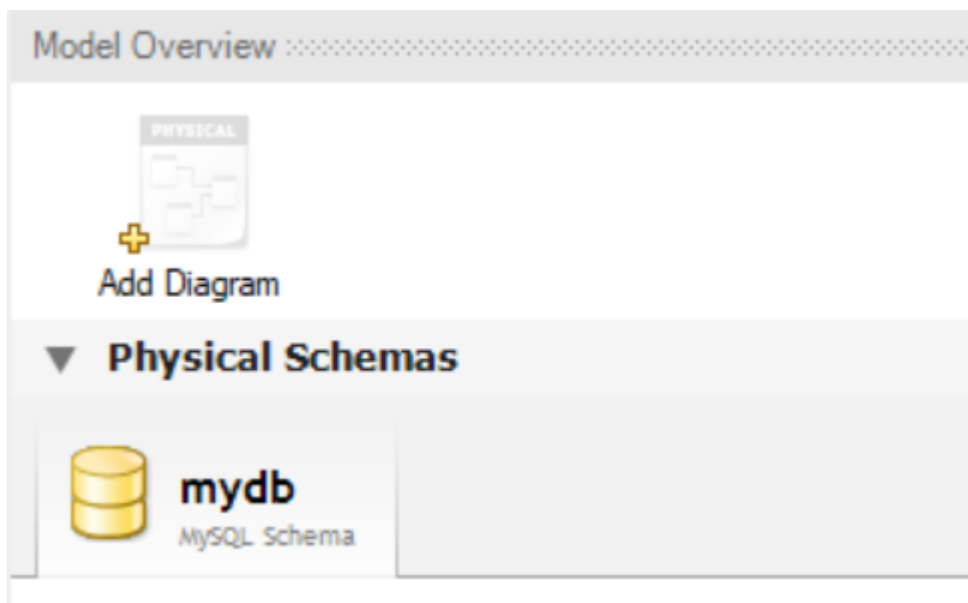
For practice, we are designing the Physical level ERD to show you all features of Workbench.

### Practice:

1. Click on File/New Model as follows:

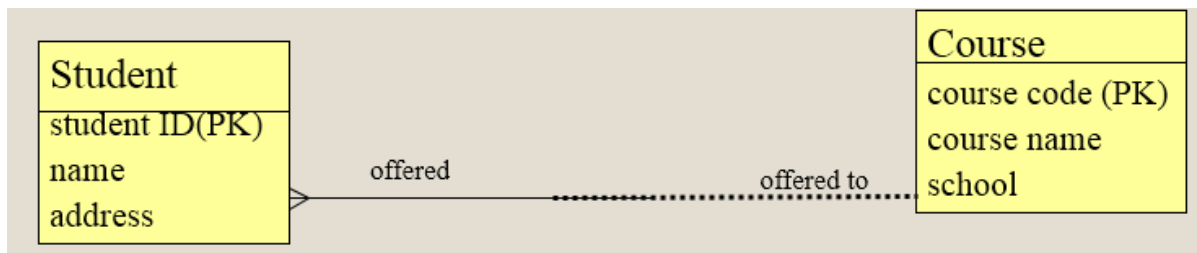


2. Double click on the **add diagram** icon.

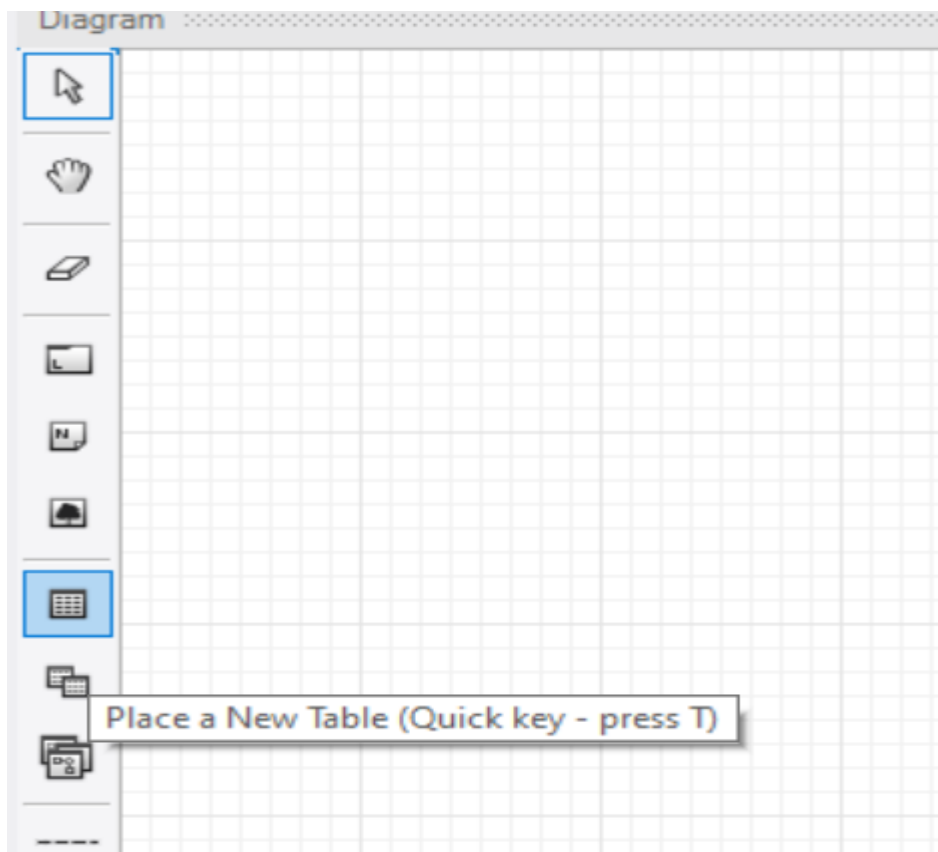


3. Down the left hand side, are a list of the symbols you can use in the ERD diagram. Hold the mouse over a symbol to see its description.

4. Draw the draft ERD for (student, course) given below using the following instructions:



- a) Place a new table(entity) on the diagram by clicking on the **place a new table** icon, and then click on the drawing pane to add the symbol. An entity called **table1** is added to the diagram. Double click on **table1** to see its properties. Rename it **student**.



- b) Click on the **columns** tab at the bottom of the screen to add columns to the table. Call the first attribute **studentID**, click the **PK** box to indicate this is the primary key.

Student

Student - Table

Table Name: Student

Column Name	Datatype	PK	NN	UQ	B	UN
StudentId	INT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Column Name: StudentId

Charset/Collation: Default Charset

c) Add a second table / entity to your diagram. Call it **Course**, and add **CourseID** as the primary key.

d) Link these entities with a 1:m relationship, with the '1' side on course as follows: click on the **1:m** icon. Click on **student**, and then click on **course**. This should link the entities, with a crow's foot on the student side. **Note: In this tool, relationships can only be added to tables with a primary key.**

e) Double click on the relationship to see its properties. Give it a caption of **'offered'**. And a second caption of **'offered to'**.

f) Click on the **foreign key tab** at the bottom of the page to see the relationship properties. On the left hand side, you can make the student table optional or mandatory, on the right hand side you can make the course table optional or mandatory. You can only change the cardinality of the student side to 1 or many.

g) Right click on the relationship to delete it. Select the double arrow at the end of the icons to see more relationships, and select the n:m relationship. Click first on students and then on course to add the relationship. As you can

see, it does not add the n:m relationship directly, but instead creates a link entity between student and courses.

**NB For your information:** the tool supports both dotted and solid line relationships, but the meaning of each is different.





- Dotted lines shows a relationship where entity is existence-independent of other entities, and PK of Child doesn't contain PK component of Parent Entity. This relationship is also called not identifying relationship. If two primary keys are unrelated its mean it is NOT an identifying relationship.

Example: A book belongs to an owner, and an owner can own multiple books. But the book can exist also without the owner. The relationship between a book and an owner is a non-identifying relationship.

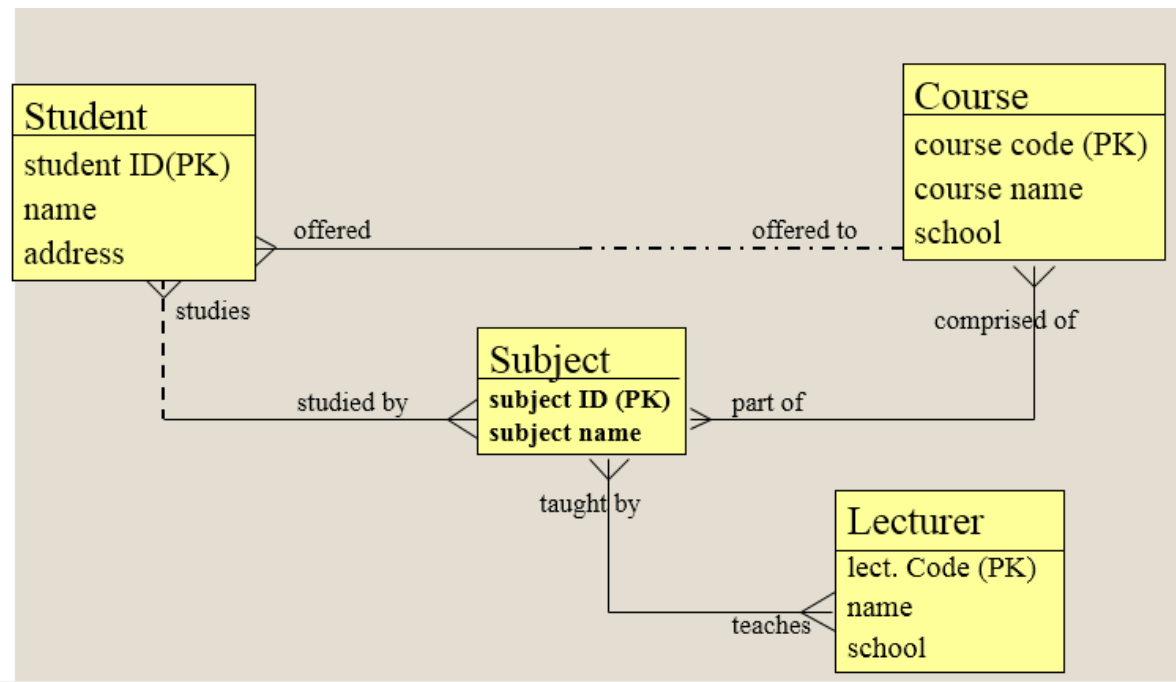
- Solid lines shows a relationship where Child entity is existence-dependent on parents and PK of Child Entity contains PK component of Parent Entity. It is also called identifying relationship.

Example: A book however is written by an author, and the author could have written multiple books. But the book needs to be written by an author, it cannot exist without an author. Therefore the relationship between the book and the author is an identifying relationship.

### MySQLWorkbench symbols and their meaning:

Symbol	Meaning
	The 'one' side of a mandatory relationship
	The many side of a mandatory relationship
	The 'one' side of an optional relationship
	The many side of an optional relationship

h) Continue with the diagram from practice one and create the full Physical level ERD in the Workbench for the college system represented below. Take screenshot of your ERD.



Note the automatic addition of the link entity in Workbench for the M:N relationships. Ensure the final diagram is correct (correct link entities and attributes etc.)

### **Lab questions**

Create Conceptual level ERDs in the workbench for each of the following:

First, identify the entities and then make sure you have the correct cardinality, degree and participation for each relationship. Take screenshot of both ERD's

#### **Question 1**

- A managing director manages one company. Each company has one managing director.
- Each company employs one or more full-time Sales staff.
- Each customer places their orders with one or more Sales staff.
- A customer can order one or more products. Some products may never have been ordered.

#### **Question 2**

- A large bank operates several departments.
- A department is managed by one manager and can have many employees.
- An employee is assigned to one or more projects in the bank. A project may be planned, but not have any employees assigned to it for several months. Each project will have a single employee assigned who acts as a project leader.