CSCI 332 Database Concepts
Fall 2020
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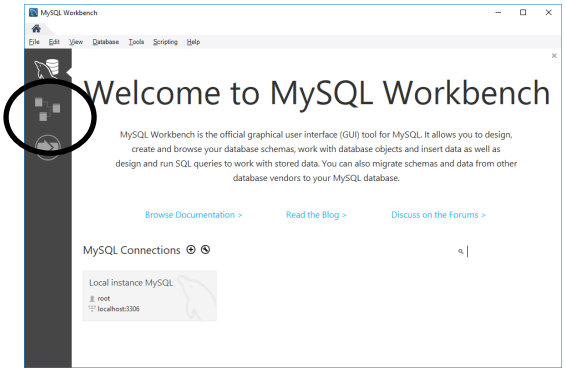
Laboratory 4 Database Creation in MySQL Using MySQL Workbench

In Lab 2 we examined how to create a database on a MySQK server using constructs found in SQL. In this lab we will create such a database using **MySQLWorkbench**.

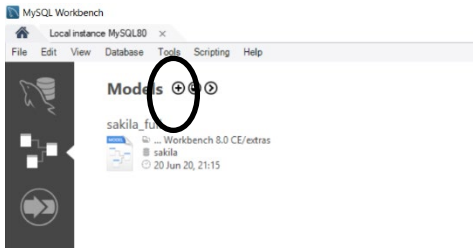
0. **Using what you learned in Lab 0 and Lab 1, start MySQL Workbench and be sure you can make a connection to a running MySQL server, or else start MySQL within a connection.**

Creating a new database schema using the table editor in MySQL Workbench

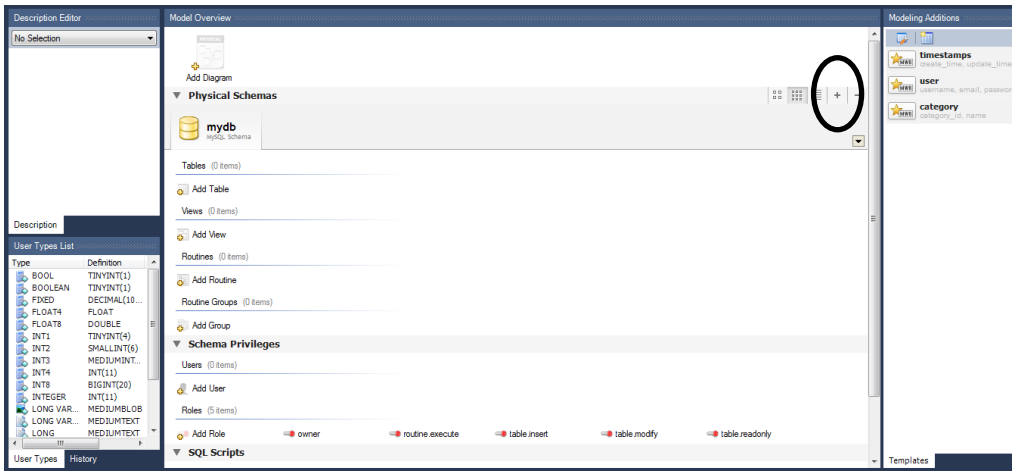
1. Start up MySQLWorkbench as you did at the end of Laboratory 0 and in Laboratory 1. Once this software is up and running you should see a window similar the following



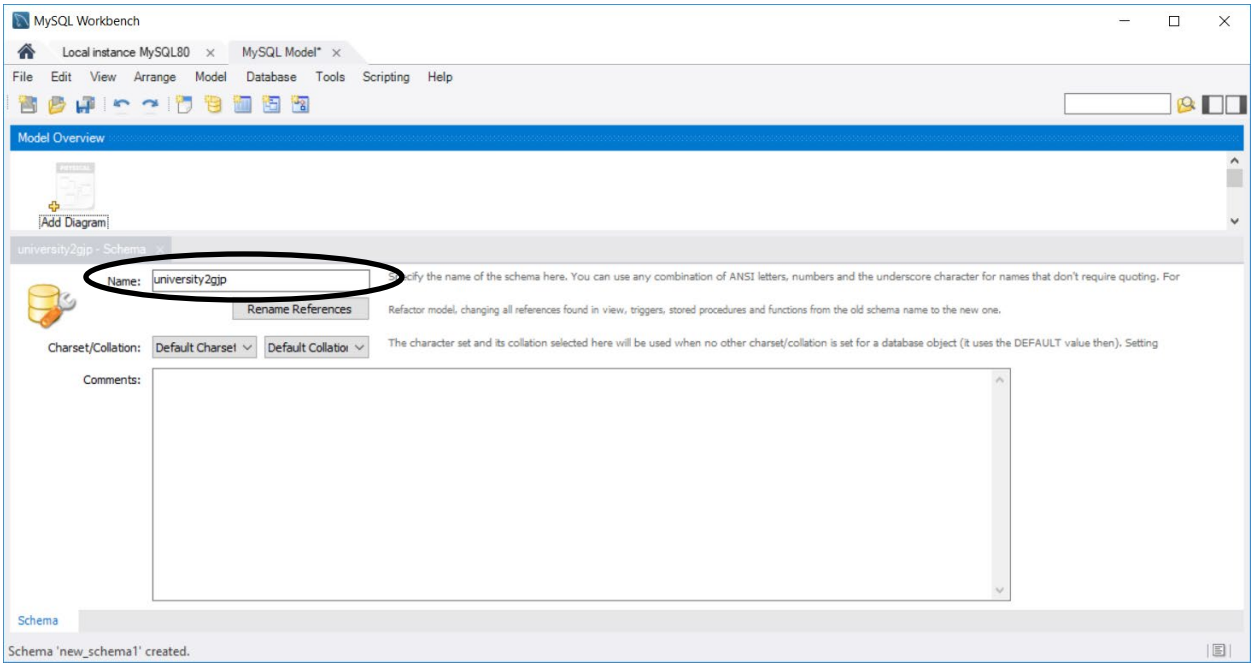
2. ***Click*** the **Models** entry in the left-hand panel (circled above) to launch the following window**.**



and then click on the Models "+" entry circled above. This will launch a window similar to the following window.

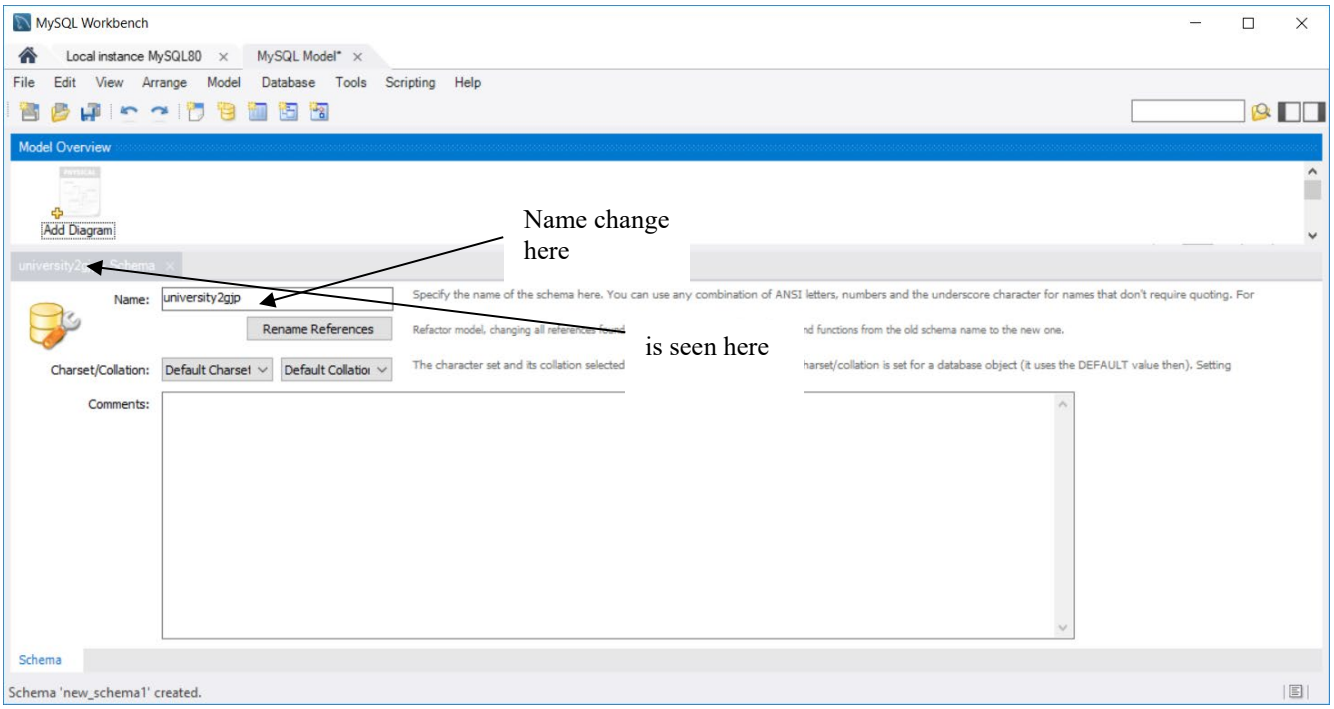


3. At the far right of the line labeled ***Physical Schemata***, click on the + entry (circled above). This will create a new tab for the window showing the following



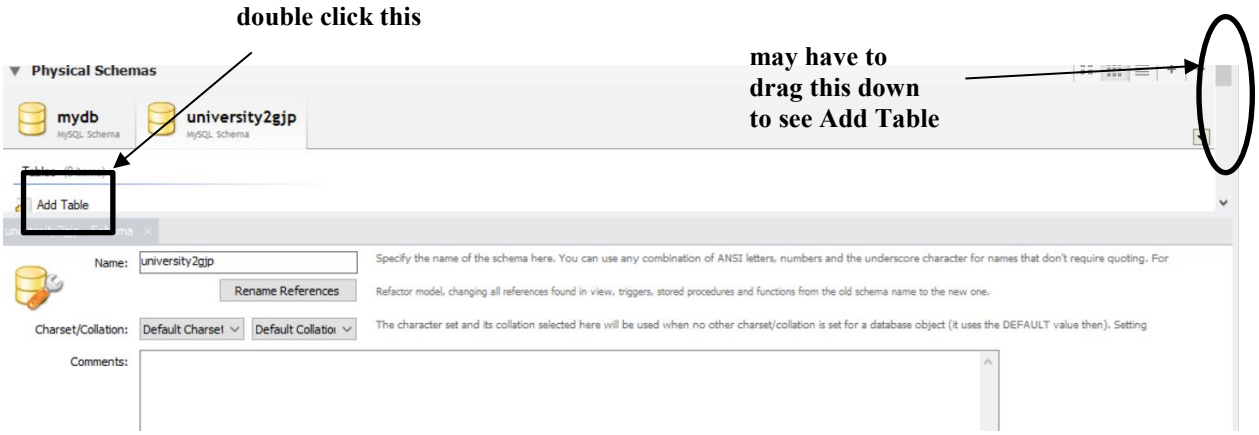
4. In the Name field of the bottom tab (circled above) change the schema name from ***new_schema1*** (most likely what yours will say) to **university2***yourInitials* (in my case, for example, I would enter **university2GJP**). You will note an immediate corresponding change in name in the panel tab immediately above it, as indicated in the snapshot below (note, for the rest of this lab, rather than say **university2*yourInitials***, we will simply refer to the database as "**university**."

5.

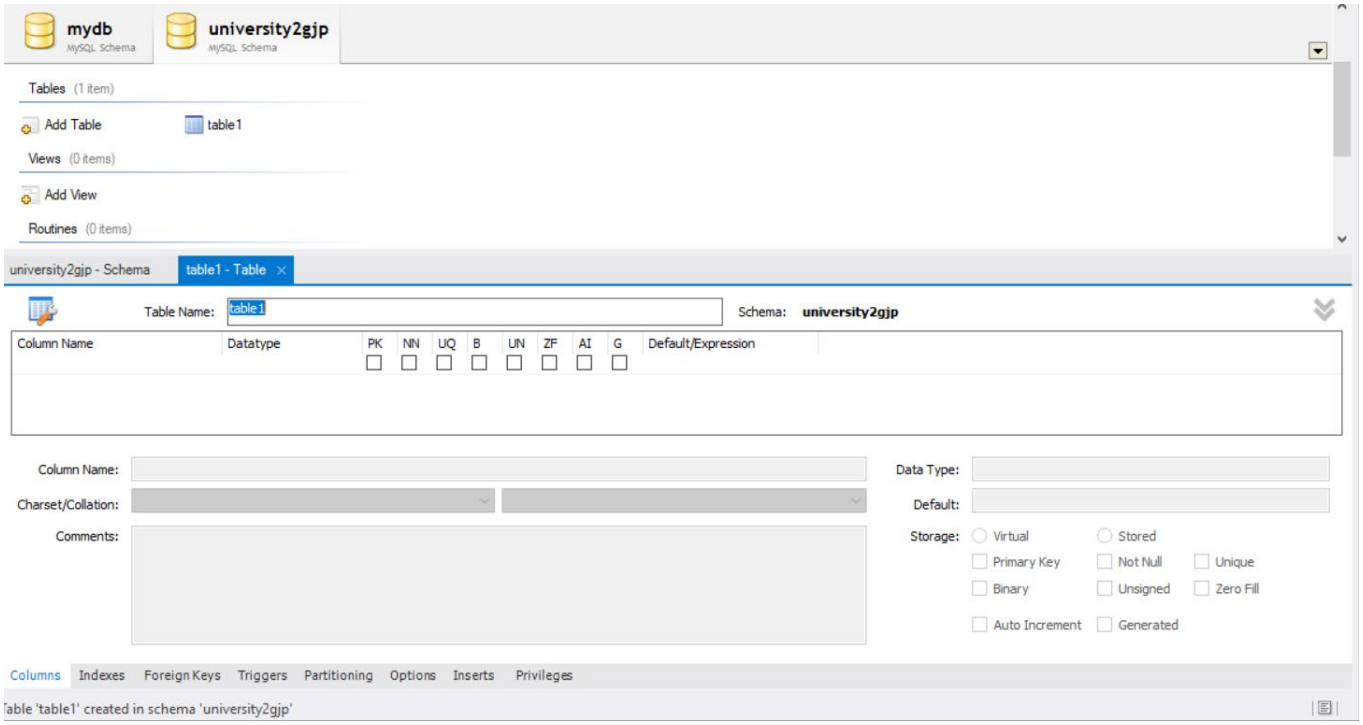


Now we are going to define the structure of the tables for our schema.

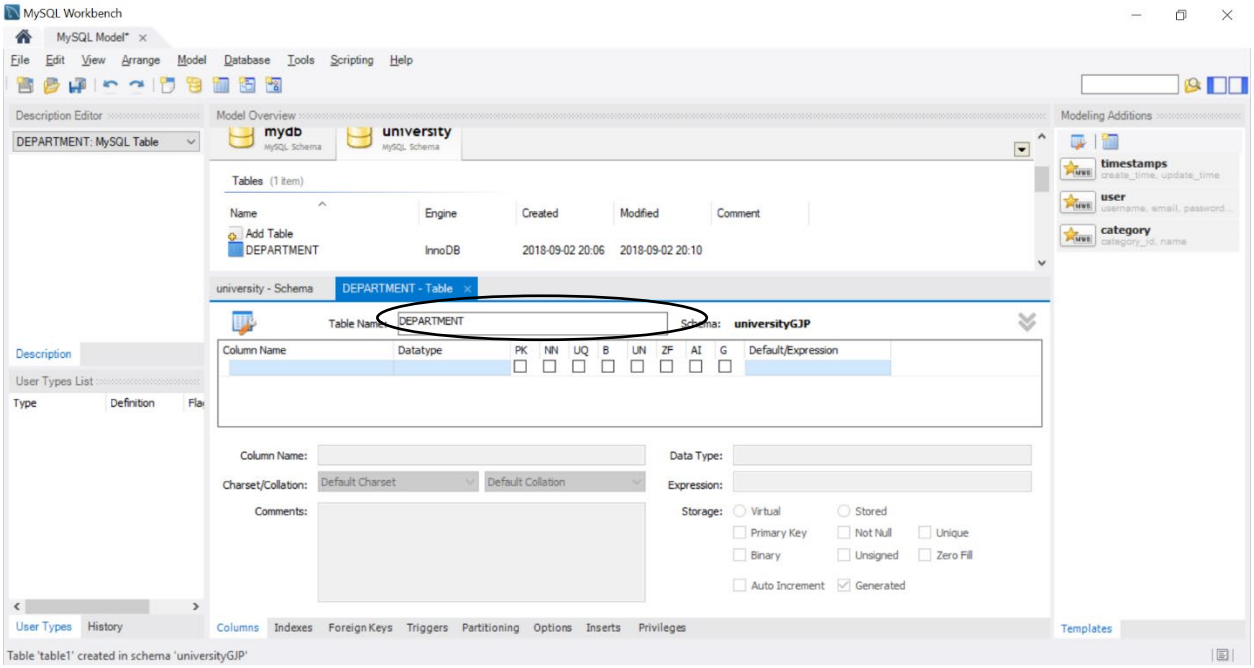
6. Double-click on **Add Table** under the ***university*** tab of Physical Schemata (shown in the box below; you may have to drag down the scroll bar, circled below, to see it.).



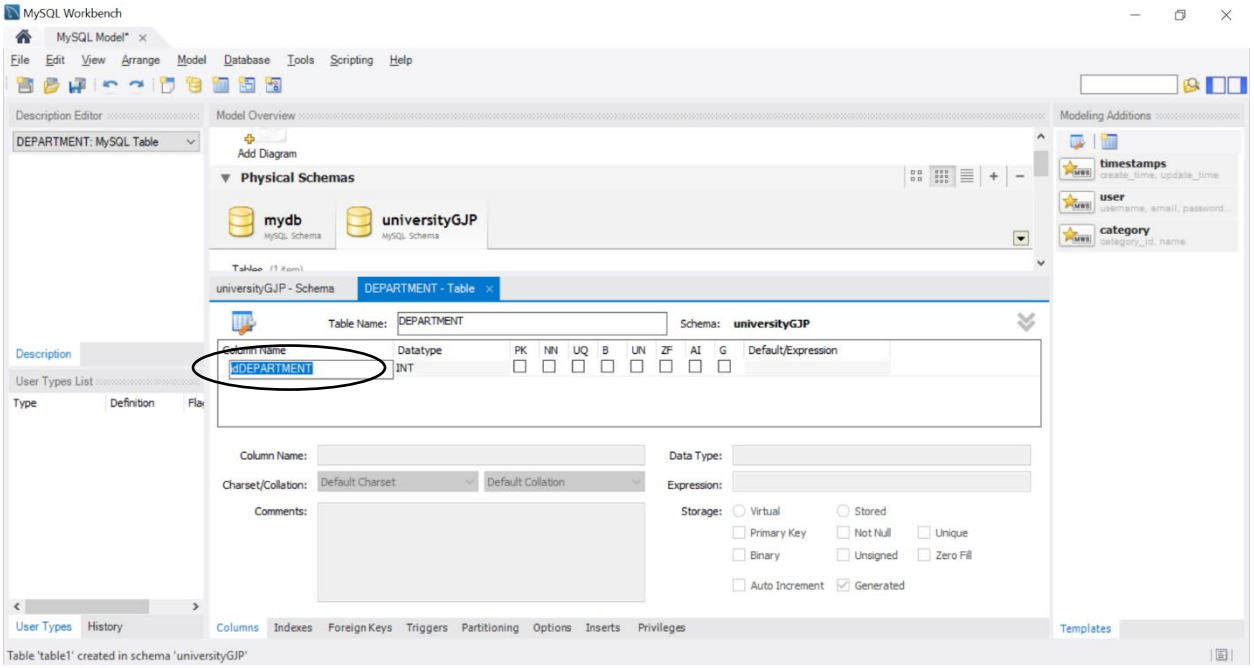
This will launch a Table Editor as shown below, in which we can specify the structure of a table.



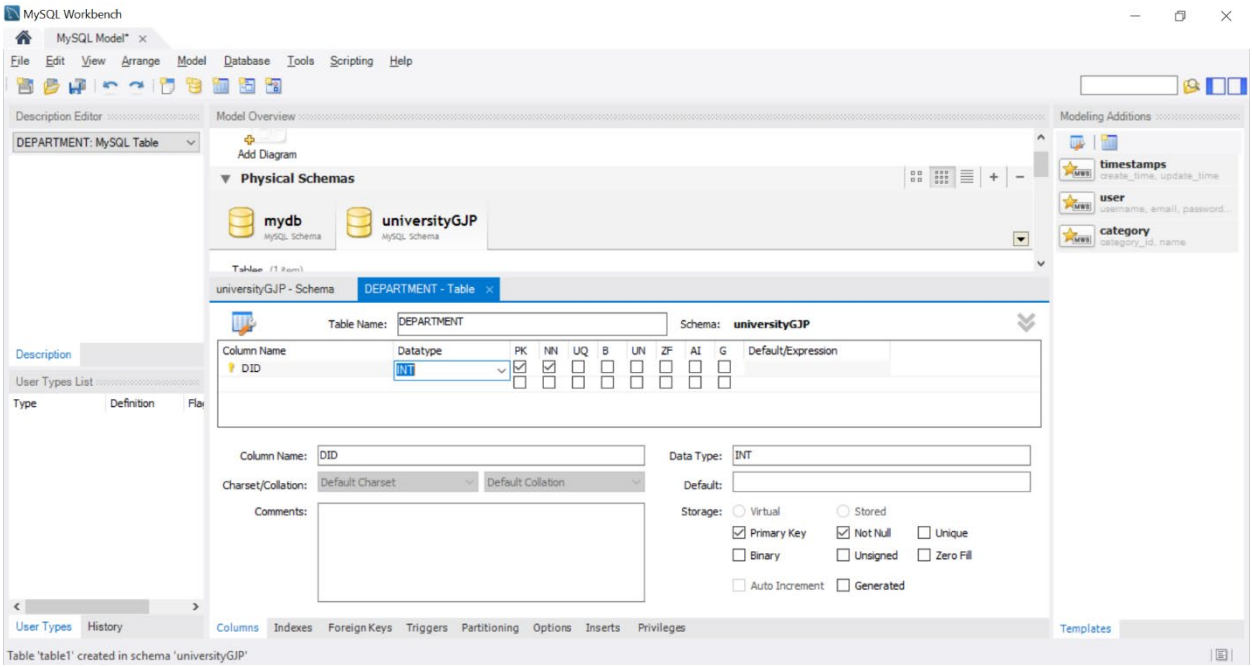
7. Enter **DEPARTMENT** (the name of the table we wish to create) as we have done in the text field circled below. We will use all caps for the names of our tables, although MySQL in general is not case-sensitive when it comes to names. You will note also that after a brief pause, the table name at the bottom of the Model Overview panel above the Table Editor will show the name change.



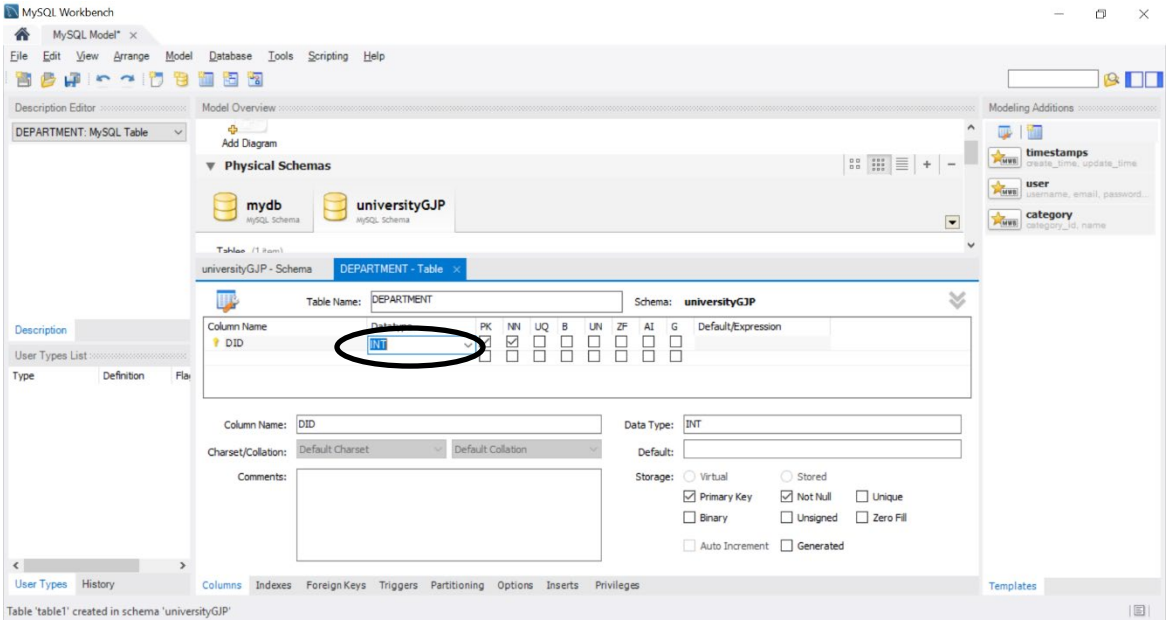
8. Double-click the cursor in the data input area immediately below the ***Column Name*** location in the window (circled below; you may have to click a second time for a cursor to appear). When you do so, a default name of *idDEPARTMENT* will appear in the area as shown in the second screen capture below.



9. Now replace the default choice of *DEPARTMENT* as the column name with our choice, **DID**, by typing over *DEPARTMENT*, the hitting the Enter key. When you have done this you should see the following in the panel.

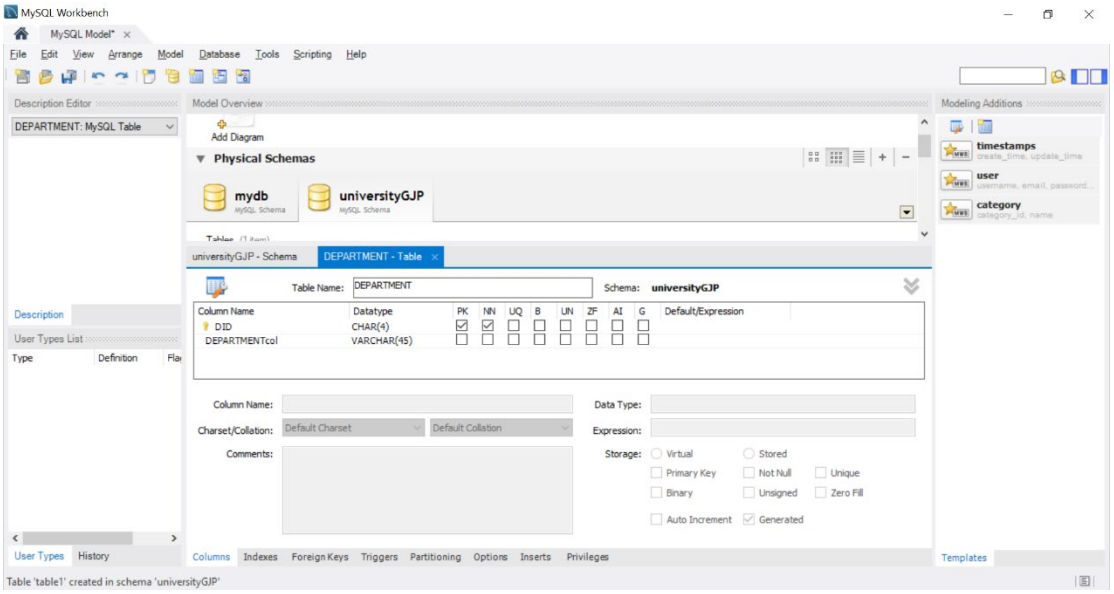


10. Next hit the Tab key to advance the cursor to the ***Datatype*** area that currently shows a default value of **INT** (circled below).



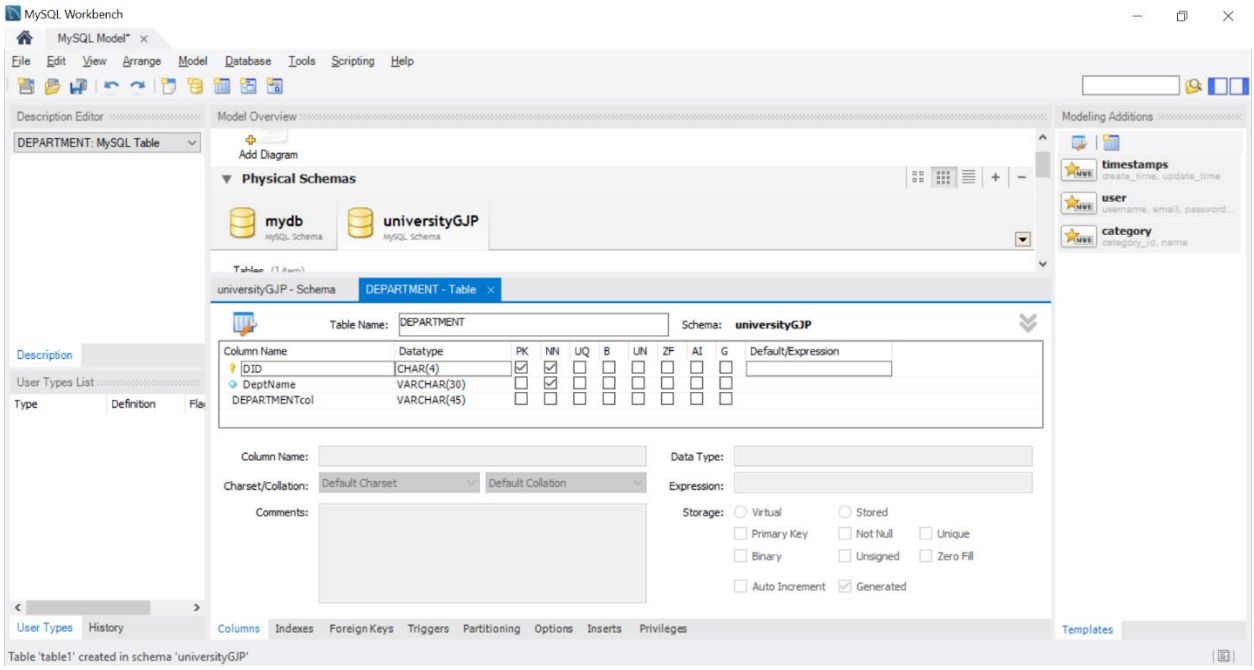
Note that there are checks in the PK (for "primary key") and NN (for "not NULL" This is equivalent to ***Required:Yes*** in the schema notation from class) boxes. MySQL Workbench anticipates that the first attribute given for a table will be an "identifying attribute" that can serve as a primary key, hence the presence of the "id" in the default name and the checking of the PK and NN boxes. Since in this case the attribute DID *will* serve in this role, we will keep these properties for DID. We will need to change the attribute type, however, from INT to that of a fixed-length string of characters of length 4.

11. Delete INT by hitting the DELETE key and then type in CHAR(4) to set this as the type for DID. If you now hit the ENTER key, then entry of properties for DID will conclude and a new line for another column will be activated (with default values) as shown below.



12. Make the following changes for this column entry:
    - ColumnName: change to **DeptName**
    - DataType: change to **VARCHAR(30)** – just click behind the "5" in "45", delete the 5 and 4, and replace them with 30.
    - NN: click the cursor in the box to place a checkmark there.

Once you have made these changes, click the Column Name field for the next attribute. Your table entry panel should look as follows.

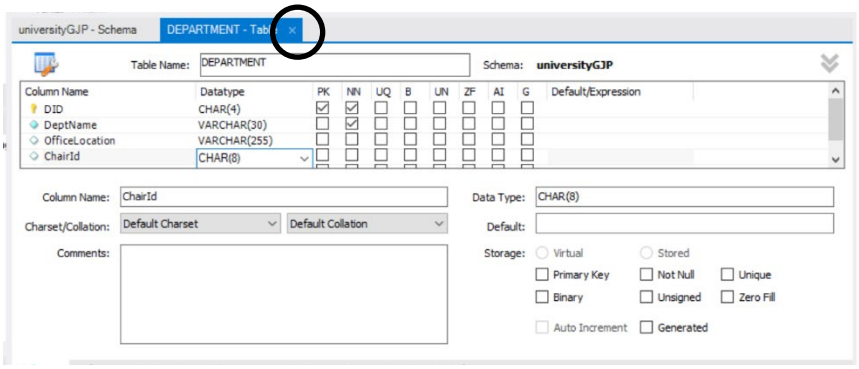


You should note that as a result of hitting the ENTER key a new column/attribute was automatically started for you. What this tells us is that we should not hit the ENTER key after the last column has been specified.

13. Follow the example of step 11 above to specifying the remaining attributes for **DEPARTMENT** according to the table below (we have just completed the first two). Note, however, that only the DID attribute will be the primary key, so you should be sure the PK box remains unchecked for the other attributes.

DEPARTMENT		
Attribute Name	**Type**	**Not Null?**
DID	Fixed length character string – CHAR(4)	Yes
DeptName	Variable length character string – VARCHAR(30)	Yes
OfficeLocation	Variable length character string – VARCHAR(255)	No
ChairID	Fixed length character string – CHAR(8)	No

Once you are finished the Table Editor window should look like the following:



14. You can close the Table Editor for DEPARTMENT if you wish by clicking on the × in the ***DEPARTMENT-Table*** tab (circled above). You can always reactivate the editor for this table by double-clicking on the DEPARTMENT table in the **university** schema listed under Physical Schemata in the top panel.

Completing the* university *Database Table Specifications

You should now continue the creation of the ***university*** database by creating tables **FACULTY**, **STUDENT, COURSE**, **SECTION**, and **CLASS** with the following specifications. The primary key attributes are in **bold**. Where more than one attribute in a table is underlined, the key is composite. Have the Primary Key box checked for each of these attributes when you specify them.

FACULTY		
Attribute Name	**Type**	**Not Null?**
FID	Fixed length character string - CHAR(8)	Yes
LastName	Variable length character string – VARCHAR(20)	Yes
FirstName	Variable length character string – VARCHAR(20)	Yes
FacRank	Fixed length character string – CHAR(4)	No
Tenured	Fixed length character string – CHAR(1)	No
DeptID	Fixed length character string – CHAR(4)	No

STUDENT		
Attribute Name	**Type**	**Not Null?**
STID	Fixed length character string – CHAR(8)	Yes
LastName	Variable length character string – VARCHAR(20)	Yes
FirstName	Variable length character string – VARCHAR(20)	Yes

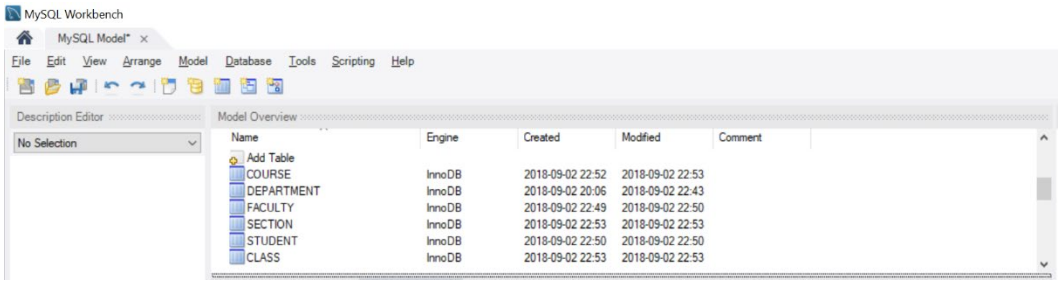
Major	Fixed length character string – CHAR(4)	No
Level	Fixed length character string – CHAR(2)	No
GPA	DECIMAL(4,3)	No
AdvisorID	Fixed length character string – CHAR(8)	No

COURSE		
Attribute Name	**Type**	**Not Null?**
CID	Fixed length character string – CHAR(8)	Yes
Title	Variable length character string – VARCHAR(80)	No
DeptOffering	Fixed length character string – CHAR(4)	Yes
CreditHours	INT	No

SECTION		
Attribute Name	**Type**	**Not Null?**
SectID	Fixed length character string – CHAR(6)	Yes
CourseID	Fixed length character string – CHAR(8)	Yes
SectionNumber	Fixed length character string – CHAR(3)	Yes
Semester	Fixed length character string – CHAR(4)	Yes
Year	Fixed length character string – CHAR(4)	Yes
InstructorID	Fixed length character string – CHAR(8)	No

CLASS		
Attribute Name	**Type**	**Not Null?**
SectID	Fixed length character string – CHAR(6)	Yes
StudentID	Fixed length character string – CHAR(8)	Yes
Grade	Fixed length character string – CHAR(2)	No

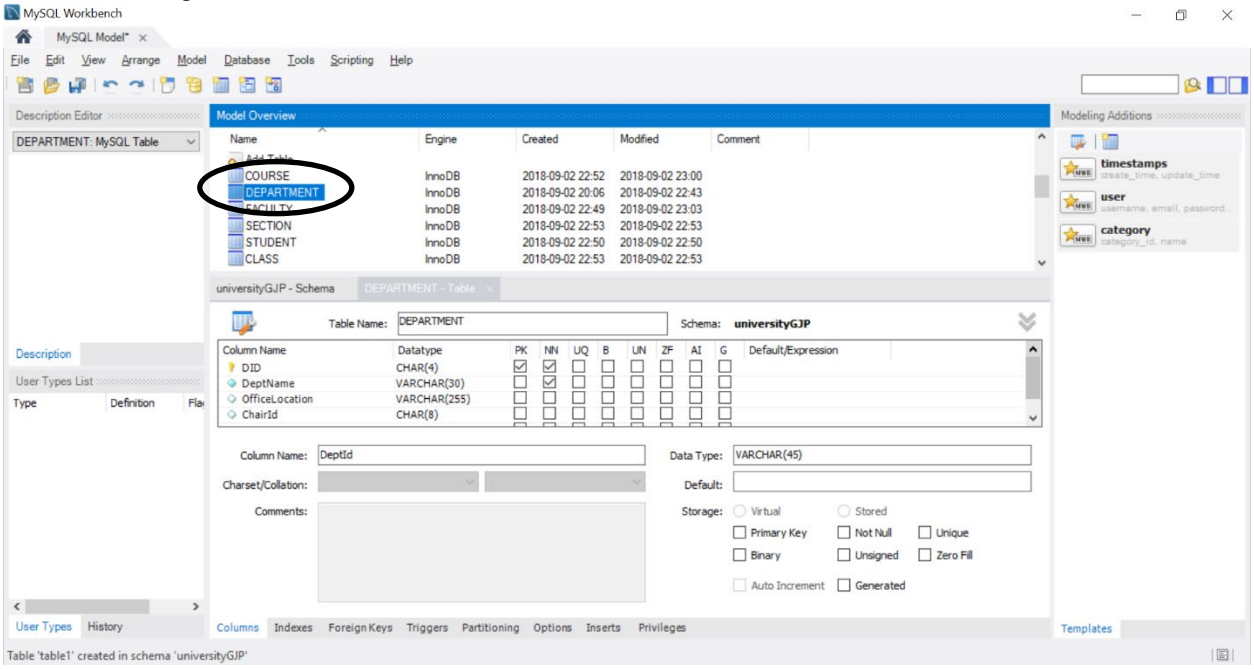
When you are finished the Tables portion your **university2** schema should appear as follows.



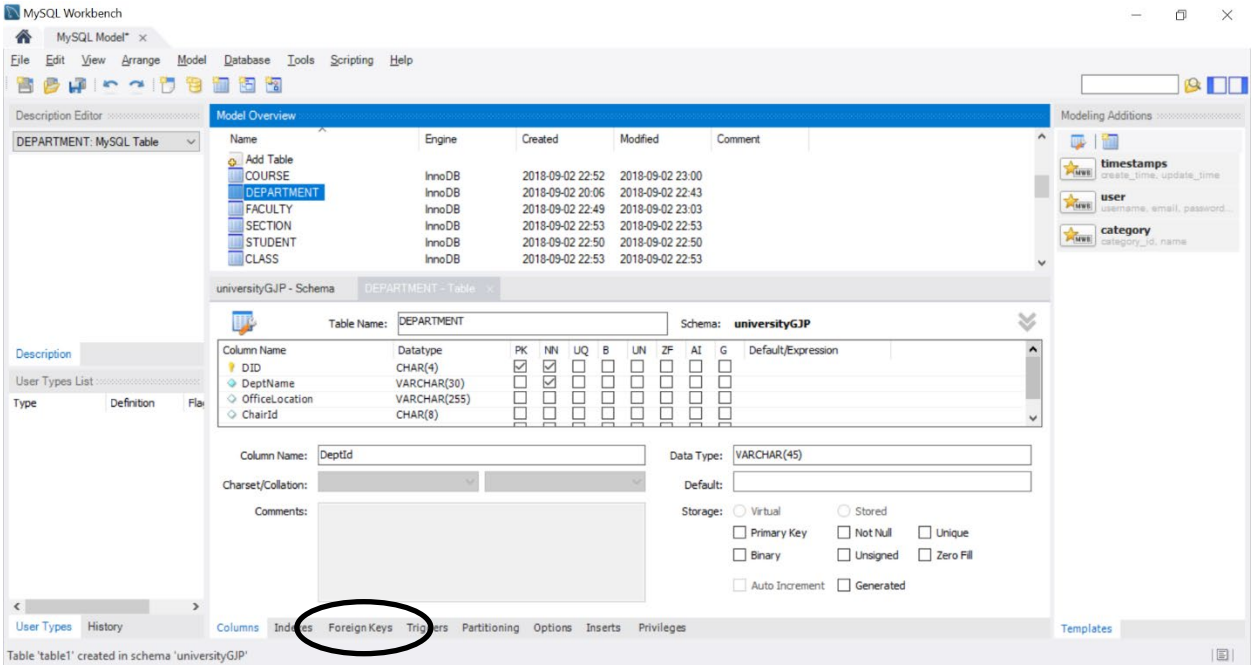
Specifying Foreign Keys

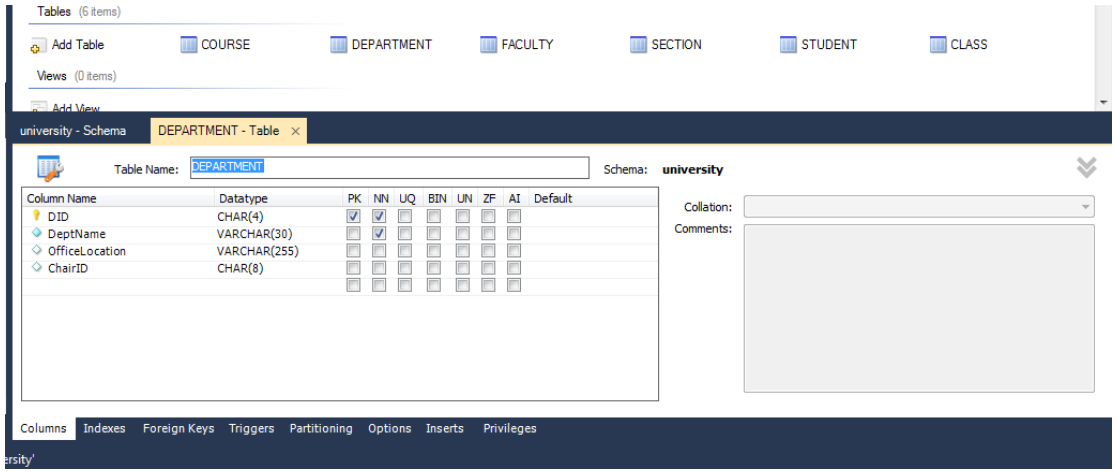
We are now going to modify our schema to incorporate foreign keys into the table specifications. We put this off until this part of the lab because we wanted to have all of our tables specified first to avoid making any references to a table before it was defined.

15. The table **DEPARTMENT** has an attribute ***ChairID*** that is a foreign key referencing the primary key ***FID*** of the **FACULTY** table [note that types of both attributes are identical – this is imperative for foreign keys and the attributes they reference.]. Double-click on the DEPARTMENT table in the table listing (circled below) to get the following

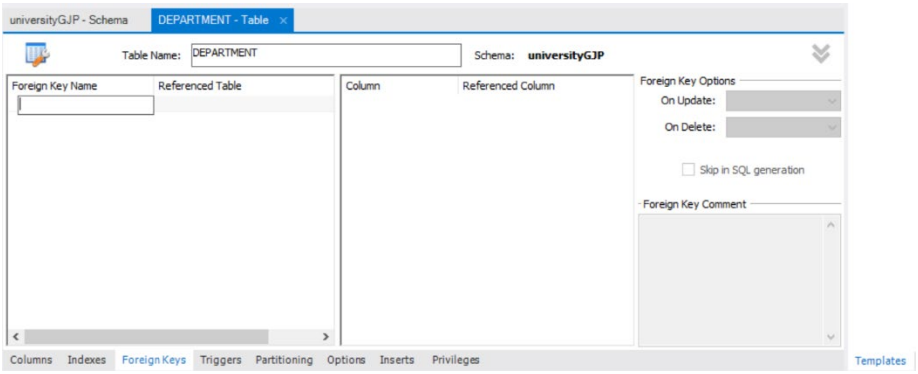


16. Now click on the Foreign Keys tab (circled below)





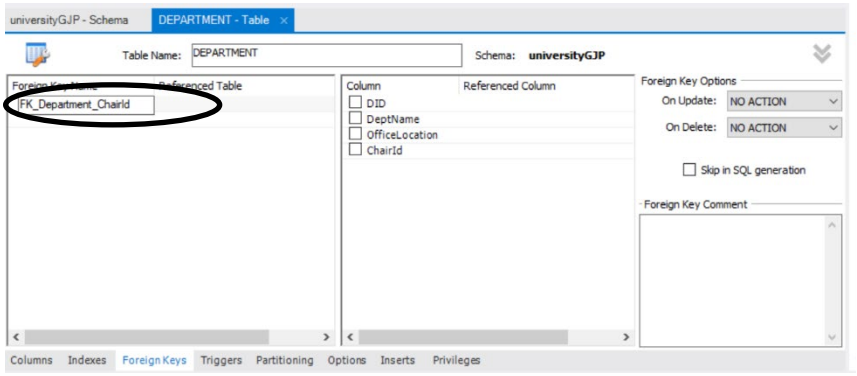
This will change the content of the ***DEPARTMENT – Table*** tab to the following



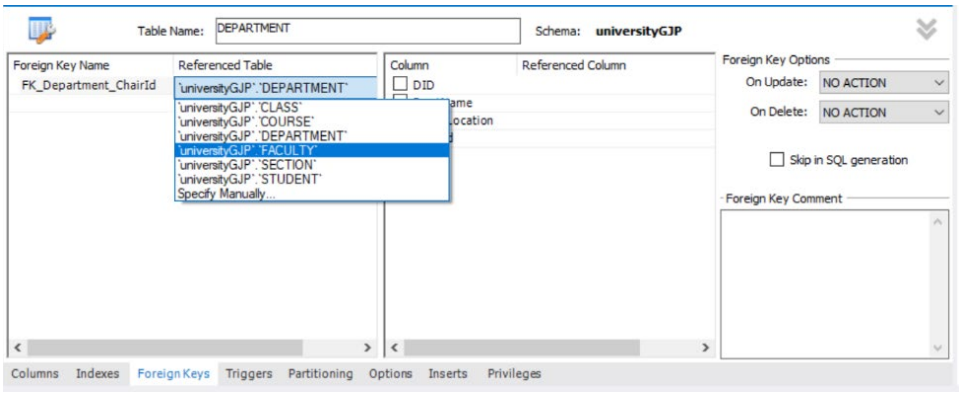
17. We will need to provide our foreign key with what is known as a *constraint name*. We shall adopt the following convention for our foreign key constraint names

FK_*tableName_attributeName*

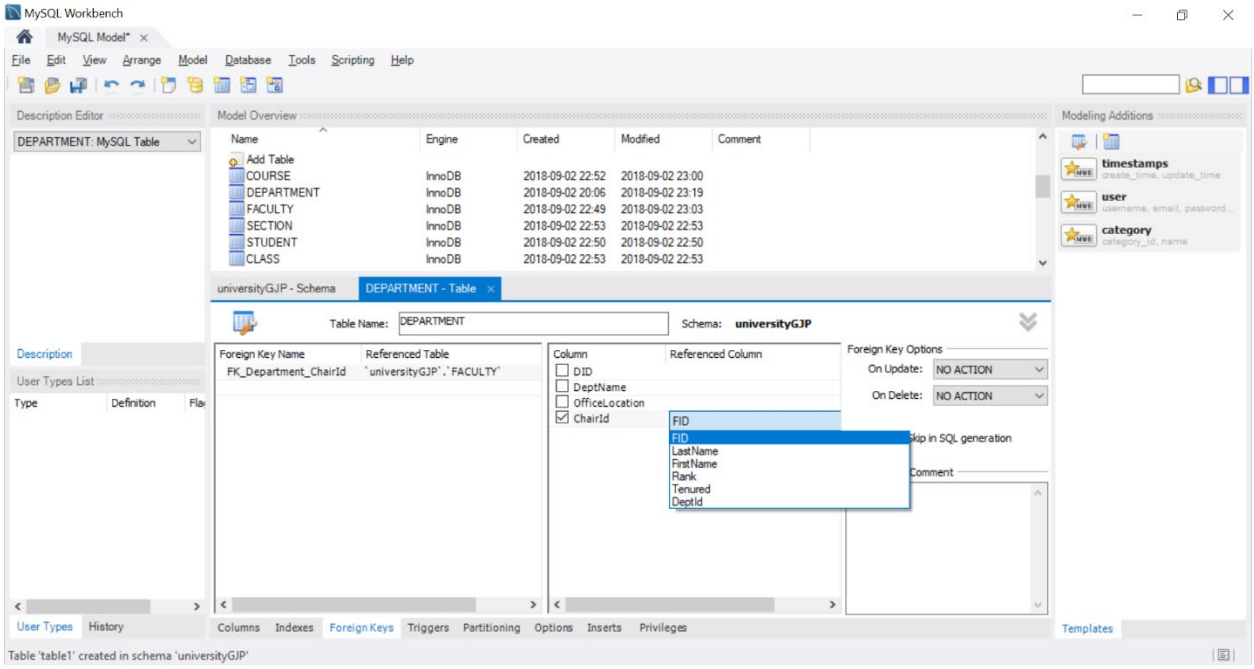
where *tableName* and *attributeName* are the names of the table and attribute respectively of the foreign key we are specifying. Thus in our case we will use a foreign key name of **FK_Department_ChairId** as shown below



18. Next click in, or tab to, the **Referenced Table** entry, which provides a drop-down list of tables to choose from. Note the names are in the form 'schemaName'.'tableName'. Select the 'university'.'FACULTY' table from this list.



19. Once you have made this selection you will note that the Referenced Columns portion of the panel was automatically filled with the column names of the DEPARTMENT table. Place a check mark in the ***ChairID*** column (since this is the foreign key we are specifying) and then tab to the associated Referenced Column entry. This will generate another drop-down list from which we can select the FID entry since this is what we want ChairID to reference.



20. Later on in the course you will learn what the "Foreign Key Options" mean. For now we will just leave NO ACTION as these options. You can now close the ***DEPARTMENT – Table*** tab as we are finished specifying the DEPARTMENT table.

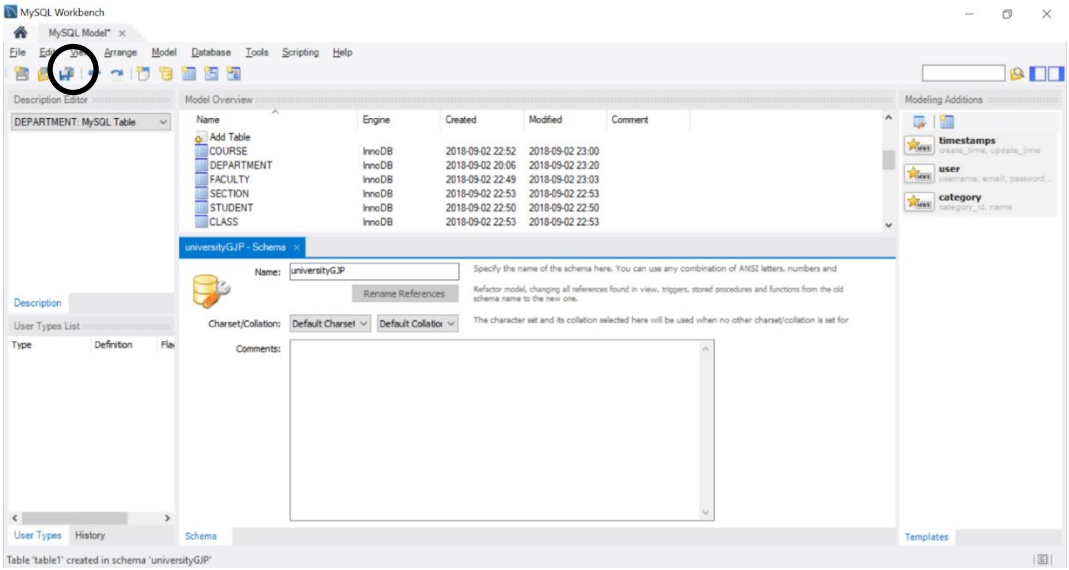
21. Complete the foreign key specifications for the remaining tables as follows:

Table	FK Name	Referenced Table	Column	Referenced Column
FACULTY	FK_DEPARTMENT_DeptID	DEPARTMENT	DeptId	DID
STUDENT	FK_STUDENT_AdvisorID	FACULTY	AdvisorID	FID
COURSE	FK_COURSE_DeptOffering	DEPARTMENT	DeptOffering	DID
SECTION	FK_SECTION_CourseID	COURSE	CourseID	CID
	FK_SECTION_InstructorID	FACULTY	InstructorID	FID

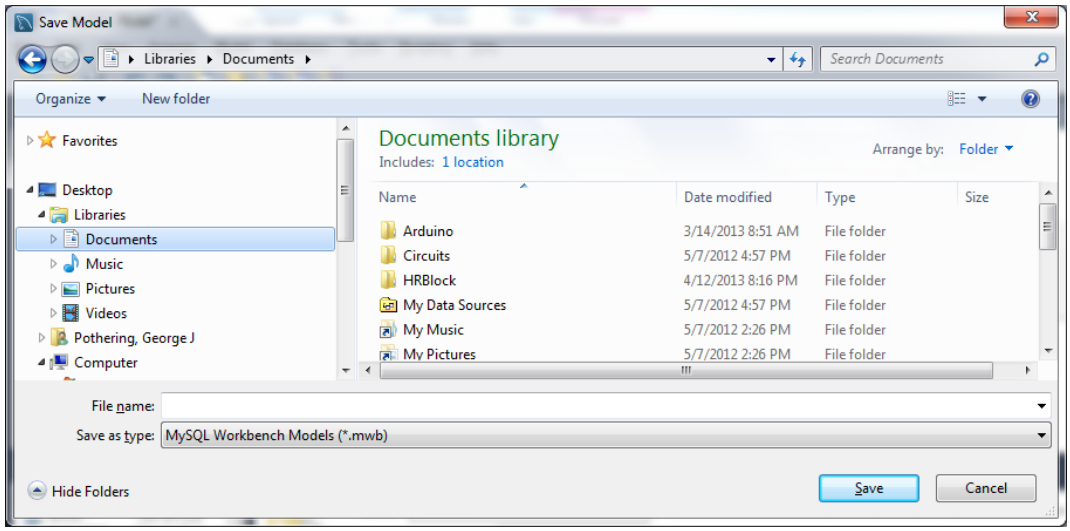
CLASS	FK_CLASS_SectionID	SECTION	SectID	SectID
	FK_CLASS_StudentID	STUDENT	StudentID	STID

Once you complete these, you will have completed the specification of the **university2** schema.

22. You should now save your work by clicking on the **Save Model** icon (circled below), or by clicking on the **File** entry and then on the **Save Model** entry.



23. Either approach will activate a window similar to the following.



Navigate to a folder where you want to save your models, and then save it as an mwb file with the file name **CSCI332-Lab4-***yourInitials*.

You have completed Lab 4. You may now close MySQL Workbench and halt the execution of the MySQL server.

Submission: When you have completed this lab upload the file **CSCI332-Lab4.***yourInitials***.mwb** to the Lab 4 dropbox on OAKS.