# University Student Database

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CS-434

**University Student Database**

Project Deliverable 3

The University Student Database was created using NaviCat for MySQL. The program allowed us to create all of the tables, as well as the constraints and triggers.

We chose to use JDBC (Java Database Connectivity) to connect the java application to the mysql database. We were not able to finish the full program, but portions of it are included. One portion allows the user to connect to the database, enter their student id number, and displays their student id, last and first name, and their GPA. This is a program that may be used by students. Another portion of the application allows a user to update, insert, and delete from any table in the database. This program could be used by administrators. The remainder of the program could not be completed due to time restrictions.

A problem we faced while creating the program was that when a value is retrieved from the database, it must be stored in a variable. This makes it difficult to display large amounts of data from several tables. We used select statements with where conditions to display only the needed data. The first two project deliverables and the java source code used for both programs and screenshots of the two application examples are also included.

To use FirstExample.java:

1. Compile and run the program

2. Enter the SQL UPDATE, INSERT, or DELETE statement and press Enter

3. Check your database to ensure the SQL statement was executed

To use FirstExample001.java:

1. Compile and run the program

2. Enter the Student ID number (1-6)

3. Program displays the student's id number, last name, first name, and GPA.

Project Deliverable 1

University Student Database

The database we have implemented shows a small section of a possible university database. This was done using MySQL. The order of table creation and foreign key constraints were factors that needed to taken into consideration before implementation. We faced a problem in making sure indexes were added for certain foreign keys before altering the tables to add the constraints. The datatypes of certain tuples may need to be modified in the future, and some foreign key constraints may need to be added, such as for "LineNo." The tables were populated using the normal methods and there were no integrity violations.

SQL commands used, and resulting messages:

```
mysql> CREATE TABLE DEPARTMENTS
(DeptId         DECIMAL,
 DeptName       VARCHAR(20),
 College        VARCHAR(20),
PRIMARY KEY (DeptId));
Query OK, 0 rows affected

mysql> CREATE TABLE COURSES
(Cno            DECIMAL,
 Ctitle         VARCHAR(20),
 Hours          DECIMAL,
 DeptId         DECIMAL,
PRIMARY KEY (Cno),
FOREIGN KEY(`DeptId`) REFERENCES `DEPARTMENTS`(`DeptId`)
ON UPDATE CASCADE ON DELETE SET NULL);
Query OK, 0 rows affected

mysql> CREATE TABLE INSTRUCTORS
(LastName       VARCHAR(20),
 FirstName      VARCHAR(20),
 DeptId         DECIMAL,
 Office         VARCHAR(20),
 Phone          DECIMAL,
 Email          VARCHAR(20),
PRIMARY KEY (LastName,FirstName),
FOREIGN KEY(`DeptId`) REFERENCES `DEPARTMENTS`(`DeptId`)
ON UPDATE CASCADE ON DELETE SET NULL);
Query OK, 0 rows affected

mysql> ALTER TABLE INSTRUCTORS ADD INDEX FirstName (FirstName);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0
```

```
mysql> ALTER TABLE INSTRUCTORS ADD INDEX LastName (LastName);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> CREATE TABLE SECTIONS
(Term          VARCHAR(20),
 LineNo        DECIMAL,
 Cno           DECIMAL,
 InstrLname    VARCHAR(20),
 InstrFname    VARCHAR(20),
 Room          VARCHAR(20),
 Days          VARCHAR(20),
 StartTime     TIME,
 EndTime       TIME,
 Capacity      DECIMAL,
PRIMARY KEY (Term,LineNo),
FOREIGN KEY(`Cno`) REFERENCES `COURSES`(`Cno`)
ON UPDATE CASCADE ON DELETE SET NULL);
Query OK, 0 rows affected

mysql> ALTER TABLE SECTIONS ADD INDEX InstrLname (InstrLname);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE SECTIONS ADD INDEX InstrFname (InstrFname);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE `SECTIONS` ADD CONSTRAINT `InstrLname` FOREIGN
KEY(`InstrLname`) REFERENCES `INSTRUCTORS`(`LastName`)
ON UPDATE CASCADE ON DELETE SET NULL;
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE `SECTIONS` ADD CONSTRAINT `InstrFname` FOREIGN
KEY(`InstrFname`) REFERENCES `INSTRUCTORS`(`FirstName`)
ON UPDATE CASCADE ON DELETE SET NULL;
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> CREATE TABLE STUDENTS
(Sid           DECIMAL,
 LastName      VARCHAR(20),
 FirstName     VARCHAR(20),
 Class         VARCHAR(20),
 Phone         VARCHAR(20),
 Street        VARCHAR(20),
 City          VARCHAR(20),
 State         VARCHAR(20),
```

```
 Zip            DECIMAL,
 Degree         VARCHAR(20),
 DeptId         DECIMAL,
 hours          DECIMAL,
 Gpa            DECIMAL,
PRIMARY KEY (Sid),
FOREIGN KEY(`DeptId`) REFERENCES `DEPARTMENTS`(`DeptId`)
ON UPDATE CASCADE ON DELETE SET NULL);
Query OK, 0 rows affected

mysql> CREATE TABLE ENROLLMENTS
(Sid            DECIMAL,
 Term           VARCHAR(20),
 LineNo         DECIMAL,
 Grade          VARCHAR(20),
PRIMARY KEY (Sid,Term,LineNo),
FOREIGN KEY(`Sid`) REFERENCES `STUDENTS`(`Sid`));
Query OK, 0 rows affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (100, 'Computer Science','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (200, 'Mathematics','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (300, 'Physics','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (400, 'Engineering','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (500, 'Biology','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO DEPARTMENTS (DeptId,DeptName,College)
VALUES (600, 'History','NJIT');
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (101, 'Java Programming',2,100);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (201,'Calculus',2,200);
```

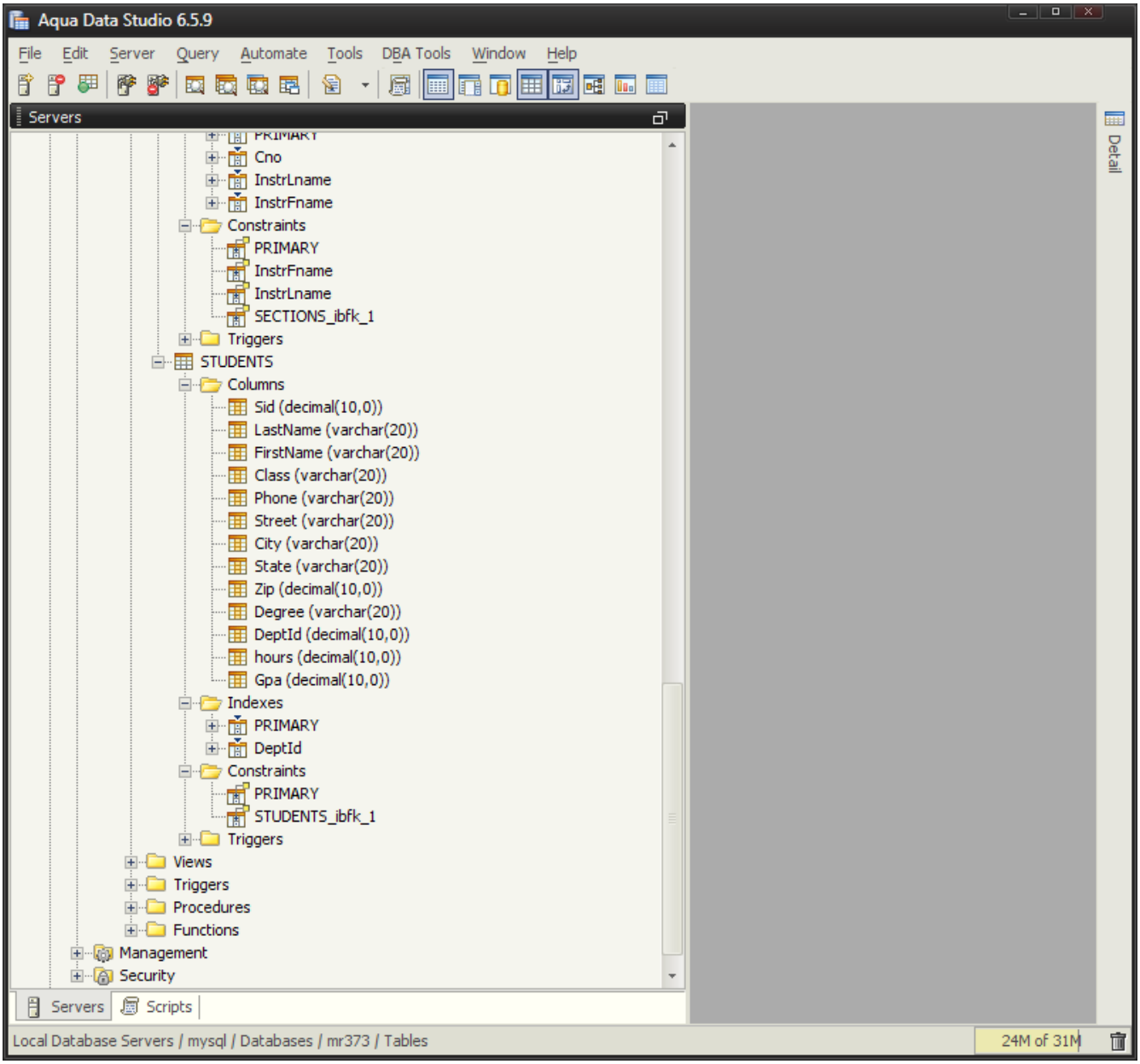
```
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (301,'Physics I',2,300);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (401,'Engineering I',2,400);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (501,'Biology I',2,500);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (601,'Western Civ I',2,600);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (202,'Statistics',2,200);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (203,'Linear Algebra',2,200);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (102,'C++ Programming',2,100);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (103,'Database Concepts',2,100);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (502,'Biology II',2,500);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (302,'Physics II',2,300);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (402,'Engineering II',2,400);
Query OK, 1 row affected

mysql> INSERT INTO COURSES (Cno,Ctitle,Hours,DeptId)
VALUES (602,'Western Civ II',2,600);
Query OK, 1 row affected
```

```
mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('Smith','John',100,'GITC123',5555550001,'js123@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('Wong','Franklin',200,'GITC124',5555550002,'fw124@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('Zelaya','Alicia',300,'GITC125',5555550003,'az125@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('Wallace','Jennifer',400,'GITC126',5555550004,'jw126@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('Narayan','Ramesh',500,'GITC127',5555550005,'rn127@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO INSTRUCTORS (LastName,FirstName,DeptId,Office,Phone,Email)
VALUES ('English','Joyce',600,'GITC128',5555550006,'je128@njit.edu');
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',1,101,'Smith','John','CKB101','MW','11:00','01:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',2,102,'Smith','John','CKB102','MW','05:00','07:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',3,103,'Smith','John','CKB103','TF','10:00','12:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',4,201,'Wong','Franklin','CKB201','MW','11:00','01:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',5,202,'Wong','Franklin','CKB202','MW','05:00','07:00',100);
Query OK, 1 row affected
```

```
mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',6,203,'Wong','Franklin','CKB203','TF','10:00','12:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',7,301,'Zelaya','Alicia','CKB301','MW','11:00','01:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',8,302,'Zelaya','Alicia','CKB302','TF','10:00','12:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',9,401,'Wallace','Jennifer','CKB401','MW','11:00','01:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',10,402,'Wallace','Jennifer','CKB402','MW','05:00','07:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',11,501,'Narayan','Ramesh','CKB501','MW','11:00','01:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',12,502,'Narayan','Ramesh','CKB502','MW','05:00','07:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',13,601,'English','Joyce','CKB601','MW','10:00','12:00',100);
Query OK, 1 row affected

mysql> INSERT INTO SECTIONS
(Term,LineNo,Cno,InstrLname,InstrFname,Room,Days,StartTime,EndTime,Capacity)
VALUES ('Spring',14,602,'English','Joyce','CKB602','TF','10:00','12:00',100);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (1,'Doe','Jane','Freshman',1234567890,'1001 Broad
```

```
Street','Newark','NJ',07103,'BA',100,10,3.8);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (2,'Smith','Jeff','Sophomore',1234567891,'1001 Oak
Street','Irvington','NJ',07111,'BS',200,20,3.4);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (3,'Jones','Stephen','Senior',1234567892,'1001 Pine
Street','Bloomfield','NJ',08234,'BA',300,90,3.6);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (4,'Washington','Abner','Junior',1234567893,'1001 Green
Street','Union','NJ',08567,'BS',400,85,3.1);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (5,'Franklin','Horace','Freshman',1234567894,'1001 Redwood
Street','Wayne','NJ',07123,'BA',500,16,2.8);
Query OK, 1 row affected

mysql> INSERT INTO STUDENTS
(Sid,LastName,FirstName,Class,Phone,Street,City,State,Zip,Degree,DeptId,hours,Gpa)
VALUES (6,'Roosevelt','Lauren','Senior',1234567895,'1001 Grove
Street','Fords','NJ',08654,'BS',600,94,4.0);
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (1,'Spring',1,'A');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (1,'Spring',2,'B');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (2,'Spring',3,'A');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (2,'Spring',4,'C');
Query OK, 1 row affected
```

```
mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (3,'Spring',5,'B');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (3,'Spring',6,'A');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (4,'Spring',7,'C');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (4,'Spring',8,'A');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (5,'Spring',9,'B');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (5,'Spring',10,'B');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (6,'Spring',11,'A');
Query OK, 1 row affected

mysql> INSERT INTO ENROLLMENTS (Sid,Term,LineNo,Grade)
VALUES (6,'Spring',12,'B');
Query OK, 1 row affected
```




Project Deliverable 2

University Student Database

In this section of the project, we altered several tables to include constraints. We added constraints to make sure the department number was greater than 99, to check that a course's hours were less than 4, to check that the capacity of a course section was no more than 100, to check that an instructor's phone number was in the correct format, for example, no more than 10 digits and no less than 0, and to check that a student was from the state of New Jersey. We also created three triggers. One was to update the student table's gpa field based on the grade. If the new gpa was 0, nothing is changed, if it was 2, then it was added to the old gpa and divided by two, to adjust for the new value, and so on. We also added a trigger for the insertion or deletion of courses, which affects the hours field

in the students table. We ran into problems with deleting a constraint after encountering an error and we also had some problems with mysql formatting when creating the triggers.

```
mysql> ALTER TABLE DEPARTMENTS
    -> ADD CONSTRAINT CHK_DID CHECK (DeptId > 99);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE COURSES
    -> ADD CONSTRAINT CHK_HOURS CHECK (Hours < 4);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE SECTIONS
    -> ADD CONSTRAINT CHK_CAP CHECK (Capacity <= 100);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE INSTRUCTORS
    -> ADD CONSTRAINT CHK_PHONE2 CHECK (Phone > 0 AND Phone < 9999999999);
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE STUDENTS
    -> ADD CONSTRAINT CHK_NJ CHECK (State = 'NJ');
Query OK, 0 rows affected
Records: 0  Duplicates: 0  Warnings: 0


mysql> delimiter //
mysql> CREATE TRIGGER upd_check BEFORE UPDATE ON STUDENTS
    -> FOR EACH ROW
    -> BEGIN
    -> IF NEW.GPA < 0 THEN
    -> SET NEW.GPA = 0 + OLD.GPA;
    -> ELSE IF NEW.GPA = 1 THEN
    -> SET NEW.GPA = ((OLD.GPA + NEW.GPA)/2);
    ->ELSEIF NEW.GPA = 2 THEN
    ->SET NEW.GPA = ((OLD.GPA + NEW.GPA)/2);
    ->ELSEIF NEW.GPA = 3 THEN
    ->SET NEW.GPA = ((OLD.GPA + NEW.GPA)/2);
    ->ELSEIF NEW.GPA = 4 THEN
    ->SET NEW.GPA = ((OLD.GPA + NEW.GPA)/2);
    -> END IF;
    -> END;//

mysql> CREATE TRIGGER insert_hours
    -> AFTER INSERT ON COURSES
    -> FOR EACH ROW
```

```
    -> BEGIN
    -> INSERT INTO STUDENTS
    -> SET HOURS = NEW.HOURS;
    -> END;
Query OK, 0 rows affected

mysql> CREATE TRIGGER delete_hours
    -> AFTER DELETE ON COURSES
    -> FOR EACH ROW
    -> BEGIN
    -> DELETE FROM STUDENTS
    -> WHERE HOURS = OLD.HOURS;
    -> END;
Query OK, 0 rows affected
```

Screenshots of the program running