Database project report

Business Requirement:

1- Department Management:
   - Each department must have a unique identifier, name, location and budget.
   - Departments can offer multiple courses.

2- Course Management:
   - Each course must have a unique ID, title and credit hours.
   - A course can have prerequisites that link it to other courses.
   - Every course must be associated with a department.

3- Student Management:
   - Each student must have a unique ID, first name, last name, phone number ,sex ,department id and total credit.
   - Every student must register in one department.
   - Each student should receive grades for the sections the takes.

4- Instructor Management:
   - Each instructor must have a unique ID, first name, last name, phone number ,sex ,department id and salary.
   - Each instructor instructs only one department.
   - Instructors can teach multiple sections.

5- Section Management:
   - Each section must have a unique ID, semester and year.
   - A section must be associated with a specific schedule and classroom.

6- Classroom Management:
   - Each classroom must have a unique class number, capacity and a building.
   - Classrooms can be assigned to sections.

7- Time Slot Management:
   - Each time slot must include a day and period number.
   - Each section must be assigned a specific time slot.
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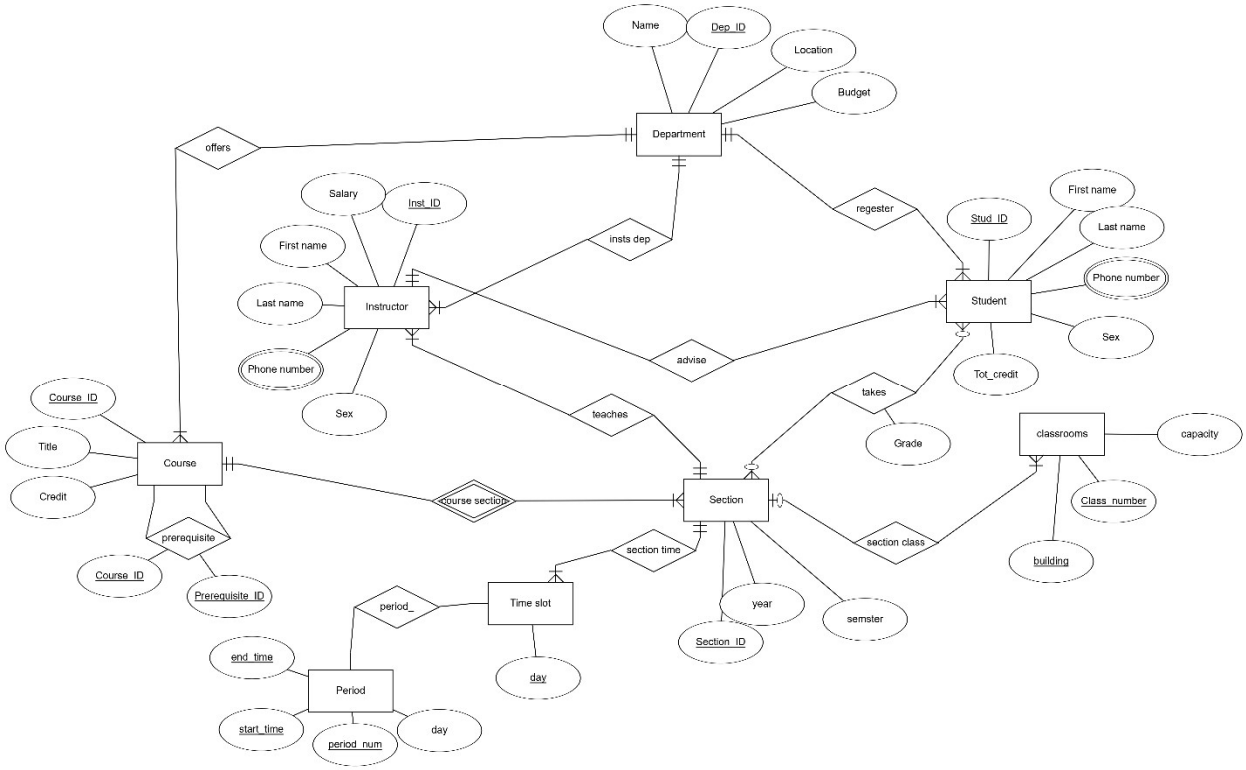
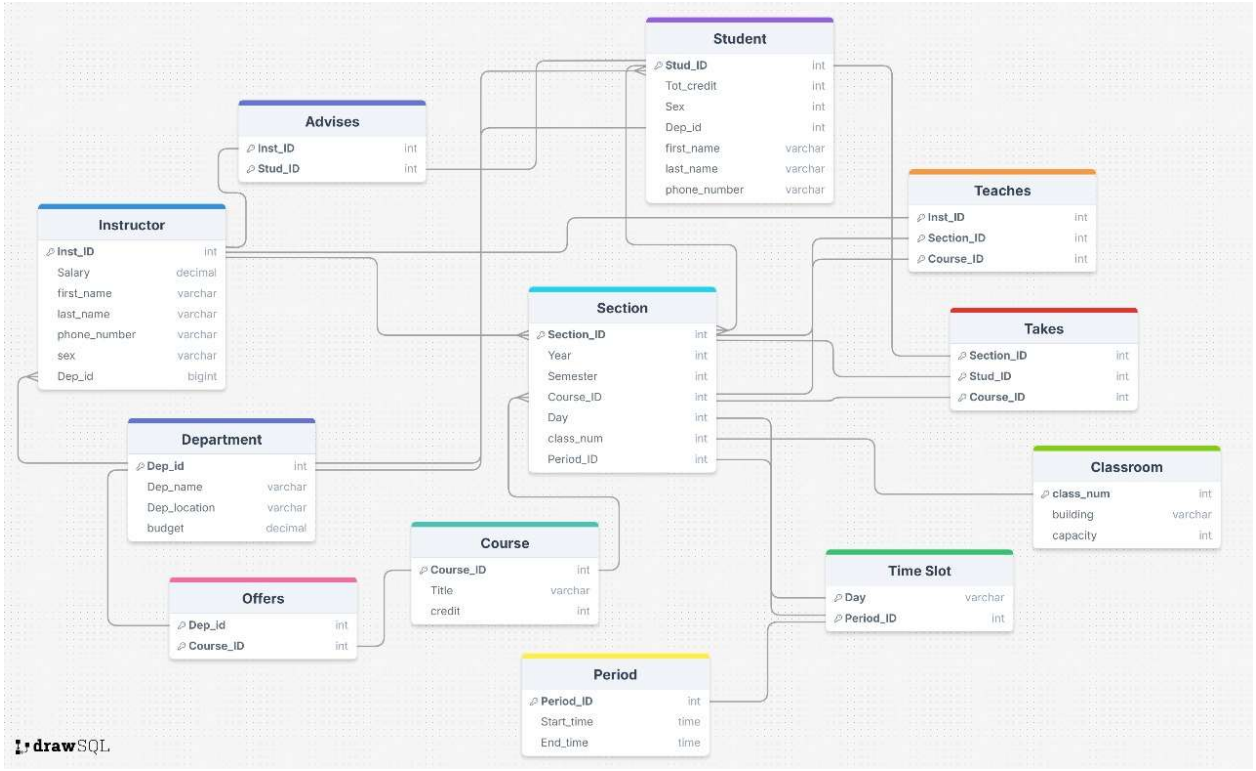
8- Scheduling and Registration:
   - Students can register for available sections based on their schedules.
   - Sections must have assigned instructors and classrooms.

ERD:



Schema:



SQL explanation:

1- Database creation:
   - “create database University;”
     Creates a new database named University.
   - “use Final_university;”
     Specifies the database context to execute subsequent queries.

2- Table Creation:
   a- “department” Table
      -Represents university departments.
      -Fields:
         1) “dep_id” (Primary key, auto-incrementing ID)
         2) “dep_name” (Department name)
         3) “dep_location” (Location)
         4) “Budget”
   b- “instructor” Table
      -Fields:
         1) “inst_id” (Primary key, auto-incrementing ID)
         2) “first_name”, “last_name”
         3) “phone_number” (multivalued attribute)
         4) “sex”
         5) “salary”
         6) “dep_id” (Foreign key referencing “department”)
   c- “student” Table
      -Fields:
         1) “stud_id” (Primary key, auto-incrementing ID)
         2) “first_name”, “last_name”
         3) “phone_number” (multivalued attribute)
         4) “sex”
         5) “tot_credit”
         6) “dep_id” (Foreign key referencing “department”)

d- “course” Table
-Fields:
1) “course_id” (Primary key)
2) “title”, “credit”

e- “classroom” Table
-Fields:
1)“class_num” (Primary key, auto-incrementing ID)
2) “building”, “capacity

f- “period” Table
-Fields:
1) “period_id” (Primary key, auto-incrementing ID)
2) “start_time”, “end_time”

g- “[time slot]” Table
-Fields
1) “day”
2) “period_id” (Foreign key referencing “period”)
3) Composite Primary Key: “day”, “period”

h- “section” Table
-Fields:
1) “section_id” (Primary key, auto-incrementing ID)
2) “year”, “semester”
3) Relationships with other tables:
a- “course_ID” (Foreign key referencing “course”)
b- “day”, “period_id” (Foreign key referencing “[time slot]”)
c- “class_num” (Foreign key referencing “classroom”)
d- “inst_id” (Foreign key referencing “instructor”)

i- Junction Tables (To manage many-to-many relationships)
1) “[department offers courses]” → Links departments and courses.
2) “[instructor advises students]” → Links instructors and students.
3) “[instructors teach sections]”→ Links instructors and sections.
4) “[students take sections]”→ Links students, sections and courses.

3- Initial Data Insertion:

- "period" Table
  Inserts 6 time periods with start and end times (e.g., '8:30', '10:30').
- "[time slot]" Table:
  Inserts all combinations of days ('saturday ' to 'thursday') and time periods (1-6).

Some SQL statements to retrieve data:

1) Retrieve all departments
   "select * from departments;"
2) List all courses offered by each department
   "Select d.dep_nam, c.title
   From [department offers courses] doc
   Join department d on doc.dep_id = d.dep_id
   Join course c on doc.course_id = c.course_id ;"
3) List instructors in each department
   "Select i.first_name, i.last_name, d.dep_name
   From instructor i
   Join department d on i.dep_id = d.dep_id;"
4) Find all students are advised by a specific instructor
   "Select s.first_name, s.last_name
   From [instructor advises students] ias
   Join student s on ias.stud_id = s.stud_id
   Where ias.inst_id = 1; "replace 1 with the desired instructor id""
5) Retrieve class schedule for a specific day
   "Select ts.day,p.start_time,p.end_time,s.section_id,c.title,
   cl.building,cl.capacity
   From section s
   Join [time slot] ts on s.day = ts.day and s.period_id = ts.period_id
   Join period p on ts.period_id = p.period_id
   Join course c on s.course_ID = c.course_ID
   Join classroom cl on s.class_num = cl.class_num
   Where ts.day = 'monday'; "replace monday with the desired day""

6) List students enrolled in a specific course

“Select s.first_name, s.last_name
From [student takes sections] sts
Join student s on sts.stud_id = s.stud_id
Join cource c on sts.course_id = c.course_id
Where c.title = ‘Database’; “replace Database with the desired course title””

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