Lebanese University **Faculty of Media and Documentation** **- Section 1 -** **Computer Science** **First Year - Semester 1** **Database 1**		**الجامعة اللبنانية** **كلية الإعلام والتوثيق** **- الفرع الأول -** **Chapter 2: ER model- exercices**

Exercise 1: Draw an ERD for the following description:

A department controls a number of projects, each of which has a unique name, a unique number, and a single location.

Entities:

1. **DEPARTMENT**
2. **Project**

Attributes:

- **DEPARTMENT**:
- **Project**: name, number, location

Relation: Controls

Exercise 2: Draw an ERD for the following description.

- Each department has a unique name, a unique number, and a particular employee who manages the department.
- We keep track of the start date when that employee began managing the department.
- A department may have several locations

Entities:

3. **DEPARTMENT**

4. **EMPLOYEE**

Attributes:

- **DEPARTMENT**: name, number, location

- **EMPLOYEE**:

Relation: manage : start date

Exercise 3: Draw an ERD for the following description:

We store each employee's name ~~(first, last, MI),~~ Social Security number (SSN), street address, salary, sex (gender), and birth date. An employee is assigned to one department, but may work on several projects, which are not necessarily controlled by the same department. We keep track of the current number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee (who is another employee).

step 1: Identify Entities and Attributes

Entities:

1. Employee
    - Attributes: SSN (Primary Key), FirstName, LastName, MI, Address, Salary, Sex, BirthDate
    - Special: Each Employee has a supervisor, which is another Employee (recursive relationship).
2. Department
    - Attributes: DeptID (Primary Key), DeptName
3. Project
    - Attributes: ProjectID (Primary Key), ProjectName, Location

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📌 Step 2: Identify Relationships

1. Employee – Department
    - Each Employee is assigned to one Department.
    - Each Department has many Employees.
    - Relationship: WorksIn (1 Department → N Employees).
2. Department – Project
    - Each Department controls many Projects.
    - A Project is controlled by one Department.
    - Relationship: Controls (1 Department → N Projects).
3. Employee – Project
    - Each Employee may work on many Projects.
    - Each Project may have many Employees.
    - This is a Many-to-Many (M:N) relationship.
    - Extra attribute: HoursPerWeek.
    - Relationship: WorksOn (M:N).
4. Employee – Employee (Supervisor)
    - Each Employee has one Supervisor.
    - A Supervisor can supervise many Employees.
    - Recursive 1:N relationship: Supervises.

📌 Step 3: ERD Structure (Textual Description)

- Employee(SSN, FirstName, LastName, MI, Address, Salary, Sex, BirthDate, SupervisorSSN [FK])
- Department(DeptID, DeptName)
- Project(ProjectID, ProjectName, Location, DeptID [FK])
- WorksOn(SSN [FK], ProjectID [FK], HoursPerWeek)

📌 Step 4: Draw

- Department controls Project (1:N).
- Employee works in Department (N:1).
- Employee works on Project (M:N, with attribute HoursPerWeek).
- Employee supervises Employee (recursive 1:N).

Exercise 4:

The Scenario:

A University contains many Faculties. The Faculties in turn are divided into several Schools. Each School offers numerous programs and each program contains many courses. Lecturers can teach many different courses and even the same course numerous times. Courses can also be taught by many lecturers. A student is enrolled in only one program but a program can contain many students. Students can be enrolled in many courses at the same time and the courses have many students enrolled.

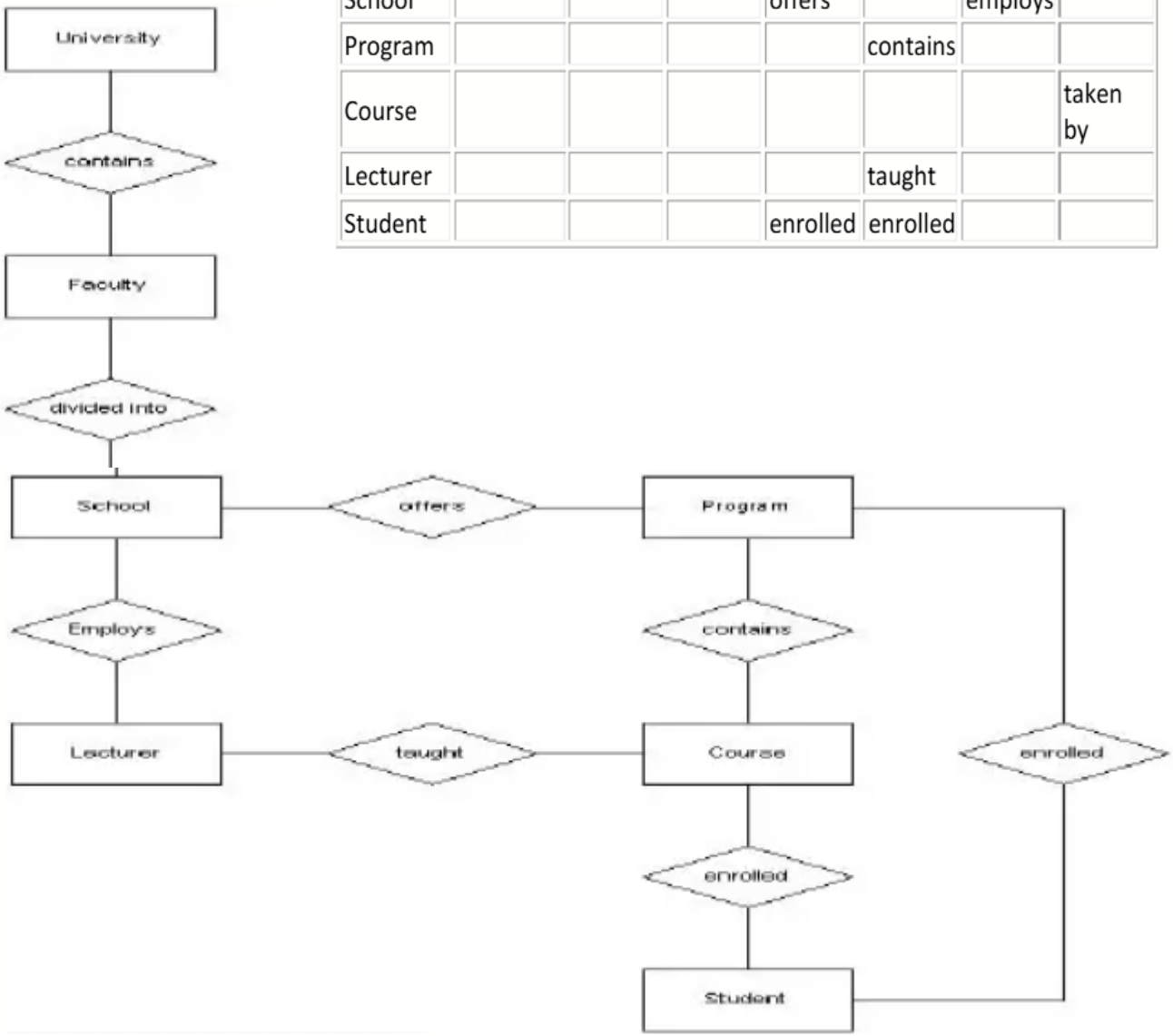
Step 1 - Identify Entities

The entities in this scenario are

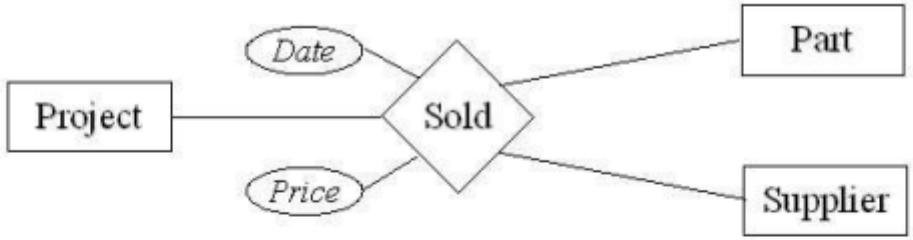
- University
- Faculty
- School
- Program
- Course
- Lecturer
- Student

Step 2 - Find relationships

	University	Faculty	School	Program	Course	Lecturer	Student
University		contains					
Faculty			divided into				
School				offers		employs	
Program					contains		
Course							taken by
Lecturer					taught		
Student				enrolled	enrolled		

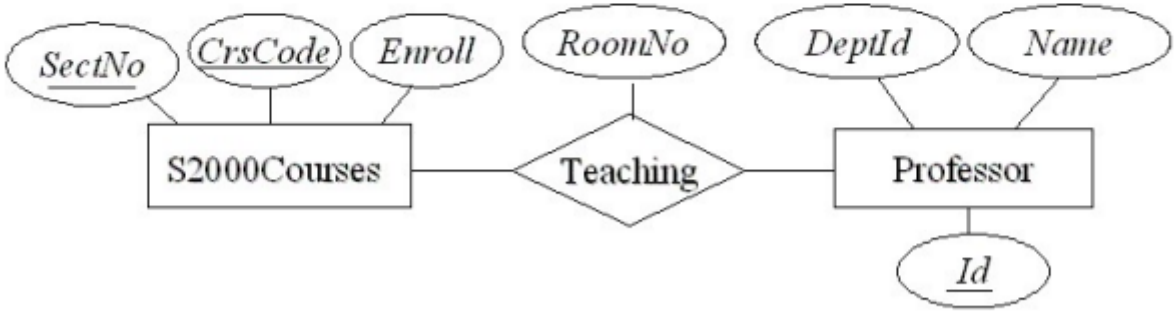


Example 2



- Project(<u>ProjId</u>, Name, TotalCost, StartDate)
- Parts(<u>UPC</u>, PartName, Weight, WSPrice)
- Suppliers(<u>SupId</u>, Name, Address)
- **Sold(<u>ProjId</u>, <u>UPC</u>, <u>SupId</u>, Date, Price)**

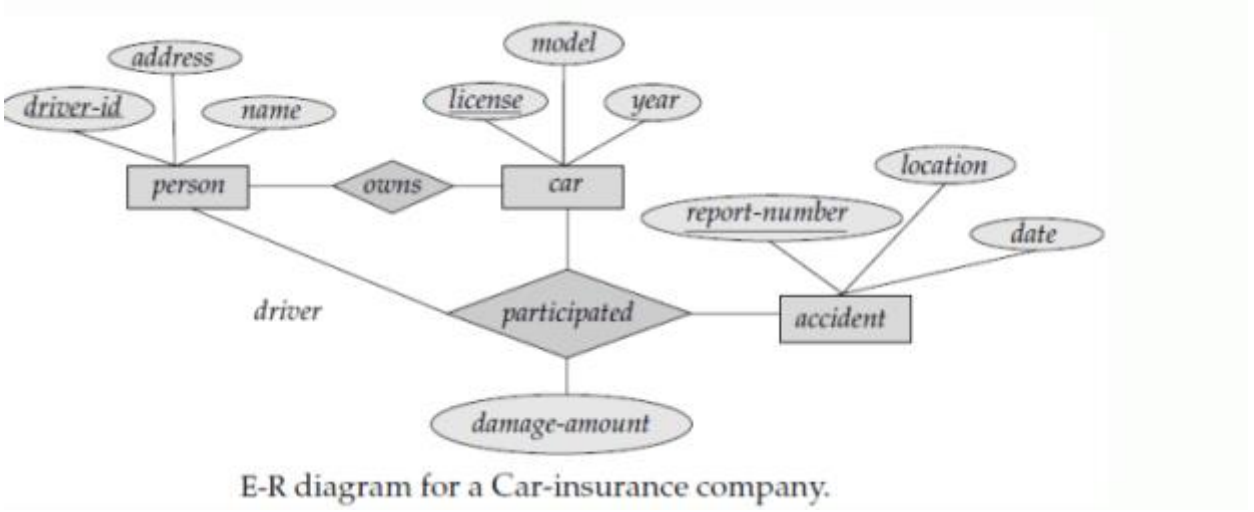
Example 3:



- S2000Courses (<u>CrsCode</u>, <u>SectNo</u>, Enroll)
- Professor (<u>Id</u>, DeptId, Name)
- **Teaching (<u>CrsCode</u>, <u>SecNo</u>, <u>Id</u>, RoomNo)**

Exercise 5:

Construct appropriate tables for the below ER diagram for a car-insurance company.



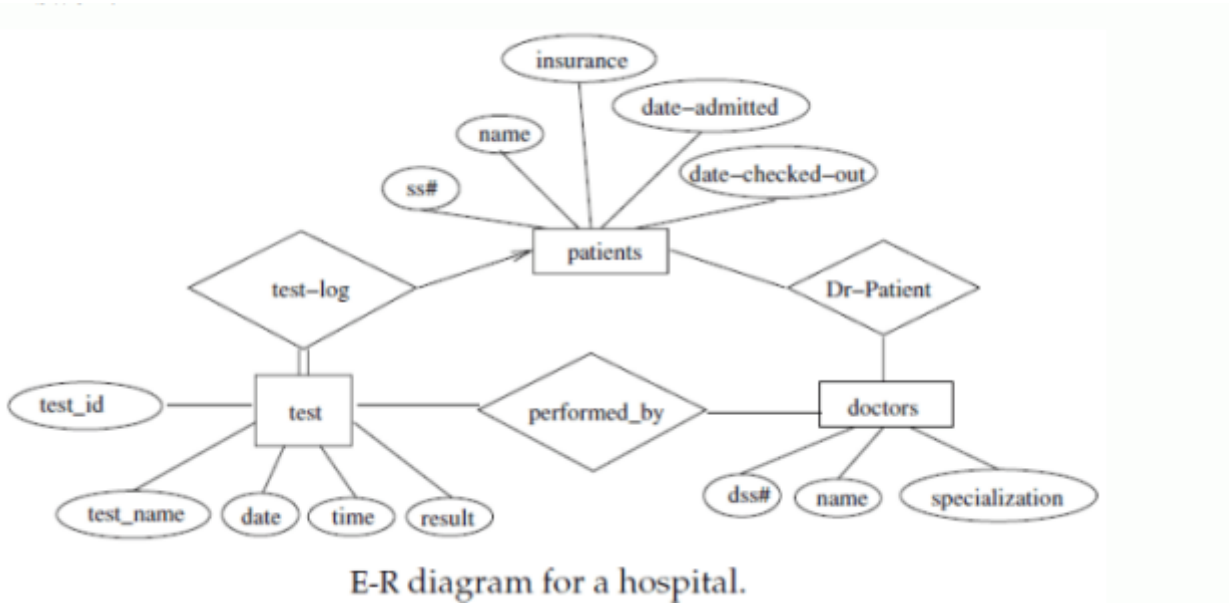
E-R diagram for a Car-insurance company.

Car insurance tables:

- person (driver-id, name, address)
- car (license, year,model)
- accident (report-number, date, location)
- participated(driver-id, license, report-number, damage-amount)

Exercise 6:

Construct appropriate tables for the below ER diagram for a hospital.



E-R diagram for a hospital.

- Patient(SS#, name, insurance)
- Physician (name, specialization)
- Test-log(SS#, test-name, date, time)
- Doctor-patient (physician-name, SS#)
- Patient-history(SS#, test-name, date)