Class 3: ER diagram

Name: ID:

**Objective:**  
The goal of this activity is to practice designing schema diagrams based on given requirements. Focus on practicing rather than achieving perfect accuracy—you will not lose points for mistakes.

**Guidelines:**

* Feel free to ask questions, refer to lecture notes, discuss with your peers (for this in-class activity, you can blame your peers for your mistakes).
* However, use references as a guide rather than copying solutions directly.

1. Design a **database schema** based on the following **requirements:**

The company is organized into departments. 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.

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

The database will store each employee’s name, social security number, 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. It is required to keep track of the current number of hours per week that an employee works on each project, as well as the direct supervisor of each employee (who is another employee).

The database will keep track of the dependents of each employee for insurance purposes, including each dependent’s name, sex (gender), birth date, and relationship to the employee.

List the entities, attributes, attribute types and your explanation:

|  |  |  |
| --- | --- | --- |
| **Entity Types** | **Attributes (Type:** Key, Composite, multivalued**)** | **Explanation** |
| Department  Employee | Name (Key),  Name (composite), Works\_on (multivalued), | Unique name is a key attribute,  Name is composed of F\_name and L\_name, |

**Complete the diagram with entities and attributes:**

EMPLOYEE

**List relationships and types:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Relationship type** | **Relation between** | **Cardinality ratio and**  **Explanation** | | **Participation and**  **Explanation** | |
| 1. Manages | 1. EMPLOYEE 2. DEPARTMENT | 1:1 | One employee manages one department and vice versa. | P:T | Some employees manage, but all departments are managed. |

**Complete the diagram with entities, relations and relation attributes:**

EMPLOYEE

DEPARTMENT

MANAGES

1

1

Name: ID:

1. Suppose that a database is needed to keep track of student enrollments in classes and students’ final grades. After analyzing the mini-world rules and the users’ needs, the requirements for this database were determined to be as follows:

The university is organized into colleges (COLLEGE), and each college has a unique name (CName), a main office (COffice) and phone (CPhone), and a particular faculty member who is the dean of the college. Each college administers a number of academic departments (DEPARTMENT). Each department has a unique name (DName), a unique code number (DCode), a main office (DOffice) and phone (DPhone), and a particular faculty member who chairs the department. We keep track of the start date (CStartDate) when that faculty member began chairing the department.

A department offers a number of courses (COURSE), each of which has a unique course name (CoName), a unique code number (CCode), a course level (Level: this can be coded as 1 for freshman level, 2 for sophomore, 3 for junior, 4 for senior, 5 for graduate level), a course credit hour (Credits), and a course description (CDesc).

The database also keeps track of instructors (INSTRUCTOR); and each instructor has a unique identifier (Id), name (IName), office (IOffice), phone (IPhone), and rank (Rank); in addition, each instructor works for one primary academic department.

The database will keep student data (STUDENT) and stores each student’s name (SName, composed of first name (FName), middle name (MName), last name (LName)), student id (Sid, unique for every student), address (Addr), phone (Phone), major code (Major), and date of birth (DoB). A student is assigned to one primary academic department. It is required to keep track of the student’s grades in each section the student has completed.

Courses are offered as sections (SECTION). Each section is related to a single course and a single instructor and has a unique section identifier (SecId). A section also has a section number (SecNo), semester (Sem), year (Year), classroom (CRoom: this is coded as a combination of building code (Bldg) and room number (RoomNo) within the building), and days/times (DaysTime: for example, ‘MWF 9 am-9.50 am’ or ‘TR 3.30 pm-5.20 pm’). The database keeps track of the students in each section, and the grade is recorded when available (this is a many-to-many relationship between students and sections).

List the entities, attributes and attribute types:

|  |  |  |
| --- | --- | --- |
| **Entity Types** | **Attributes (Type:** Key, Composite, multivalued**)** | **Explanation** |
|  |  |  |

**Complete the diagram with entities and attributes:**

List relationships:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Relation between** | **Cardinality ratio and**  **Explanation** | | **Participation and**  **Explanation** | |
|  |  |  |  |  |  |

**Complete the diagram with entities, relations and relation attributes:**