

# Database Laboratory

## Lesson 1

Introduction to databases

# Data Dictionary

- A data dictionary collects information from **entities** and **relationships**
- Main reasons to use data dictionaries:
  1. To handle details in large systems
  2. To communicate a common meaning for all system elements
  3. To document system features
  4. To locate errors and omissions

# Data dictionary: entities

- An entity is a “thing” or “object” in the real world that is distinguishable from all other objects.
- An entity has a set of **attributes**, and some of them may identify the entity (the national identity document -NID- identifies a person).
- Entity examples:
  - Person: name, surname, NID, address
  - Subject: code, name, plan, theory credits, laboratory credits, course, etc.

# Data dictionary: relationships

- A **relationship** is an association among several entities.
- Relationship example:
  - **Enrolled in** (between **student** and **subject**)
  - A student can be enrolled in at least 1 subject and at most n subjects.
  - A subject can have a minimum enrollment of 0 students and a maximum of n students.
  - Relationships can also have **attributes** (student enrolled in an **academic year**).

# Data dictionary

- Template:

Entity	Attribute	Domain	Restriction

Relationship	Entities	Cardinality	Attribute

# Data dictionary: entities

Entity	Attribute	Domain	Restriction
Person			
	SSN	INTEGER	0 < PK < 9999999999
	name	CHAR 40	Name and surname: only characters and spaces
	address		composite
	telephone	INTEGER	Multivalued, 9xxxxxxxx/6xxxxxxxx
Client			
	Email	CHAR 40	Pk
Employee			
	ID	INTEGER	Pk

# Data dictionary: relationships

Relationship	Entities	Cardinality	Attributes
Enrolled in	Student-Subject	N:M	Mark
Teach	Professor – Student	N:M	
Manage	Professor - Department	1:1	Start date
Belongs to	Professor- Department	1:N	

# Exercises



# Exercise 1

- Design a relational database for a company that has to manage employees, departments and projects.
  - The company is organized into departments. Each department has a number and name that are unique and there is a certain employee who manage it. We are interested in the date on which that employee began to manage the department. In addition a department can be distributed in several places of the company.
  - Each department controls a certain number of projects. Each project has a unique name and number, and is carried out in a single place.
  - The name, social security number, address, salary, gender and date of birth will be stored for each employee. Every employee is assigned to a department, but can work on several projects, which will not necessarily be controlled by the same department. We are interested in the number of hours per week an employee works on each project and we are also interested in who is the direct supervisor of each employee.
  - We also want to keep data of the family members of each employee in order to manage their insurance. The name, gender, date of birth and family relationship will be stored for each family member.

# Exercise 2

- A video club has decided to use a database to store information regarding the films it offers for rent. The information is as follows:
  - A film is characterized by its title, nationality, producer, date and role played by the main actors.
  - Several actors can participate in a movie (name, nationality, gender), some of them as main actors.
  - A film is directed by a director (name, nationality).
  - Each film has one or several copies identified by a copy number and characterized by their state of preservation.
  - A copy can be found rented to a client (ID, name, address, telephone). We want to store the rental start date and the return date.
  - A client has to be endorsed by another client who responds to him in case of problems in the rental.

# Exercise 3

- Design a database with a schema that captures all the information that art galleries need to maintain.
  - Galleries keep information about artists, their names (which are unique), birthplaces, age, and style of art.
  - For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lifes, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group.
  - Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like. Draw the ER diagram for the database.