University
Mohammed VI
Polytechnic

College of Computing

Moroccan National Health Services (MNHS)

Data Management Course

Mohammed VI Polytechnic University (UM6P)

Professor: Karima Echihabi **Program:** Computer Engineering

Session: Fall 2025

Part I : Conceptual Design

Preparatory Exercises

Before starting the MNHS project, students should review and solve the following textbook exercises.

Textbook Exercises

Reference: Ramakrishnan, Raghu, and Johannes Gehrke, *Database Management Systems*, 3rd Ed. [1].

- Chapter 2 (Introduction to Database Design): Exercises 2.1, 2.3, 2.5

Objectives

- Understand the MNHS project domain and define core requirements.
- Identify entities, attributes, relationships, and participation/cardinality constraints.
- Build a first-pass ER diagram.

MNHS Scenario

The Moroccan National Health Services (MNHS) aims to manage *patients, staff, hospitals, departments, appointments, prescriptions, medications, insurance, billing, and emergencies*. The design must support operational queries and future analytics.

Requirements

Patients

- Each patient has an internal identifier and a national identifier (`CIN`).
- Attributes: full name, date of birth, sex, blood group, phone.
- A patient may use several contact locations (e.g., home, work). Each includes street, city, province, postal code, and optional phone.

Staff

- Staff work in departments and interact with patients via clinical activities.
- For practitioners, capture license number and specialty when applicable.
- For caregiving staff, record grade and ward when relevant.
- For technical staff, record modality/equipment and certifications when relevant.

Hospitals and Departments

- Keep hospitals with name, city, region.
- Departments belong to one hospital.
- Staff are assigned to departments.

Appointments

- Track date, time, reason, and status (`Scheduled`, `Completed`, `Cancelled`).
- An appointment links exactly one patient and one staff member and occurs in one department.

Prescriptions and Medications

- A prescription is issued for a patient by a staff member on a given date.
- A prescription may include several medications; for each, record dosage and duration.
- Medications include: `DrugID`, name, form, strength, manufacturer, therapeutic class, and active ingredient .

Insurance and Billing

- Supported coverage types: CNOPS, CNSS, RAMED, private, or none.
- Bills must be attached to a clinical activity; some generated after consultations, others after prescriptions.
- A patient can have more than one insurance, and a bill is only linked to one insurance.

Emergencies

- Record patient, admission timestamp, triage level[1], outcome; optionally the staff member who handled triage/attending.

Pharmacy inventory

- Track for each hospital the on-hand quantity, reorder level, last restock timestamp, and unit price per medication.

Deliverable

- ER diagram with a one-page rationale explaining modeling choices, due on September 24th at 23:59.

[1]The triage level is the priority category assigned to a patient upon arrival at the Emergency, used to determine how quickly the patient requires medical attention. Typical categories range from *Immediate (Level 1)* to *Non-Urgent (Level 5)*.

References

[1] Raghu Ramakrishnan, Johannes Gehrke, and Johannes Gehrke. *Database management systems*, volume 3. McGraw-Hill New York, 2003.