# **Programming Assignment Unit 1**

Computer Science, University of the People

CS 2203-01 Databases 1 - AY2024-T3

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## Relations and Constraints for the Hospital Software System

For this assignment, we are tasked with designing the database for a hospital software system focusing specifically on capturing and managing the interactions between doctors, patients, and their appointments. Our primary goal is to define the necessary relations to accurately represent these entities and their interconnections within the system. This involves identifying the appropriate attributes for each entity, assigning data types to these attributes, and ensuring the correct degree of each relation. We must include specific details for the Doctor, Patient, and Appointment relations, each with its unique identifiers and relevant attributes as outlined in the requirements.

The following are the relations:

**Doctor Relation**

| **Attribute Name** | **Type** | **Domain** | **Optional** |
| --- | --- | --- | --- |
| DOCTOR\_ID | Unique identifier | Text | No |
| NAME | Single valued attribute | Text | No |
| PHONE | Single valued attribute | Text | Yes |
| SPECIALTY\_NUMBER | Single valued attribute | Numeric | No |
| SPECIALTY | Single valued attribute | Text | No |

Degree: 5

**Constraints:**

* **Entity Integrity Constraint**: DOCTOR\_ID must be a unique and non-null value to uniquely identify each doctor.
* **Domain Constraint**: PHONE must match a pattern like "+[Country Code][Number]" ensuring international standardization. SPECIALTY\_NUMBER is an integer representing a unique code for each speciality.
* **Unique Constraint**: Both DOCTOR\_ID and SPECIALTY\_NUMBER must be unique across the relation to prevent duplicate entries and ensure specialties are uniquely identified.

**Patient Relation**

| **Attribute Name** | **Type** | **Domain** | **Optional** |
| --- | --- | --- | --- |
| PATIENT\_ID | Unique identifier | Text | No |
| NAME | Single valued attribute | Text | No |
| PHONE | Single valued attribute | Text | Yes |
| EMAIL | Single valued attribute | Text | Yes |
| ADDRESS | Single valued attribute | Text | Yes |
| DATE\_ADDED | Single valued attribute | Date | No |
| ALLERGIES | Multi valued attribute | Text | Yes |
| DOCTOR\_ID | Foreign key | Text | No |

Degree: 8

Constraints:

* **Entity Integrity Constraint**: PATIENT\_ID must be unique and non-null to accurately track each patient.
* **Referential Integrity Constraint**: DOCTOR\_ID must match an existing DOCTOR\_ID in the Doctor relation, ensuring that each patient is associated with a valid doctor.
* **Domain Constraint**: EMAIL addresses must follow a standard format (e.g., "user@email.com"), and DATE\_ADDED must be a valid date.
* **Null Constraint**: PHONE, EMAIL, and ADDRESS are optional, allowing for incomplete patient records at the time of entry. However, DATE\_ADDED cannot be null, ensuring that the system tracks when each patient was added.

**Appointment Relation**

| **Attribute Name** | **Type** | **Domain** | **Optional** |
| --- | --- | --- | --- |
| APPOINTMENT\_ID | Unique identifier | Text | No |
| APPOINTMENT\_DATE | Single valued attribute | Date | No |
| DOCTOR\_ID | Foreign key | Text | No |
| PATIENT\_ID | Foreign key | Text | No |
| BLOOD\_PRESSURE | Single valued attribute | Text | Yes |
| PULSE | Single valued attribute | Numeric | Yes |
| TREATMENT\_NOTES | Single valued attribute | Text | Yes |
| MEDICINES | Multi valued attribute | Text | Yes |

Degree: 8

**Constraints:**

* **Entity Integrity Constraint**: APPOINTMENT\_ID must be unique and non-null to ensure each appointment is distinctly identifiable.
* **Referential Integrity Constraint**: DOCTOR\_ID and PATIENT\_ID must refer to existing entries in their respective relations, ensuring appointments are linked to valid doctors and patients.
* **Domain Constraint**: BLOOD\_PRESSURE should follow a specific format (e.g., "120/80 mmHg") and PULSE as beats per minute (bpm), ensuring consistency in medical records.
* **Null Constraint**: Allows for BLOOD\_PRESSURE, PULSE, TREATMENT\_NOTES, and MEDICINES to be optional, accommodating various stages of patient care and information availability at the time of the appointment.
* **Semantic Integrity Constraint**: APPOINTMENT\_DATE must not precede the DATE\_ADDED of the patient, ensuring logical sequencing of patient care events

This structure allows for a comprehensive tracking system of interactions between doctors and patients in a hospital setting. Each relation is designed to capture essential information and enforce data integrity through well-defined constraints, ensuring accurate and reliable data management within the software system.

## References

* Learning Guide Unit 1  
  <https://my.uopeople.edu/mod/book/view.php?id=402421>
* Sharma, N., Perniu, L., Chong, R. F., Iyer, A., Nandan, C., Mitea, A. C., Nonvinkere, M. & Danubianu, M. (2010). Database fundamentals. IBM Canada.  
  <https://my.uopeople.edu/pluginfile.php/1827130/mod_book/chapter/484065/Database_Fundamentals.pdf>
* Watt, A., & Eng, N. (2014). Database design,  2nd ed. BCcampus, BC Open Textbook Project.   
  <https://opentextbc.ca/dbdesign01/>  
  <https://my.uopeople.edu/pluginfile.php/1827130/mod_book/chapter/484065/Database-Design-2nd-Edition-1560272109.pdf>
* Unit 1 Lecture: Information Models

<https://my.uopeople.edu/mod/kalvidres/view.php?id=402427>

* Unit 1 Lecture: Relations  
  <https://my.uopeople.edu/mod/kalvidres/view.php?id=402428>
* Unit 1 Lecture: Constraints  
  <https://my.uopeople.edu/mod/kalvidres/view.php?id=402429>