Harmony IT Solution

Database Design and Programming

Tahaluf Training Center 2022

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1. Overview of Database
2. Introduction of Oracle Database
3. Development Life Cycle SDLC
4. Database Design Phases

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Overview of Database

- **A Database** is a collection of related data organized in a way that can make the process of data access, manage and update easier.

- **Database** can be hardware based or software based in order to store data.

What is DBMS?

- **DBMS** is software that allows users to build, create and manipulate the database, allowing them to process, analyze and store data easily.

- **DBMS** provides a tool or interface to perform different operations such as storing data, creating and updating it, and creating tables in the database.

Examples of popular **DBMS** used these days:

1. MySQL.
2. Oracle.
3. MS SQL Server.
4. IBM DB2.
5. PostgreSQL.
6. Amazon SimpleDB (cloud based).

etc..

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Introduction of Oracle Database

- An **Oracle database** is a combination of data treated as a unit. The purpose of a database is to retrieve and store related data.

- A database server is a key used to solve the problems of information management.

Oracle Database features:

1. Oracle database is cross-platform.

2. Oracle database has its networking stack.

3. ACID-compliant – Oracle is ACID-compliant Database that helps maintain data integrity and reliability.

4. Commitment to open technologies.

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Development Life Cycle
SDLC

- The **Software Development Life Cycle (SDLC)** is a methodology used to create a high-quality software.

- SDLC provides a structured flow of phases that used to help an organization to produce high quality software quickly.

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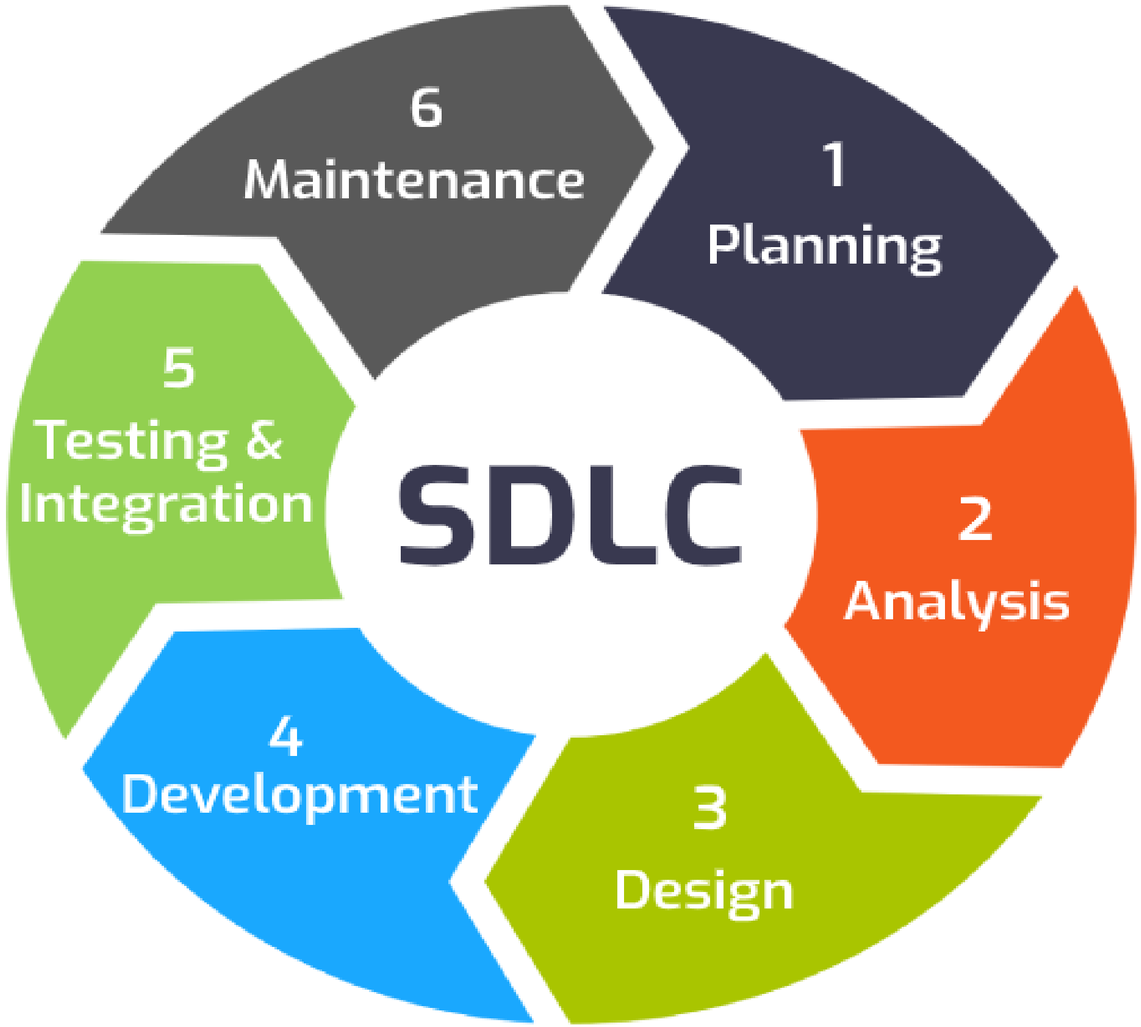

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Database Design Phases

- **Design methodology** is a structured approach that uses techniques, procedures, tools, and documentation aims to support and make the process of design easier.

- There are many **database design phases**, such as:
  1. Requirement analysis.
  2. ER – Diagram.
  3. Schema Diagram.
  4. Class Diagram.

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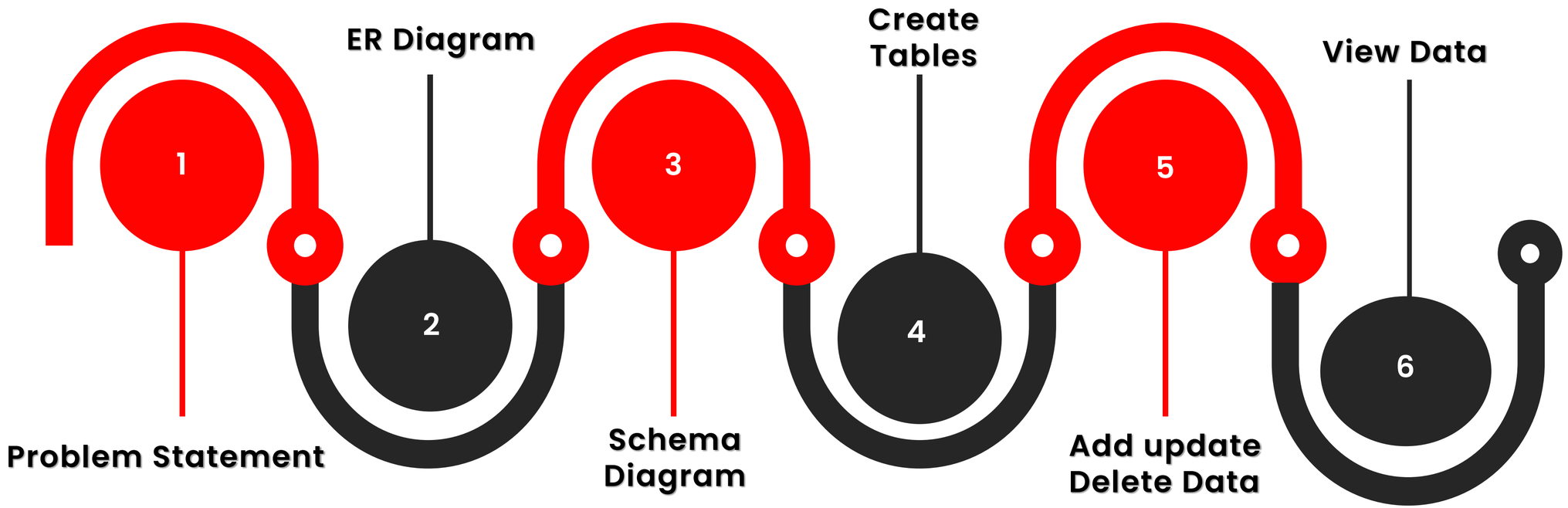


Database Design Cycle

What is Requirements Analysis?

- Requirements Analysis is the process of characterizing the expectations of the users for an application that is to be built or updated. It contains all the tasks that are produced to identify the needs of different stakeholders.

- Requirements analysis means to analyze, validate, document and manage system or software requirements.

Example:

In a LMS System, there are many courses teach by a many teachers. Each course has a name, status, date from and date to. Each course has an exam. In this system, there are many employees work in different positions.

Database Name: LMS.

Entities: Course, Teacher, Exam, Employee, Role.

Attributes:

1. Course: name, status, date from and date to.
2. Employees: First Name, Last Name, email, Phone Number … etc.

Relationships:

1. Many-to-Many: Course and Teacher.
2. One-to-One: Course and Exam.
3. One-to-Many: Role and Employee.

Attributes determine by a database creator based on System need.

Example:

In a hospital System, there are many doctors and other employees work, Doctors treat patients and provide them with care and medicines. There is a room for every patient entering the hospital.

Database Name: Hospital.

Entities: Room, Medicine, Patient, Employee, Role.

Attributes:

1. Employees: First Name, Last Name, email, Phone Number … etc.

Relationships:

1. Many-to-Many: Patient and Medicine.
2. One-to-One: Patient and room.
3. One-to-Many: Role and Employee, Employee and Patient.

Attributes determine by a database creator based on System need.

What is ER - Model?

- An **Entity–relationship model (ER model)** describes the structure of a database with a diagram, which is known as **Entity Relationship Diagram (ER Diagram).**

- An ER model represent a design of a database that can later be implemented as a database.

- An entity relationship diagram **(ERD)** displays the relationships of entities stored in a database.

ER – Diagram Components

- Entities are represented by rectangles.
- An entity is an object or thing about used to store information.

ER – Diagram Components

- Relationships are represented by diamond shapes, display how two entities share a data in the database.

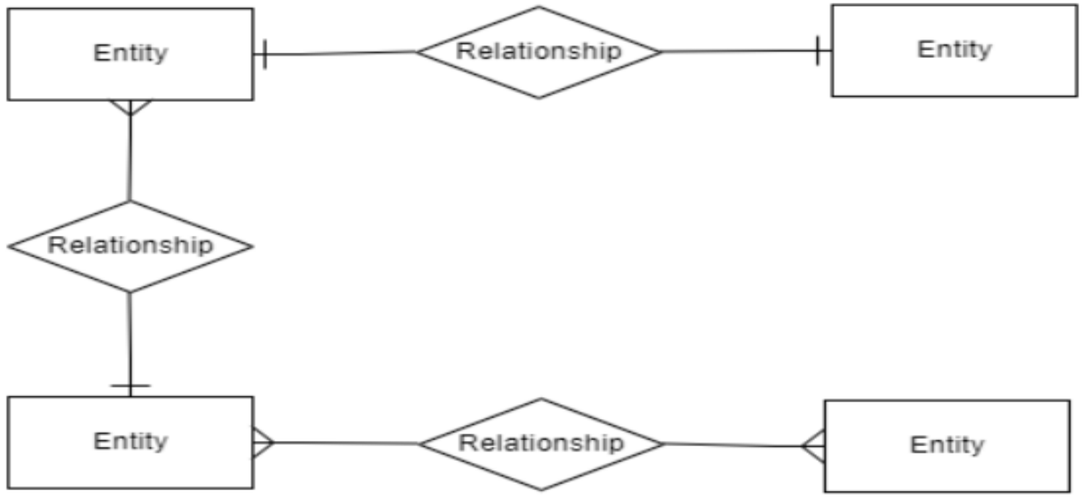
ER – Diagram Components

- Attributes are represented by ovals.
- A key attribute is the unique, special characteristic of the entity.

Example: an employee’s have a social security number.

ER – Diagram Components

- There are Three types of relationships:
  1. One to One.
  2. One to Many.
  3. Many to Many.



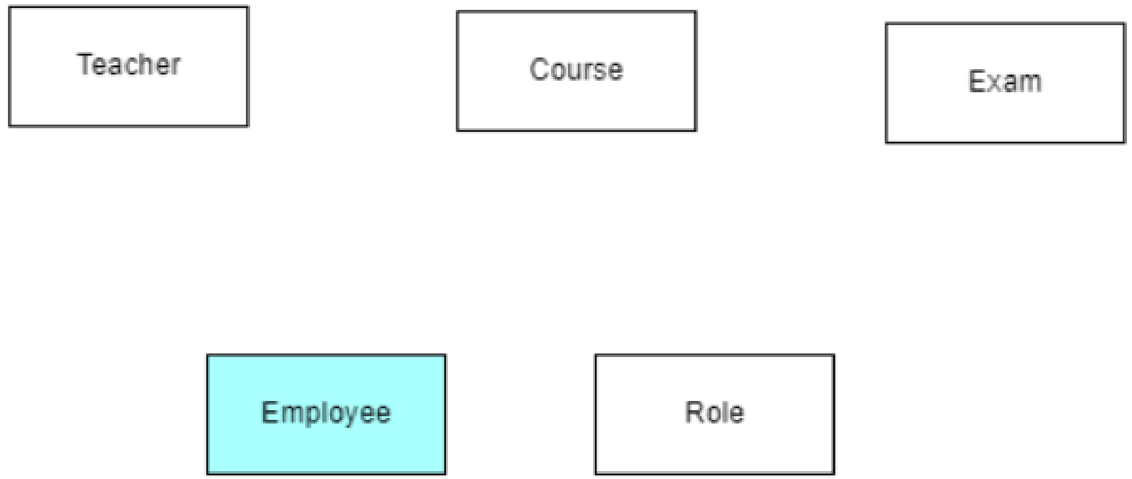
ER – Diagram Components

- **ERDPlus** is a web-based database modeling tool to create entity relationship (ER) diagrams, star schemas, relational schemas, and SQL DDL statements.

- Click on this link: https://erdplus.com/standalone

Example

1. Create an entities.



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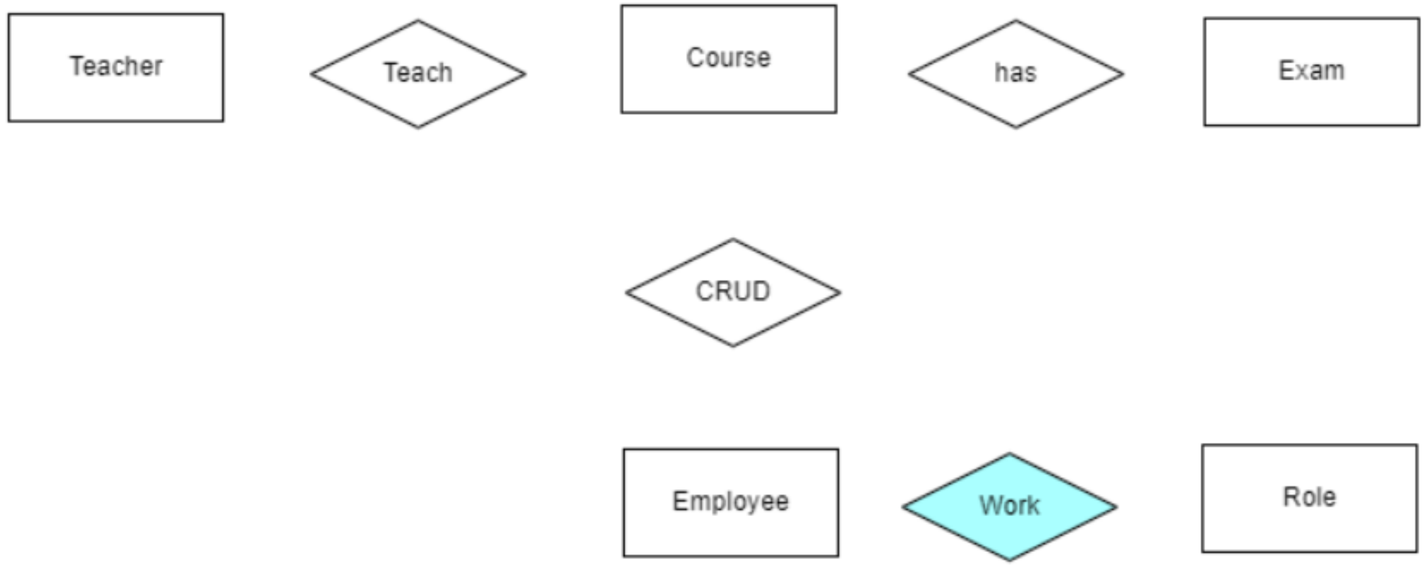
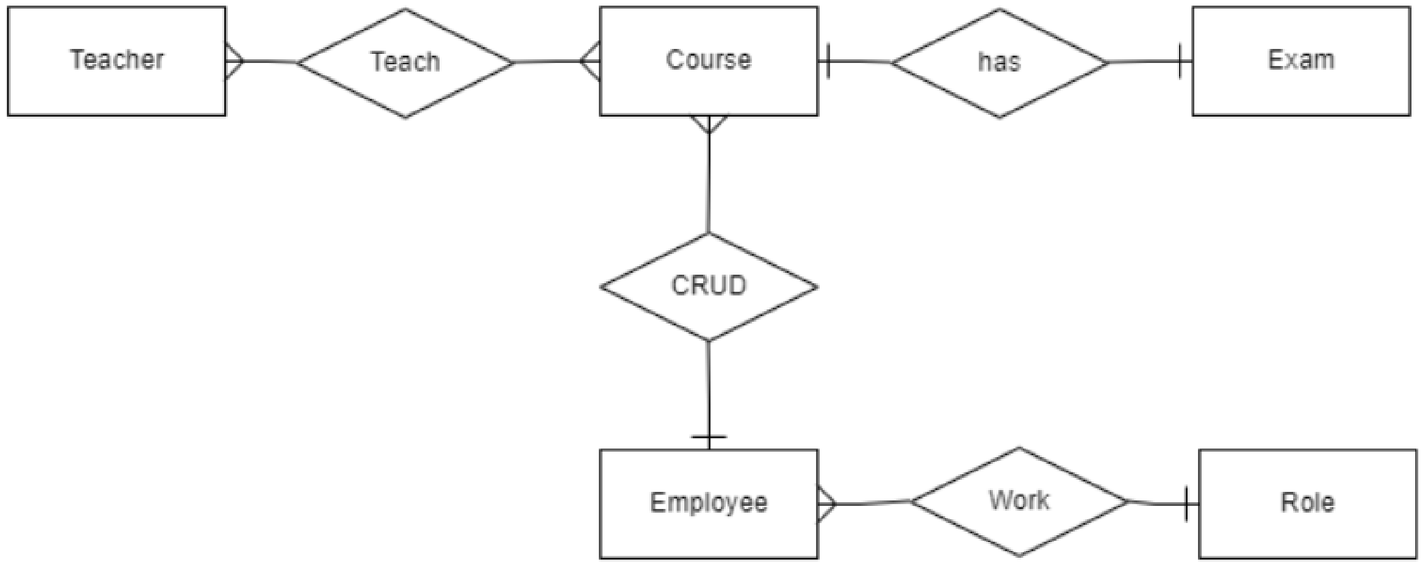
Example

2. Create a relationships.



Example

2. Create a relationships.



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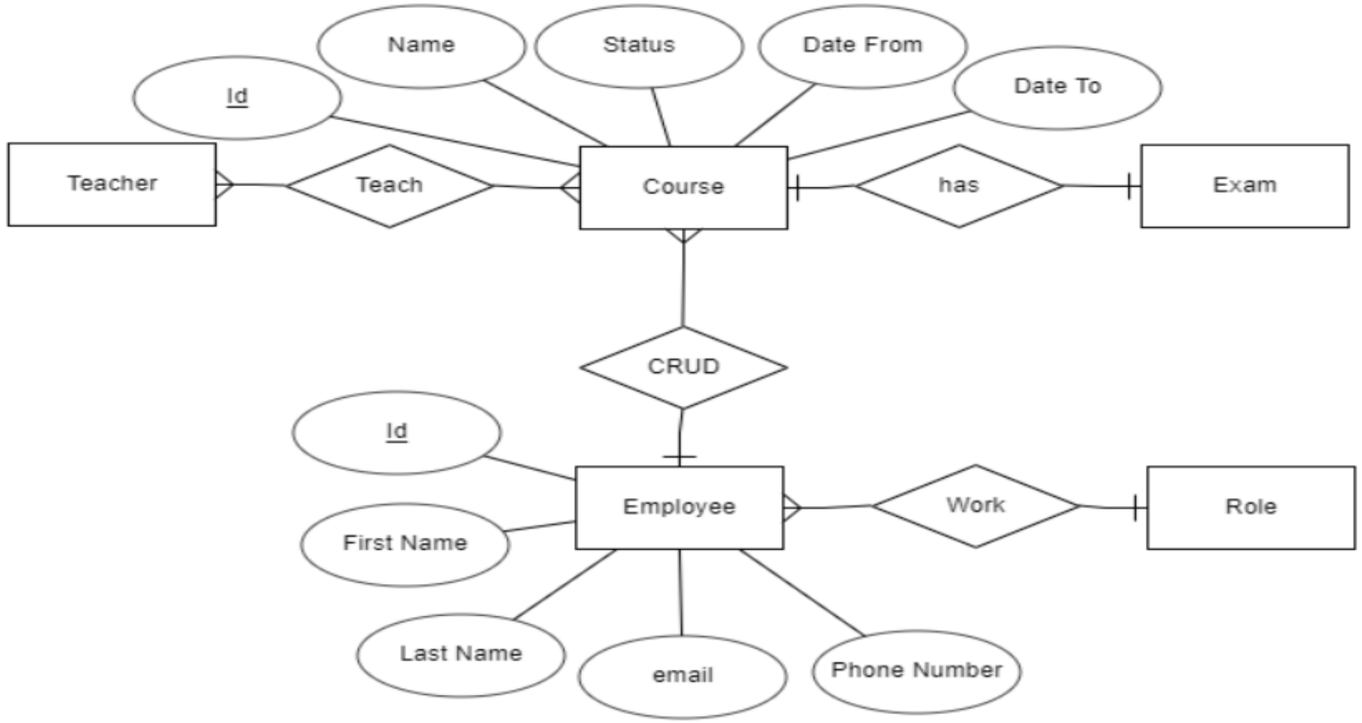
Example

3. Create an attributes.

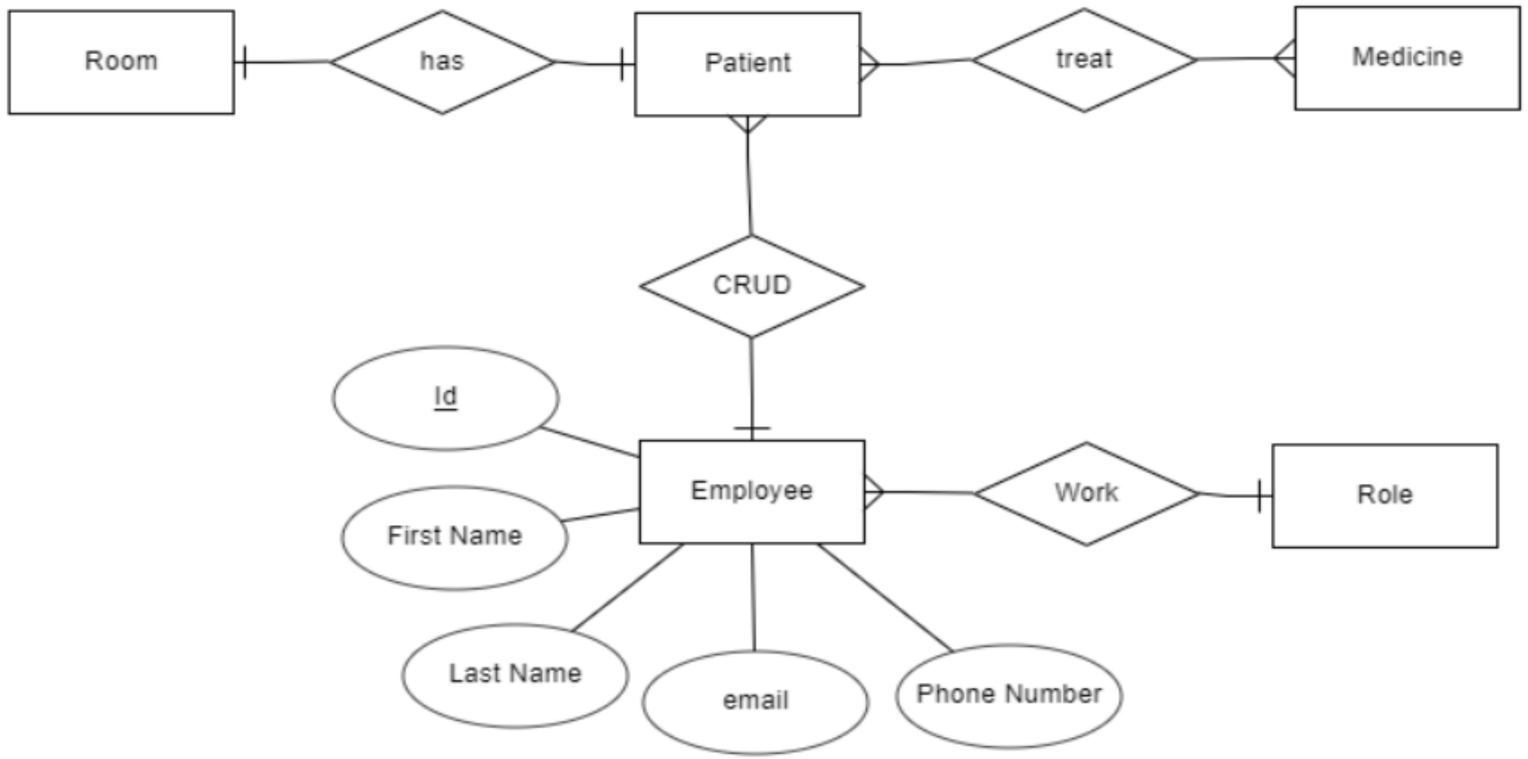


Exercise

Draw ER – Diagram for the following scenario:

In a hospital System, there are many doctors and other employees work. Doctors treat patients and provide them with care and medicines. There is a room for every patient entering the hospital.

Exercise Solution



What is Schema Diagram?

- Schema diagram contains attributes and entities.
- It only display the database design and does not display the actual data of the database.
- Schema can be a single table or more than one table which is related.

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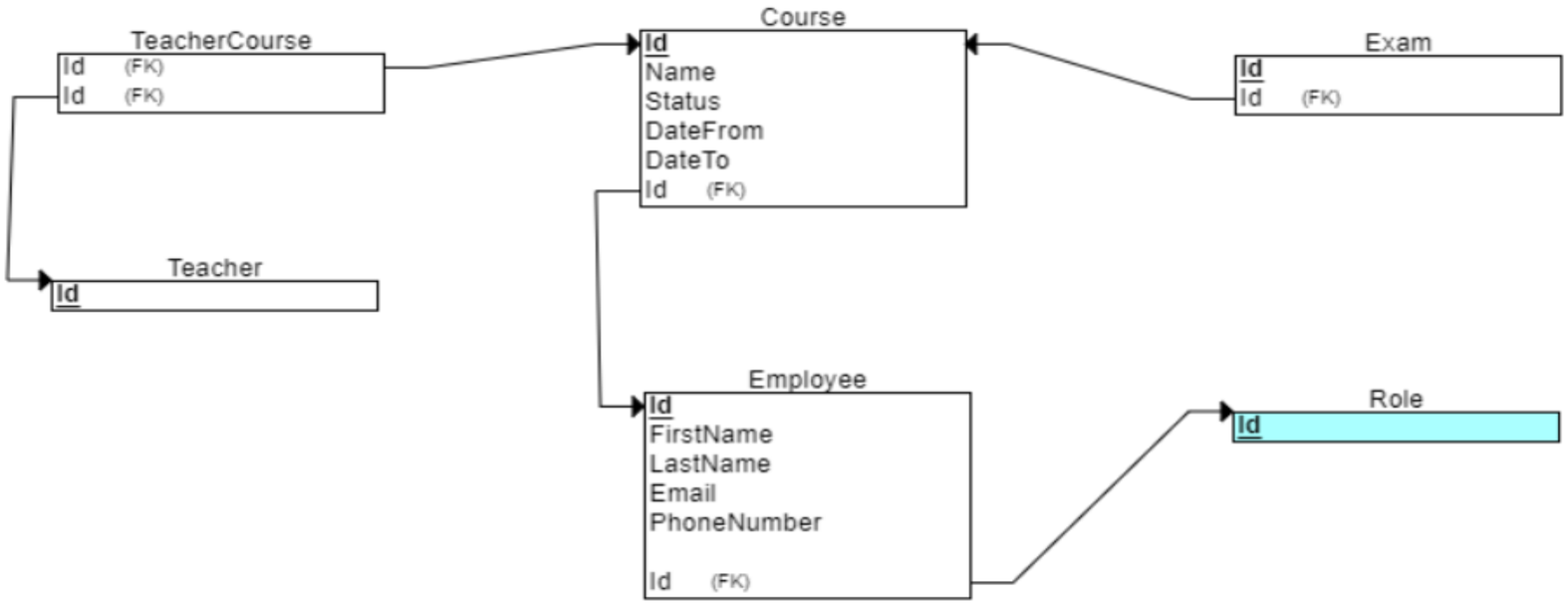
Draw Schema Diagram



Exercise

Draw Schema Diagram for the following scenario:

In a hospital System, there are many doctors and other employees. Doctors treat patients and provide them with care and medicines. There is a room for every patient entering the hospital.

What is Class Diagram?

- A class diagram used in modeling and designing software to describe classes and relationships.
- Class diagrams used to model a software in a high level of abstraction.

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