DATABASE MANAGEMENT SYSTEM BCSC0003

By

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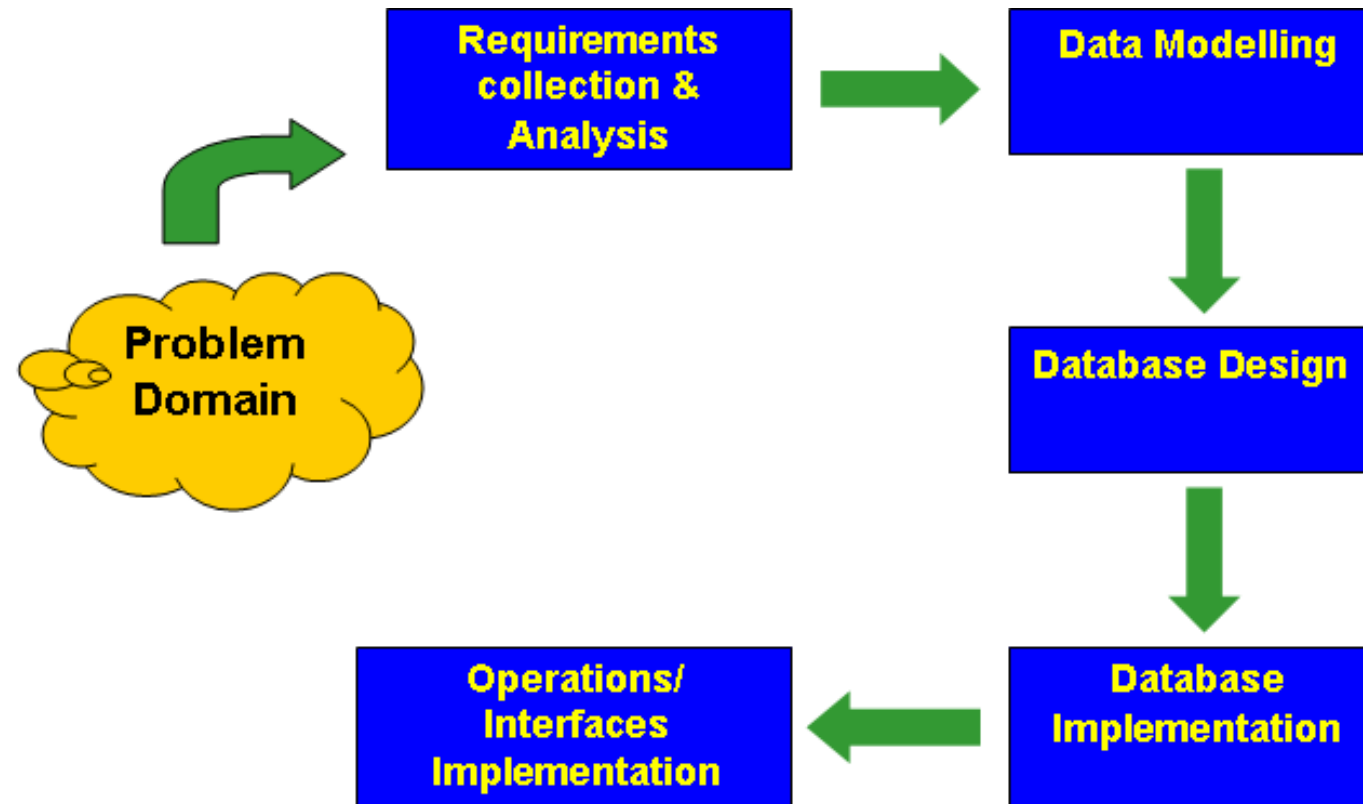
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Today we will discuss

✓Data Model using Entity Relationship Model

✓ER Model Concepts

✓Notation for ER Diagram

Phases of the database application development process

Data Model using Entity Relationship Model

✓ Data modeling is a technique to document a software system using diagrams and symbols.

✓ It is used to represent communication of data.

✓ The highest level of abstraction for the data model is called the Entity Relationship Diagram (ERD).

✓ It is a graphical representation of data requirements for a database.

Entity Relationship Diagram

The main value of carefully constructing an ERD is that it can readily be converted into a database structure.

There are three components in ERD.

Entities: Number of tables you need for your database.

Attributes: Information such as property, facts you need to describe each table.

Relationships: How tables are linked together.

Entity

➢Entities are the basic objects of ERDs.

➢These are the tables of your database.

➢Entity are nouns and the types usually fall into five classes: concepts, locations, roles, events or things.

✓For example: students, courses, books, campus, employees, payment, projects.

✓A specific example of an entity is called an instance. Each instance becomes a record or a row in a table. For example: the student John Smith is a record in a table called students.

Weak Entity

A weak entity is an entity that depends on the existence of another entity.

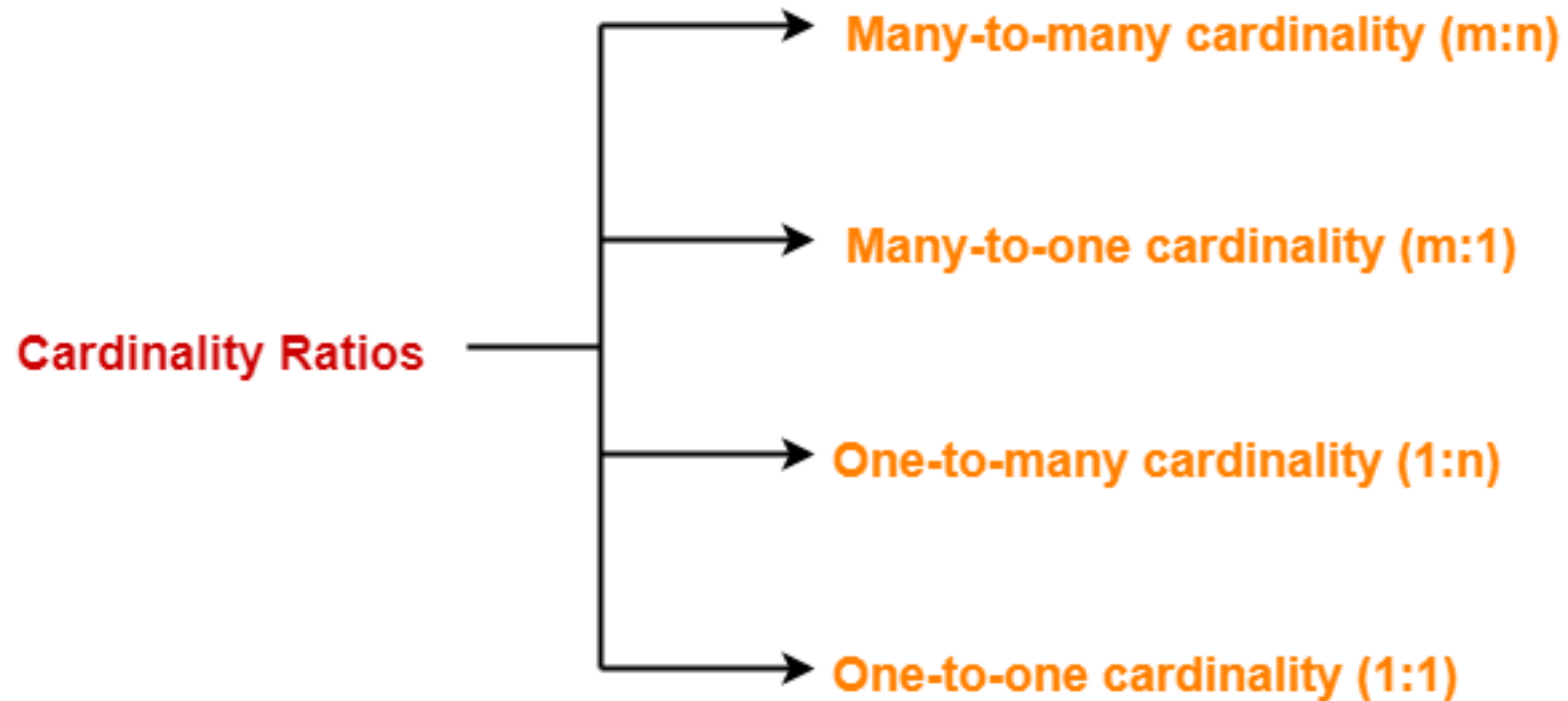In more technical terms it can be defined as an entity that cannot be identified by its own attributes.

An entity like order item is a good example for this. The order item will be meaningless without an order so it depends on the existence of the order.
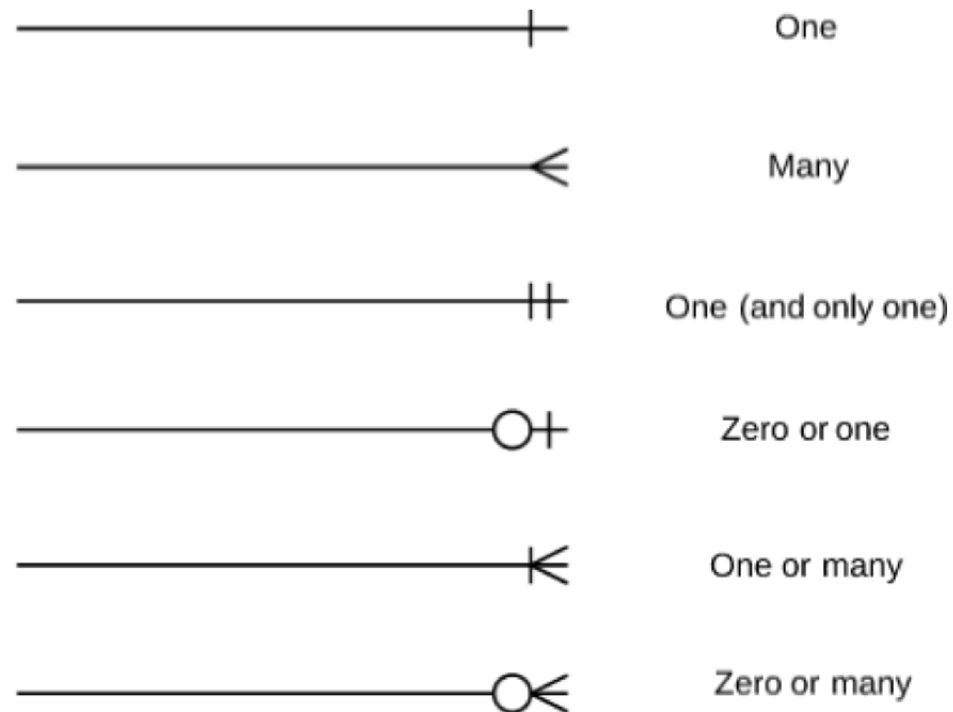
Relationships

➢Relationships are the associations between the entities.

➢Verbs often describe relationships between entities.

➢We will use Crow's Foot Symbols to represent the relationships.

➢4 types of relationships are discussed here.

➢ If you read or hear cardinality ratios, it also refers to types of relationships.

Cardinality Ratios

Cardinality Ratios
- Many-to-many cardinality (m:n)
- Many-to-one cardinality (m:1)
- One-to-many cardinality (1:n)
- One-to-one cardinality (1:1)

✓ Cardinality refers to the maximum number of times an instance in one entity can relate to instances of another entity. Ordinality, on the other hand, is the minimum number of times an instance in one entity can be associated with an instance in the related entity

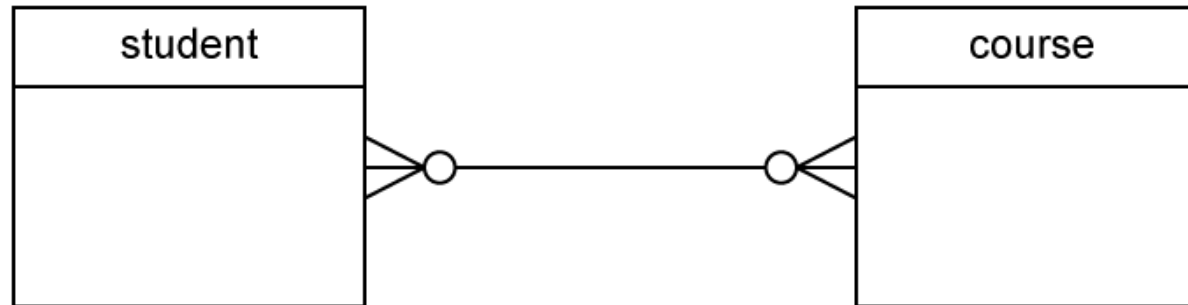|	
——————————+	One
——————————<	Many
——————————++	One (and only one)
——————————O+	Zero or one
——————————K<	One or many
——————————O<	Zero or many

In this example,
One student can enroll in any number (zero or more) of courses.
One course can be enrolled by any number (zero or more) of students.

Cardinality Ratios

One to One Relationship (1:1)

A single entity instance in one entity class is related to a single entity instance in another entity class.

✓For example:

Each student fills one seat and one seat is assigned to only one student.

Each professor has one office space.

Cardinality Ratios

One to Many Relationship (1:M)

A single entity instance in one entity class (parent) is related to multiple entity instances in another entity class (child)

✓For example:

One instructor can teach many courses, but one course can only be taught by one instructor.

One instructor may teach many students in one class, but all the students have one instructor for that class.

Cardinality Ratios

Many to Many Relationship (M:M)

Each entity instance in one entity class is related to multiple entity instances in another entity class; and vice versa.

For example:

Each student can take many classes, and each class can be taken by many students.

Each consumer can buy many products, and each product can be bought by many consumers.

The detailed Crow's Foot Relationship symbols can be found here. Crow's Foot Relationship Symbols

Attributes

➢Attributes are facts or description of entities.

➢They are also often nouns and become the columns of the table.

✓For example, for entity student, the attributes can be first name, last name, email, address and phone numbers.

Attributes

✓Multivalued Attribute

If an attribute can have more than one value it is called a <u>multi-valued attribute.</u>

It is important to note that this is different from an attribute having its own attributes.

For example, a teacher entity can have multiple subject values.

Attributes

✓Derived Attribute

An attribute based on another attribute.

This is found rarely in ER diagrams.

For example, for a circle, the area can be derived from the radius.
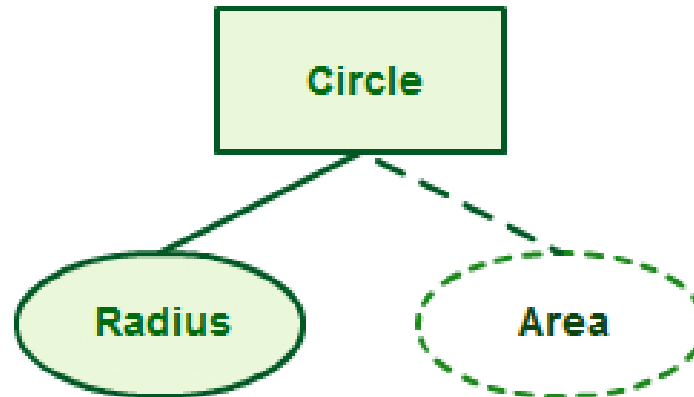
Attributes

✓**Primary Key**

Primary Key* or identifier is an attribute or a set of attributes that uniquely identifies an instance of the entity.

For example, for a student entity, student number is the primary key since no two students have the same student number. We can have only one primary key in a table. It identify uniquely every row and it cannot be null.
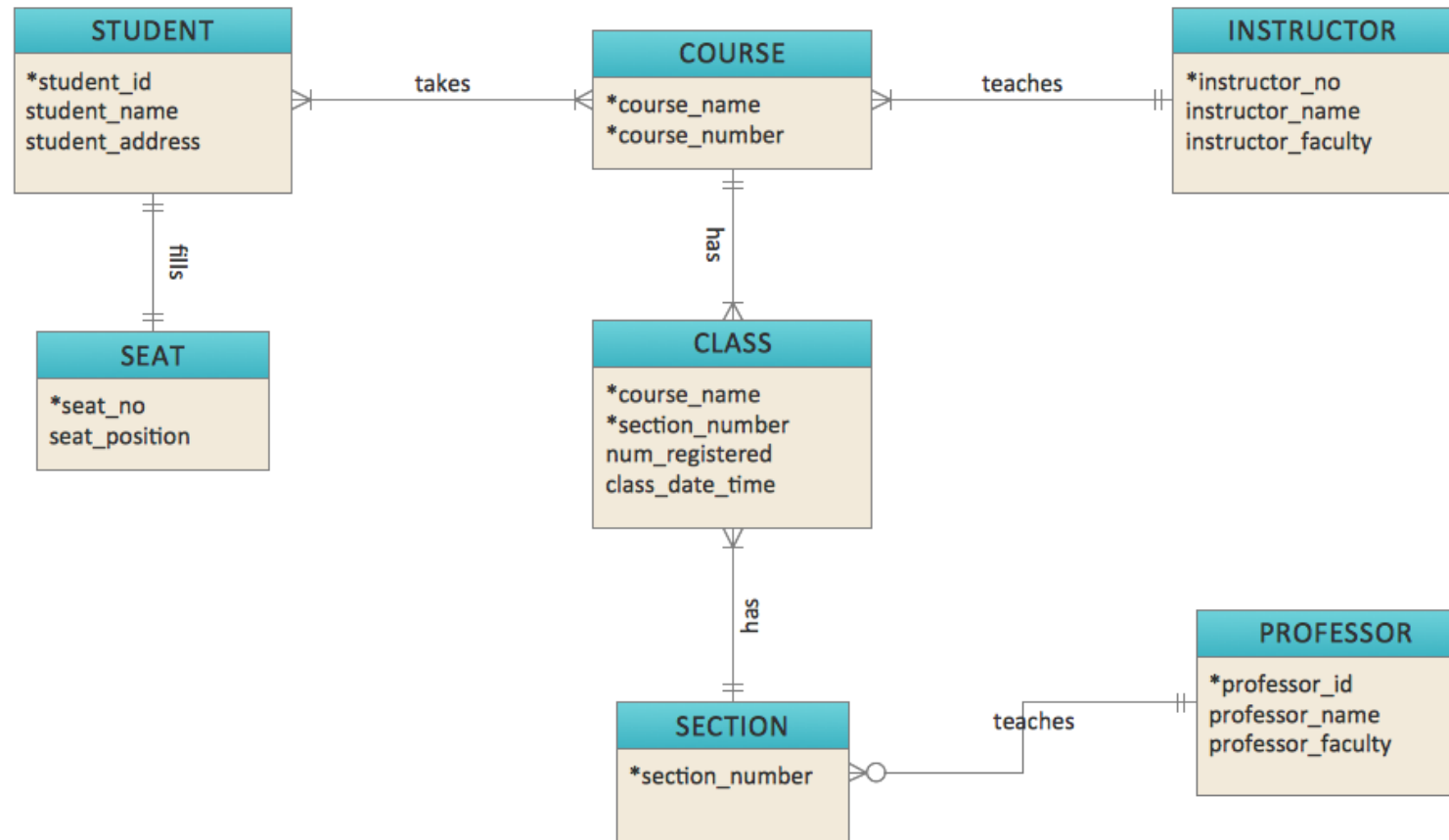
Attributes

✓**Foreign key**

A foreign key+ (sometimes called a referencing key) is a key used to link two tables together.

Typically you take the primary key field from one table and insert it into the other table where it becomes a foreign key (it remains a primary key in the original table).

We can have more than one foreign key in a table.

Weak entity uses a <u>foreign key</u> combined with its attributed to form the primary key.
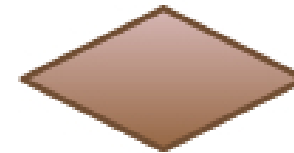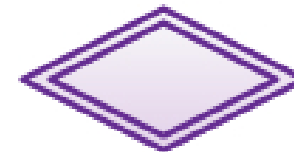
Example,

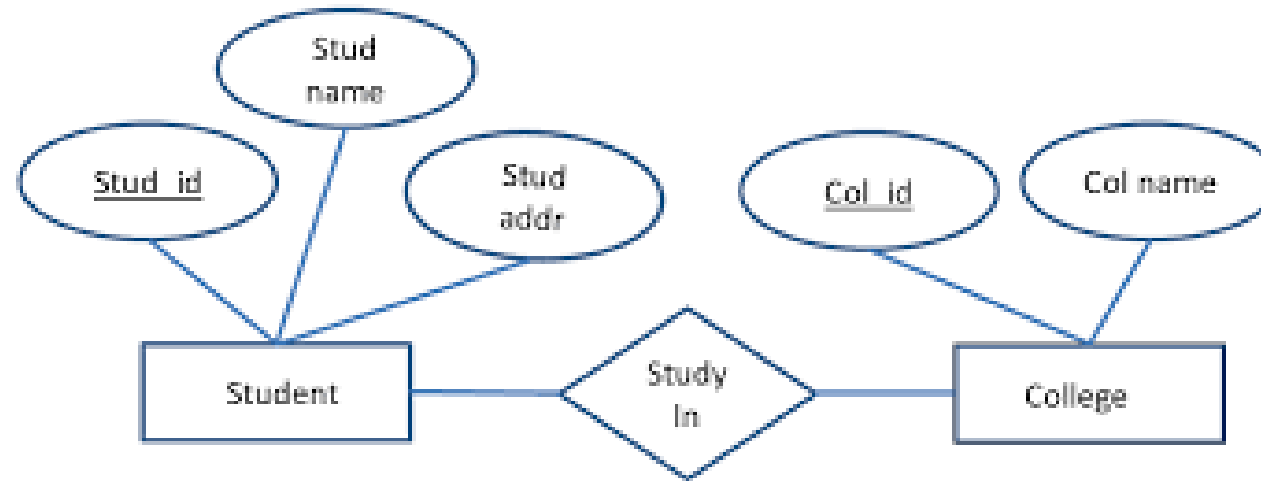# Notation for ER Diagram
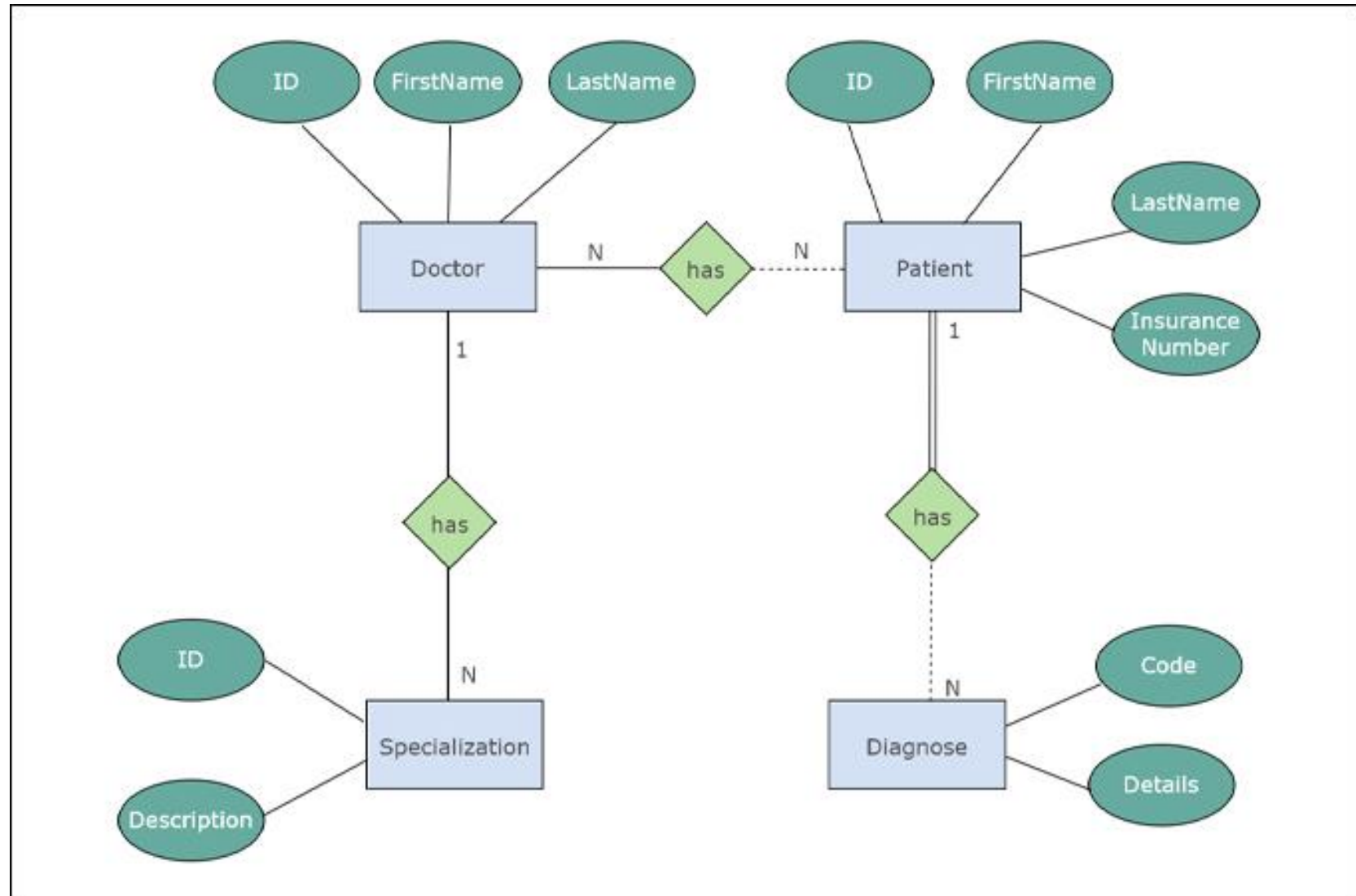
How to Draw ER Diagrams

3 steps,

Identify all the entities in the system. An entity should appear only once in a particular diagram. Create rectangles for all entities and name them properly.

Identify relationships between entities. Connect them using a line and add a diamond in the middle describing the relationship.

Add attributes for entities. Give meaningful attribute names so they can be understood easily.

Example of ER diagram

Thanks