



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG



CHAI

Humanities-Centered AI

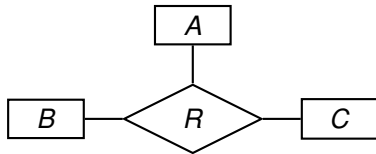
Databases

**Malte Luttermann – Institute for Humanities-Centered
Artificial Intelligence (CHAI)**

October 16, 2025

Topics for Today

- Entity-Relationship (ER) Modelling
 - Comprehension questions
 - Requirements definition to ER diagram
 - Interpretation of an ER diagram
 - From ER Diagram to Tables



Acknowledgement

- Some of the upcoming content is taken from the following lecture (and corresponding exercises) and has been translated and partially modified:
 - PD Dr. habil. Özgür L. Özçep: »Datenbanken«

Exercise 1: Comprehension Questions

Are the following statements regarding ER diagrams correct?

- »A relationship between two entities is represented by an edge between the entity types.«
- »A relation is always a set of pairs of entities.«
- »A key can consist of several attributes.«

Exercise 1: Comprehension Questions

Are the following statements regarding ER diagrams correct?

- »A relationship between two entities is represented by an edge between the entity types.«
 - Incorrect. A relationship type must be specified between two entities.
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- »A relationship between two entities is represented by an edge between the entity types.«
 - Incorrect. A relationship type must be specified between two entities.
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 - Incorrect. Relations can be tuples of any order (n-tuples).
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Are the following statements regarding ER diagrams correct?

- »A relationship between two entities is represented by an edge between the entity types.«
 - Incorrect. A relationship type must be specified between two entities.
- »A relation is always a set of pairs of entities.«
 - Incorrect. Relations can be tuples of any order (n-tuples).
- »A key can consist of several attributes.«
 - Correct. Composite keys consisting of multiple attributes are possible and sometimes necessary in order to uniquely reference objects.

Exercise 2: Requirements Definition to ER Diagram

Given the following requirements definition, create an ER diagram.

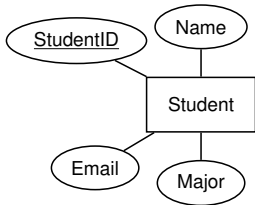
- (1) Each student has a student ID, name, email, and major.
- (2) Each course has a course code, title, and number of credits.
- (3) Each instructor has an instructor ID, name, and office.
- (4) Each course is taught by one instructor, but an instructor may teach many courses.
- (5) Each student can enroll in many courses, and each course can have many students enrolled.
- (6) For each enrollment, the grade obtained by the student must be recorded.

Exercise 2: Possible Solution

- Each student has a student ID, name, email, and major.

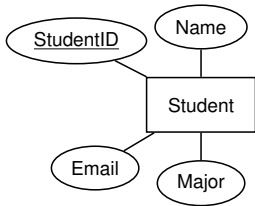
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- Each student has a student ID, name, email, and major.



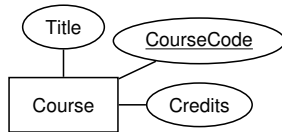
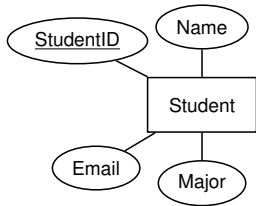
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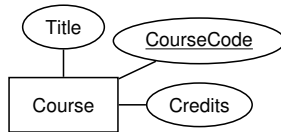
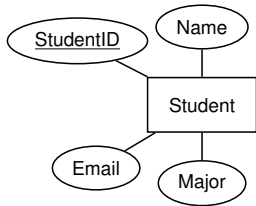
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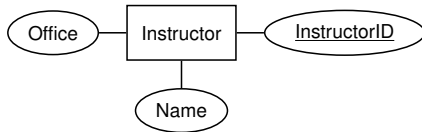
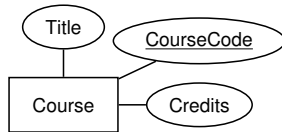
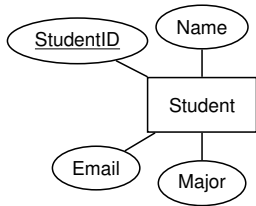
Exercise 2: Possible Solution

- Each instructor has an instructor ID, name, and office.



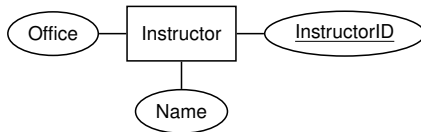
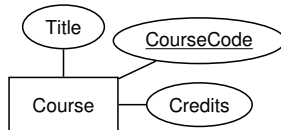
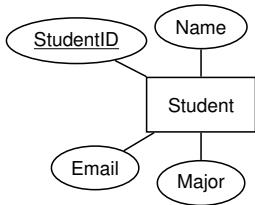
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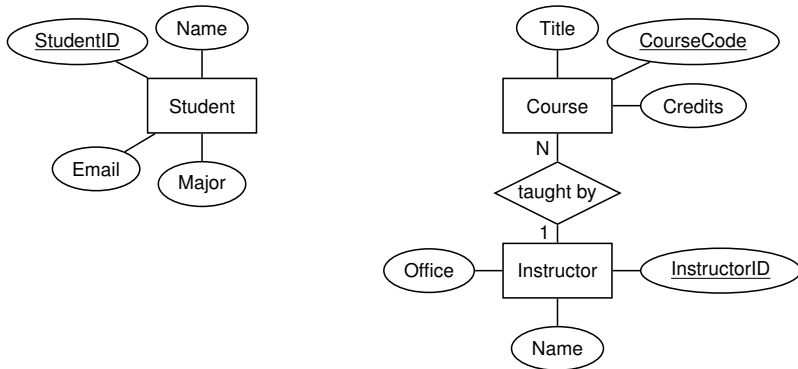
Exercise 2: Possible Solution

- Each course is taught by one instructor, but an instructor may teach many courses.



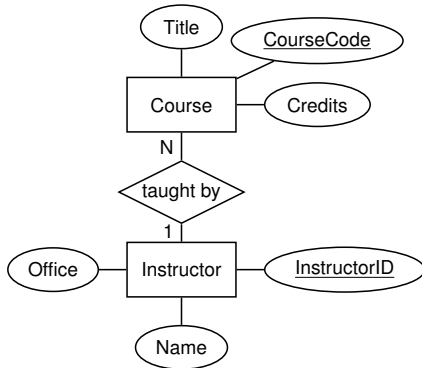
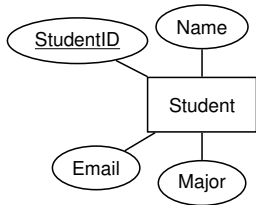
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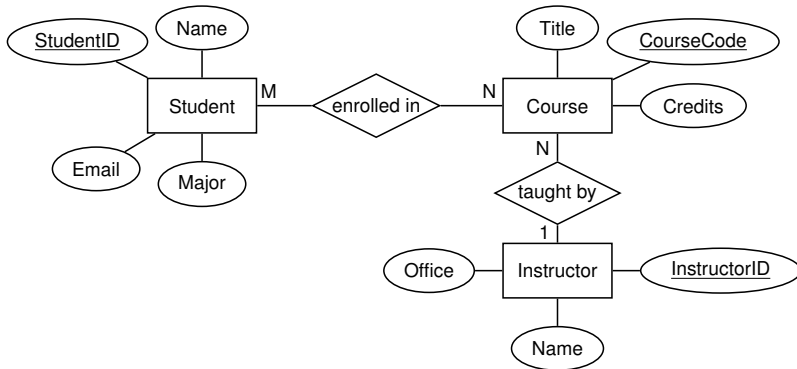
Exercise 2: Possible Solution

- Each student can enroll in many courses, and each course can have many students enrolled.



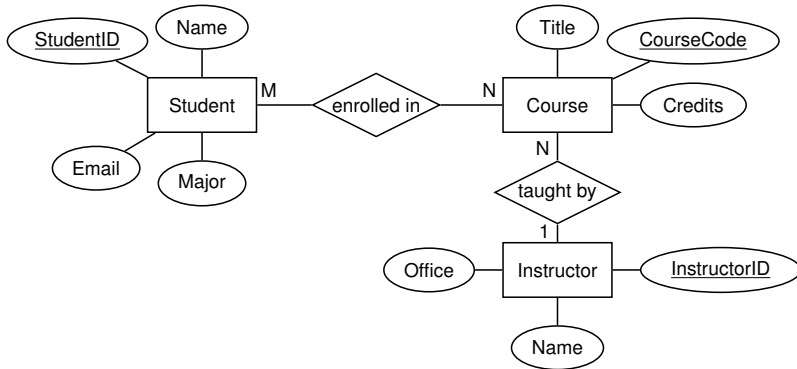
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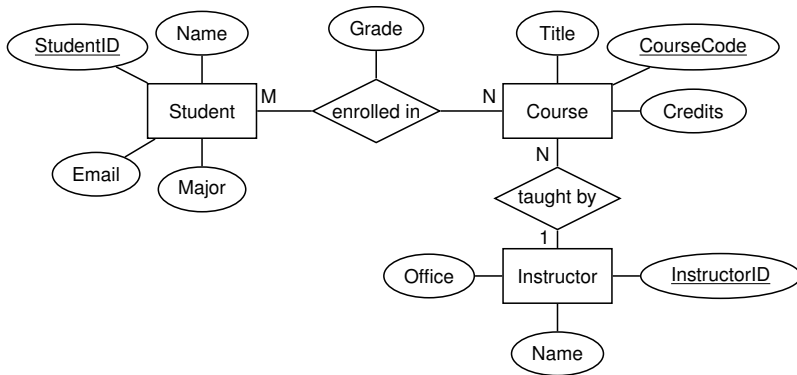
Exercise 2: Possible Solution

- For each enrollment, the grade obtained by the student must be recorded.



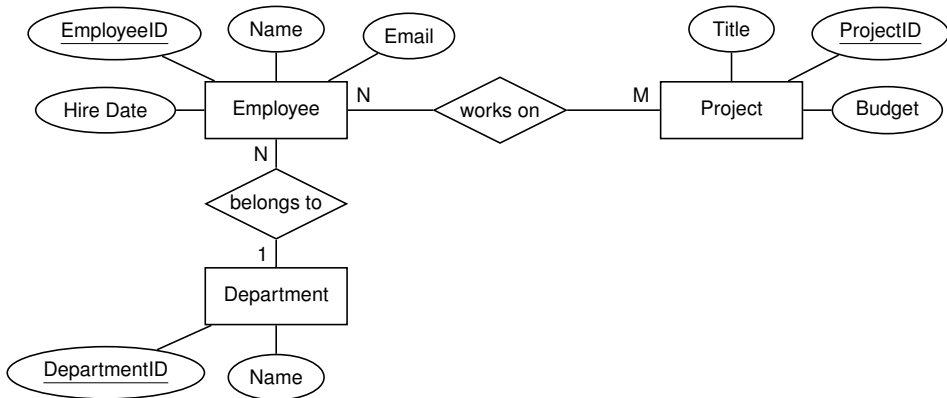
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Exercise 3: Explain ER Diagram

Explain the following ER diagram:

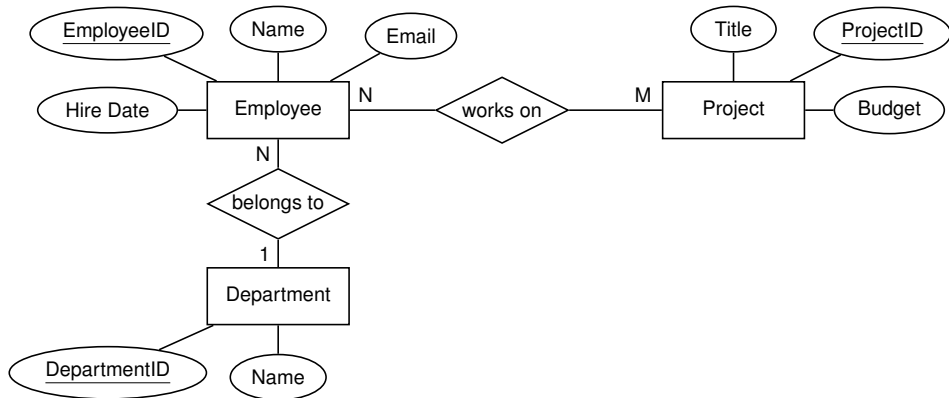


Exercise 3: Possible Solution

- Each employee has an employee ID (key), a name, an email, and a hire date.
- Each department has a department ID (key), and a name.
- Employees can work on multiple projects, and each project can have multiple employees assigned.
- Each project has a project ID (key), a title, and a budget.
- Each employee belongs to exactly one department, while a department can have multiple employees belonging to it.

Exercise 4: From ER Diagram to Tables (Rough Idea)

How to translate the following ER diagram into tables of a relational database?



Exercise 4: Possible Solution

- One table for each entity type and relationship type
- Columns for each attribute

Table »Employee«:

EmployeeID	Name	Email	HireDate
...	...	...	...

Table »Project«:

ProjectID	Title	Budget
...	...	...

Table »Department«:

DepartmentID	Name
...	...

Table »Works_On«:

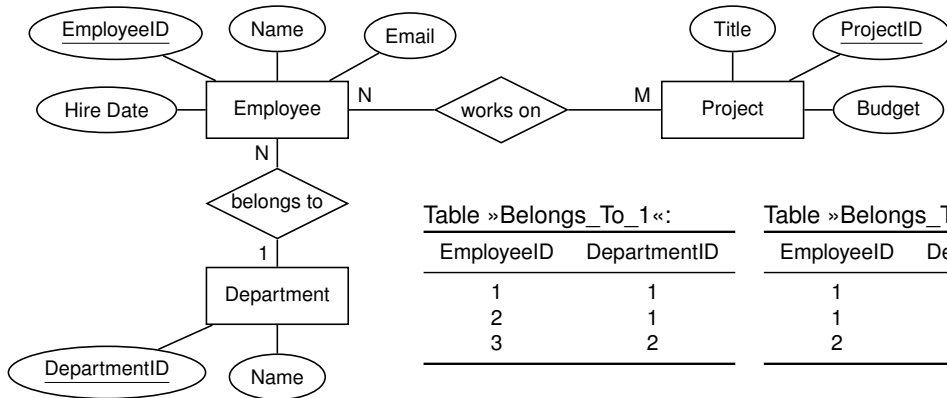
EmployeeID	ProjectID
...	...

Table »Belongs_To«:

EmployeeID	DepartmentID
...	...

Add-On: Consistency

Which of the given tables are consistent with the given ER diagram?



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Which of the given tables are consistent with the given ER diagram?

