Conceptual Analyses

Conceptual Schema Design Steps

(Chapter 3)

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Course Page: http://www.jarrar.info/courses/ORM/Jarrar.LectureNotes.ConceptualAnalyses.pdf

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Some diagrams in this lecture are based on [1]

Conceptual Analyses

Conceptual Schema Design Steps

- **Part 1: Conceptual Analyses Steps**
- Part 2: Basic ORM Constructs and Syntax
- Part 3: Use case (ID Card)
- Part 4: Use case (University Programs)

Conceptual Analyses

Given an application domain, e.g. hospital, and three information modelers, what steps do you suggest them to start with, to build the hospital's conceptual model?

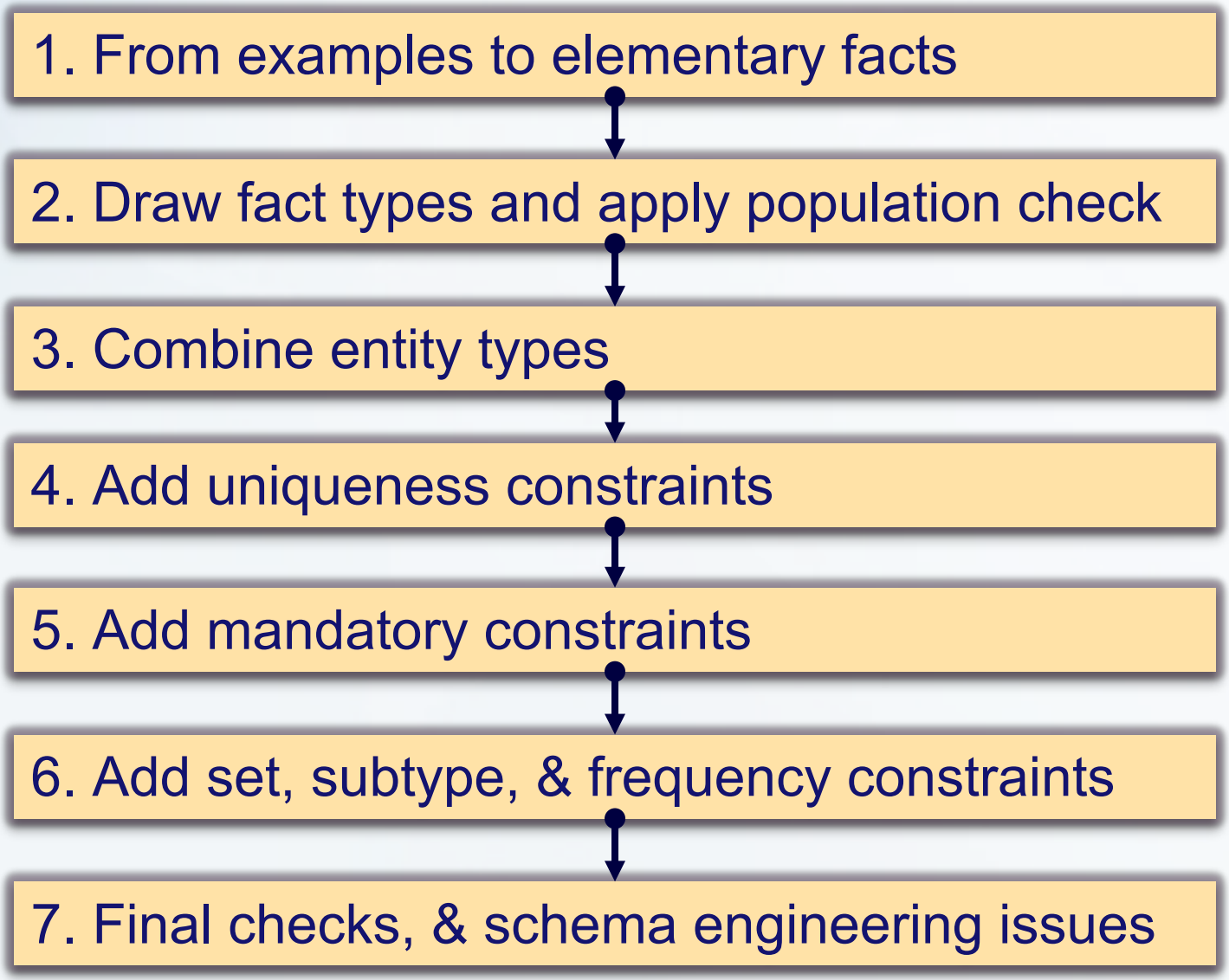
There is no strict or perfect modeling process or procedure!

You may start with any step you think suitable, taking into account the complexity of the domain, available resources, modelers' prior knowledge about the domain, etc.

It is recommended that you modularize the domain into sub-domains, build a conceptual schema for each sub-domain , then integrate all sub-schemes into one conceptual schema.

The following procedure (**7 steps**) is to help you model a sub-domain, but you don't have to strictly follow these steps.

Conceptual Schema Design Steps



Elementary Facts and Fact Types

What is a fact?

- Rami smokes.
- Rami drives car.
- Rabab was born in Ramallah.
- Rami smokes and drives car.
- If Rabab was born in Ramallah and Ramallah is part of Palestine, then Rabab was born in Palestine.

➔ A fact must be either true or false

What is a fact type?

- Person smokes.
- Person drives car.
- Person was born in a city.
- Person smokes and drives car.
- If a Person was born in a city and this City is part of a country, then this person was born in that country.

Elementary Facts and Fact Types

What is an elementary fact type?

- ✓ – Person smokes.
- ✓ – Person drives car.
- ✓ – Person was born in a city.
- ✘ – Person smokes and drives car.
- ✘ – If a Person was born in a city and this City is part of a country, then this person was born in that country.

→ An elementary fact type cannot be spited.

Conceptual Schema Design Steps

1. From examples to elementary facts

1. Make elementary facts from examples

Mustafa teaches Knowledge Engineering.

Rami is enrolled in Knowledge Engineering.

Knowledge Engineering is offered by the University of Birzeit.

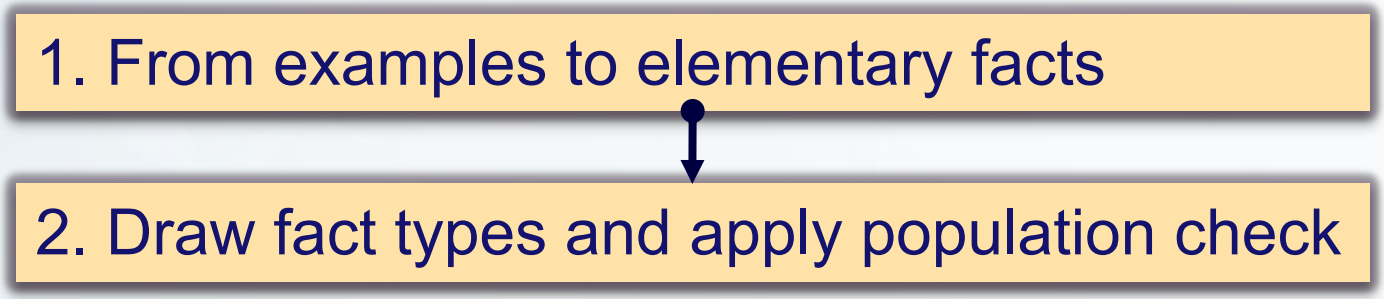
From examples to fact types

- The Person that has the name Mustafa teaches the course that has the title Knowledge Engineering.
- The Person Rami is enrolled in the course that has the title Knowledge Engineering.
- The course that has the title Knowledge Engineering is offered by the university that has the name University of Birzeit.

More precise

- The Person (ID4514) that has the name Mustafa teaches the course (SC242) that has the title Knowledge Engineering.
- The Person (ID123) Rami is enrolled in the course (CS242) that has the has the title Knowledge Engineering.
- The course (CS242) that has the title Knowledge Engineering is offered by the university that has the name University of Birzeit.

Conceptual Schema Design Steps



2. Draw fact types and apply population check

- The Person (ID4514) that has the name Mustafa teaches the course (SC242) that has the title Knowledge Engineering.
- The Person (ID123) Rami is enrolled in the course (CS242) that has the has the title Knowledge Engineering.
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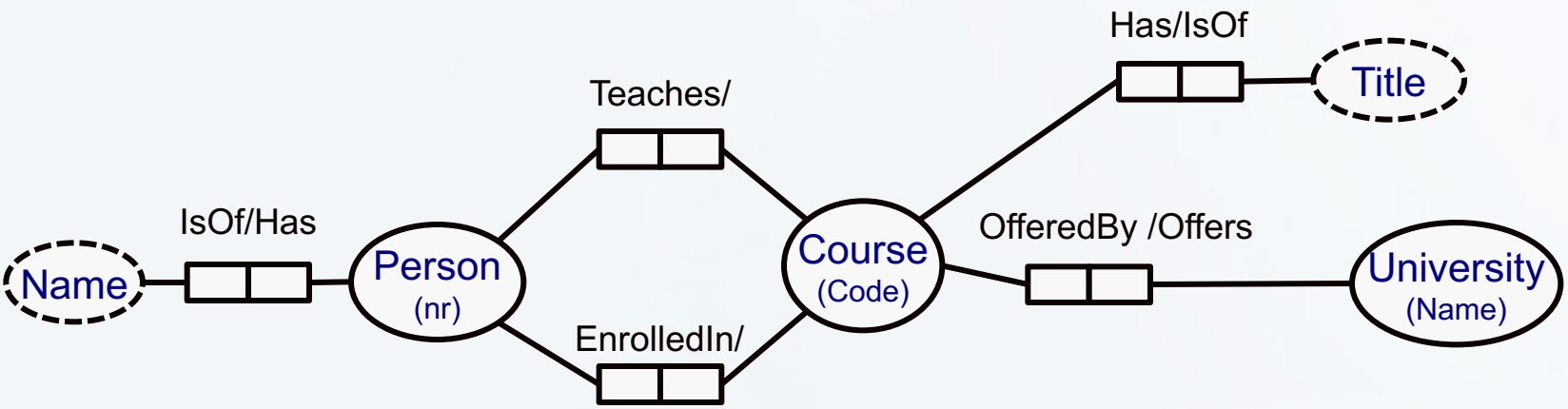
Draw Fact Types



2. Draw fact types and apply population check

- The Person (ID4514) that has the name Mustafa teaches the course (SC242) that has the title Knowledge Engineering.
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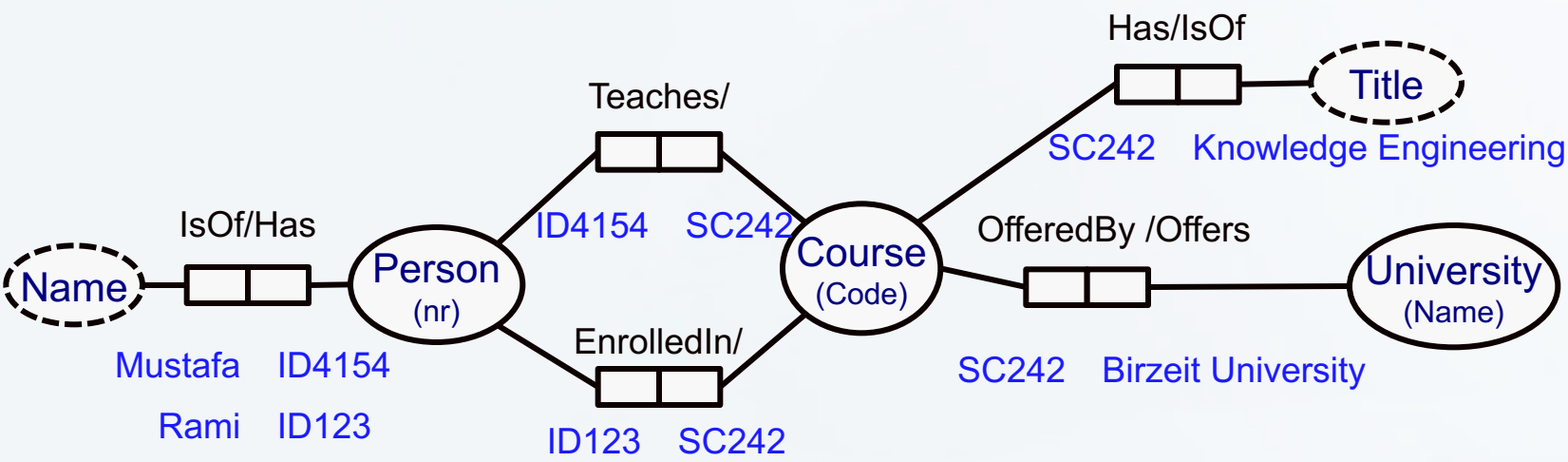
Test with population



Conceptual Analyses
Conceptual Schema Design Steps

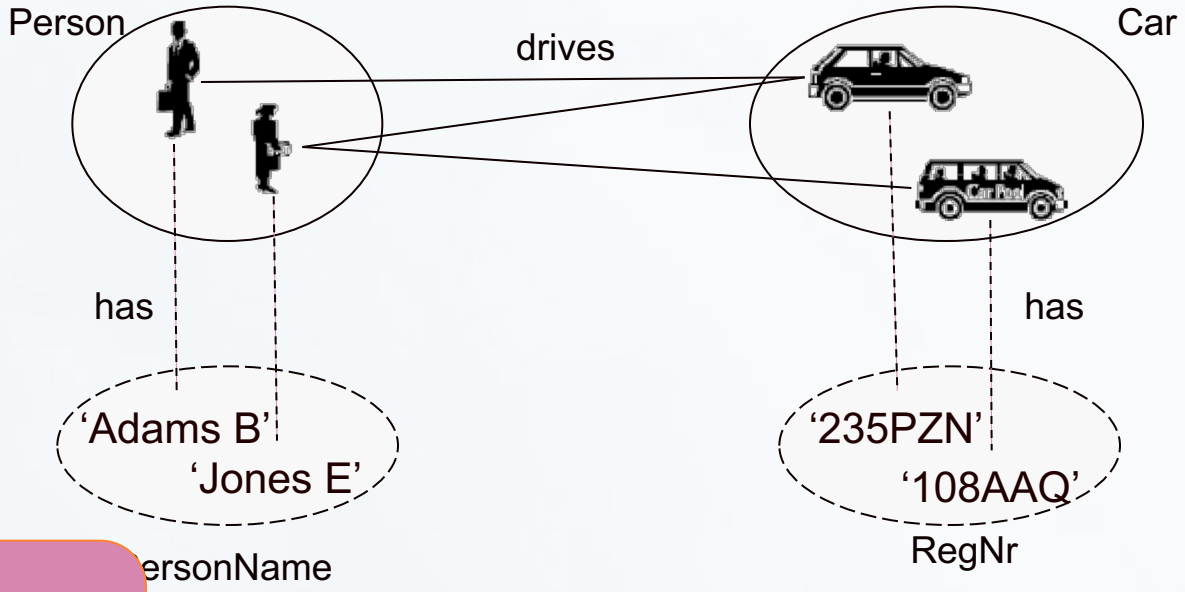
- Part 1: Conceptual Analyses Steps
- **Part 2: Basic ORM Constructs and Syntax**
- Part 3: Use case (ID Card)
- Part 4: Use case (University Programs)

Basic ORM Constructs and Syntax

- Object and Value Types
- Roles and relations
- Unary relations
- Ternary relations
- Nested Fact Types
- Ring Fact Types

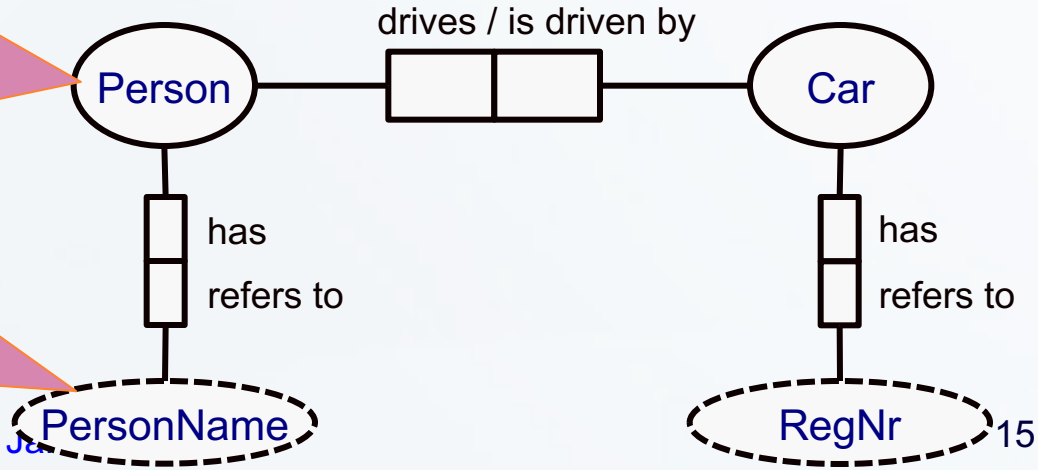
Object and Values Types

Person	Car
Adams B	235PZN
Jones E	235PZN
Jones E	108AAQ



Object Type (non lexical)
You cannot lexicalize, or refer to a person without using a value of its properties.

Value Type (lexical)
It is always a value of an Object Type.

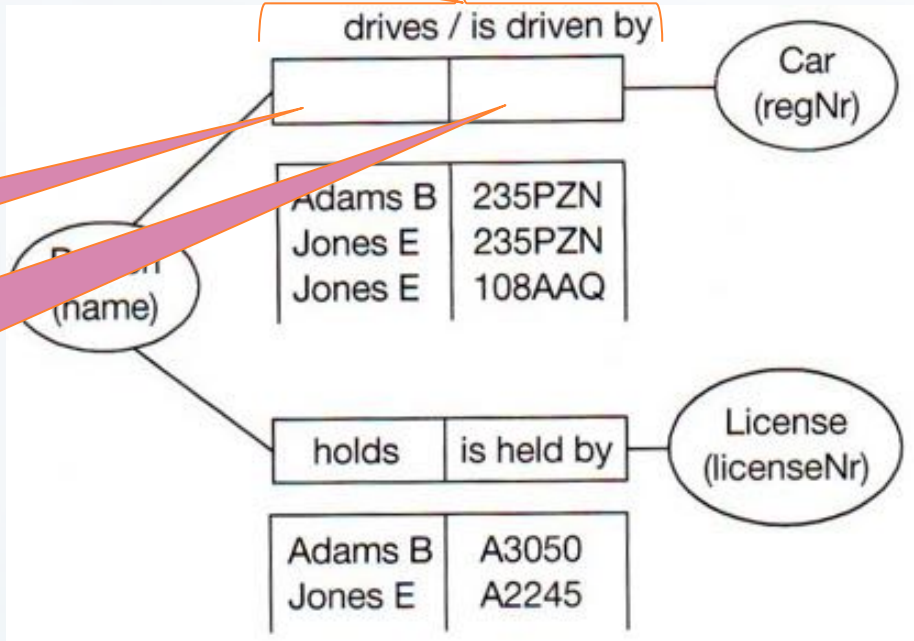


Roles and Relations

Person	*LicenseNr*	*Cars driven*
Adams B	A3050	235PZN
Jones E	A2245	235PZN, 108AAQ

Called **Binary Relation**
It consists of two roles
("drives" and "is driven by")

Called **Role**
which is part of a relation

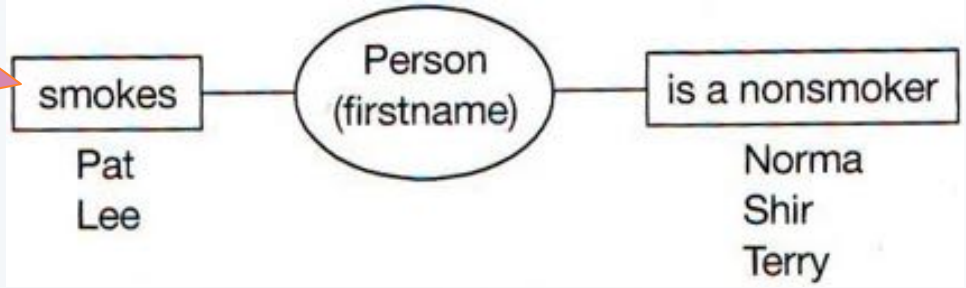


Unary Relations

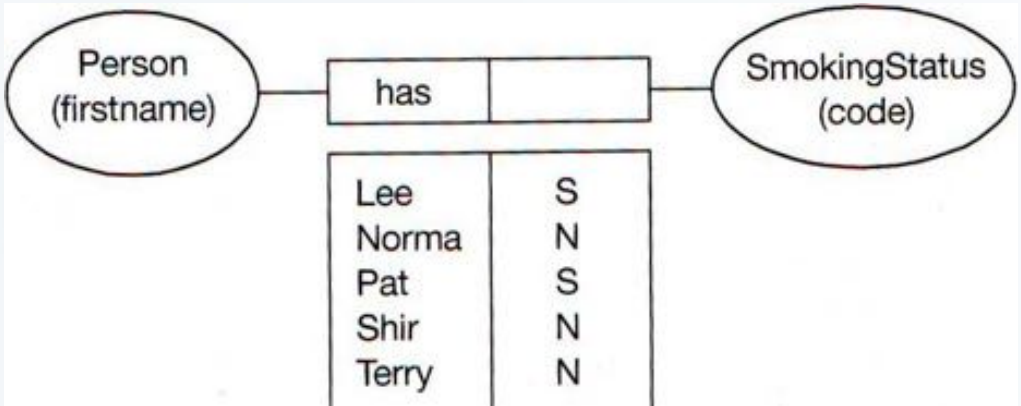
Pat smokes
Lee smokes
Shir does not smoke

Smokers	*Nonsmokers*
Pat Lee	Norma Shir Terry

Called **Unary Relation** as it has one role ("smokes")

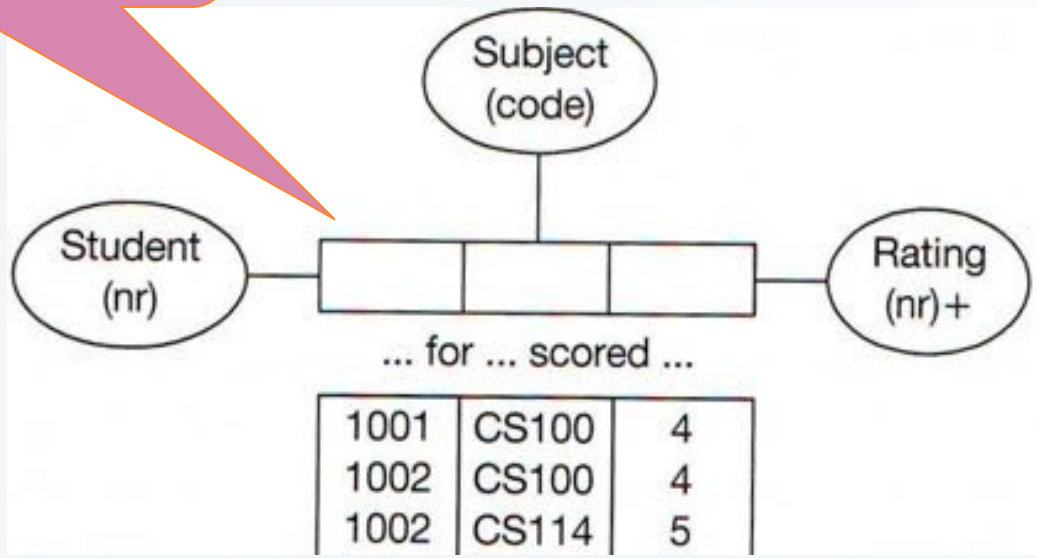


You can transform unary fact types into binary:



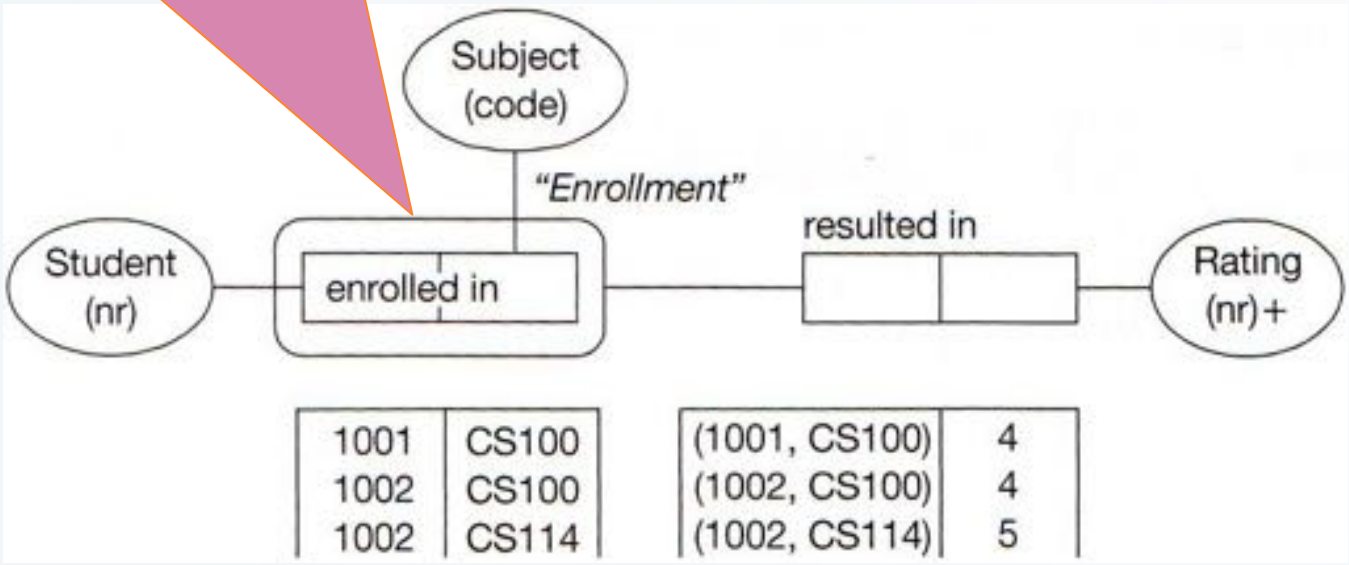
Ternary Relations

Called **Ternary Relation** as it has three roles ("smokes")

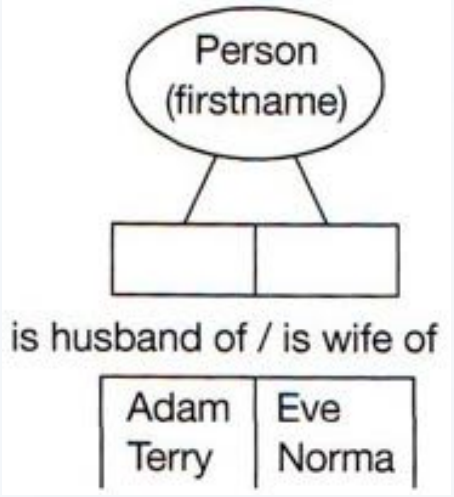


Nested Fact Types

Called **Nested Fact Type**
The fact type "Student enrolled in Subject" is objectified, i.e., the whole Fact type is seen as an Object Type



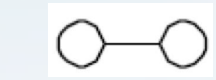
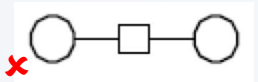
Ring Fact Types

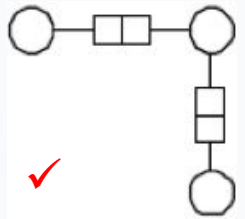
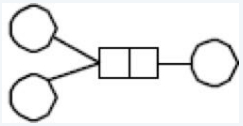
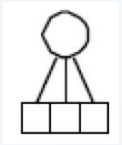
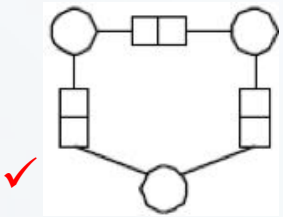
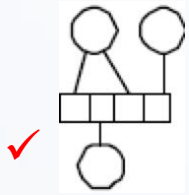
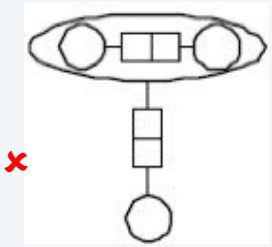
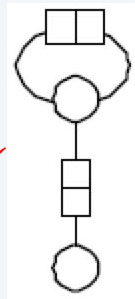
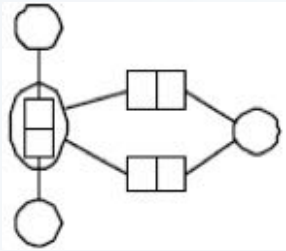


Same object type is connected to two roles in the same relation

The ORM Syntax (Test)

An object type can be only connected with roles.
Each role can be connected with only one object type.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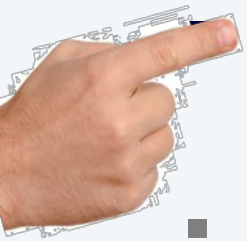

- **Part 3: Use case (ID Card)**
- Part 4: Use case (University Programs)

Use Case (ID Card)

Model the Information found in your ID Card, using ORM, for example:

Each Person has a ID Number, First Name, Father Name, Grandfather Name, BirthDate, Birth Place, Religion, Gender, and Address. A Person maybe a father/mother of one or more persons, and wife/husband of another person. etc.

- Each student is expected to deliver (PDF and Hard copies) of his/her ORM model before (Deadline: 17/2/2015).
- Any ORM tool can be used.
- Each student is expected to bring his laptop next lecture, so to present his/her models to all students.

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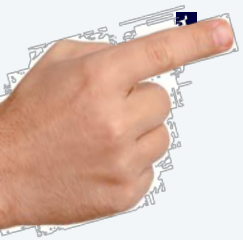

Use Case (University Programs)

Model Information about University Programs, using ORM, for example:

According to the Ministry of Higher Education:

A University consists of a set of faculties, each faculty consists of departments, each department offers several Bachelor and Master programs. Each program consists of a set of courses. Same courses might not be offered by different programs. A course has number, title, description, etc.

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References

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