###### Cairo University

**Faculty of Computers and Information Information Systems Department Database Systems 1**

**Section-6**

**(ERD Mapping to Relational Model (Physical Data Modeling))**

**Steps of Mapping ERD to Relational Model**

1. Mapping Regular Entities
   1. Mapping Composite Attributes (if exist...)
2. Mapping Weak Entities
3. Mapping Multi-Valued Attributes
4. Mapping Relationships
   1. Mapping 1:1 Relationship Types
   2. Mapping 1:N Relationship Types
   3. Mapping M:N Relationship Types
5. **Mapping Regular Entities**

For each regular (strong) entity type *E* in the ER schema, create a relation *R* that includes all the **simple** attributes of *E*.

* 1. **Mapping Multi-Valued Attributes**

For each multivalve attribute *A*, create a new relation *R*.

This relation R will include an attribute corresponding to *A*, plus the primary key of the entity type or relationship type that has *A* as a multi-value attribute.

The primary key of *R* is the combination of *A* and *K*. If the multi-value attribute is composite, we include its simple components.

* 1. **Mapping Composite Attributes**

Include only the simple component attributes of a composite attribute.

Note:

If the chosen key of E is composite, the set simple attributes that form it will together form of the primary key of R

1. **Mapping Relationships**
   1. **Mapping 1:1 Relationship Types**

PK on the mandatory side becomes a FK on the optional side

* 1. **Mapping 1:N Relationship Types**

PK on the one side becomes a FK on the many side

* 1. **Mapping M:N Relationship Types**

We create a new relation (bridge entity) with the PKs of the two entities as its composite PK

**Note:**

If Relationship has Attributes

1. 1:1 relationship type can be migrated to one of the participating entity types.
2. 1:N relationship type, a relationship attribute can be migrated *only* to the entity type on the N-side of the relationship
3. M:N relationship type, a relationship attribute migrated to the bridge entity
4. **Mapping Weak Entities**

Weak Entity becomes a separate relation with a FK taken from the superior entity

Primary key composed of:

Partial identifier of weak entity

Primary key of identifying relation

## Case Study 1: University System

1. **Mapping Regular Entities**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Students | Students   |  |  |  | | --- | --- | --- | | SID | SName | GPA | |
| Courses | Courses   |  |  |  | | --- | --- | --- | | CrsID | Name | Description | |
| Departments | Departments   |  |  | | --- | --- | | DeptID | DName | |

* 1. **Mapping Multi-Valued Attributes**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Professor | Professor   |  |  |  | | --- | --- | --- | | PID | PName | Email |   Prof\_Phone   |  |  | | --- | --- | | PhoneNum | PID | |

1. **Mapping Relationships**
2. **Mapping 1:N Relationship Types**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| N  Advises  Students  1  Professor | Students   |  |  |  |  | | --- | --- | --- | --- | | SID | SName | GPA | PID |   **FK** |
| Offers  N  Courses  1  Departments | Courses   |  |  |  |  | | --- | --- | --- | --- | | CrsID | Name | Description | DeptID |     **FK** |
| Offers  1  Professor  N  Courses | Courses   |  |  |  |  |  | | --- | --- | --- | --- | --- | | CrsID | Name | Description | DeptID | PID |     **FK** |

1. **Mapping M:N Relationship Types**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| N  Courses  Enrolls in  N  Students | Stud\_EnrollsIn\_Course   |  |  |  |  |  | | --- | --- | --- | --- | --- | | CrsID | SID  **FK** | Year | Grade | Semester | |
| Courses  Requires | ReqiredCourse   |  |  | | --- | --- | | CrsID | RCrsID | |

Professor

|  |  |  |
| --- | --- | --- |
| PID | PName | Email |

Prof\_Phone

|  |  |
| --- | --- |
| PhoneNum | PID |

Students

|  |  |  |  |
| --- | --- | --- | --- |
| SID | SName | GPA | PID |

Departments

|  |  |
| --- | --- |
| DeptID | DName |

Courses

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CrsID | Name | Description | DeptID | PID |

Stud\_EnrollsIn\_Course

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CrsID | SID | Year | Grade | Semester |

ReqiredCourse

|  |  |
| --- | --- |
| CrsID | RCrsID |

# Case Study 2: ABC Company

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