###### 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**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NAdvisesStudents1Professor | Students

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

**FK** |
| OffersNCourses1Departments | Courses

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

 **FK**  |
| Offers1ProfessorNCourses | Courses

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

 **FK**  |

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NCoursesEnrolls inNStudents | Stud\_EnrollsIn\_Course

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CrsID | SID**FK** | Year | Grade | Semester |

  |
| CoursesRequires | 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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