ER to Relational Mapping

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Chapter-7

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ER Design to Relational Schema

☐ Here we see rules of creating Relational Schema from a given ER design.

☐ Recall: only construct relational model has is a relation, while ER has Entities and Relationships

☐ In relational model both map to relations. First we will see how entities map to relations, and then we look relationships to relations mapping rules

Mapping Regular Entities

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

☐ Keys are also mapped to relation R, and one of the key can be designated as PK of R.

Mapping Composite attributes

☐ Include only "member attributes" of composite attribute.

☐ Suppose an Entity E has a composite attribute A, having member attributes A1, A2, and A3

☐ Then the relation R created for E will have attributes named A1, A2, A3, and no attribute named A.

Mapping Multi-valued attributes

- Suppose an Entity E has a multi-valued attribute A, and let us say we created a relation R for E.

- Now for the multi-valued attribute A, we create a new relation S. This relation will have attribute A, plus PK K of R as FK in S.

- The PK of S will be combination of PK of R and attribute A.

- This needs to be repeated for all multi-value attributes separately.

- Example: DEPARTMENT_LOCATIONS in company database

Mapping Weak Entities

- ☐ For each weak entity type W in the ER schema with owner entity type E, create a Relation R, and include all simple attributes of W as attributes of R.

- ☐ In addition, include PK of owner entity as FK in R. This will take care of relationship between the weak and owner entities.

- ☐ The PK of R will be PK of owner entity plus partial key of W.

- ☐ Example: DEPENDENTS in company database

Mapping 1:1 Relationship

☐ For each binary 1:1 relationship type R in the ER schema, identify the relations S and T that corresponds to the Entity types participating in the relationship type R.

☐ Choose one of the relations, say S, and include as FK in S the primary key of T. It is better to choose an entity type with total participation in the relationship in the role of S?.

☐ Example: Manages relationship in company database. The relationship is represented as FK (mgrssn) DEPARTMENT relation

Mapping 1:N Relationship

- ☐ For each regular binary 1:N relationship type R, identify the relation S that represents the entity type at the N-side of the relationship type.

- ☐ Include PK of T, that is another entity participating In the relationship type, as FK in S.

- ☐ Example: WORKS_FOR relationship in company database is represented as FK in EMPLOYEE relation.
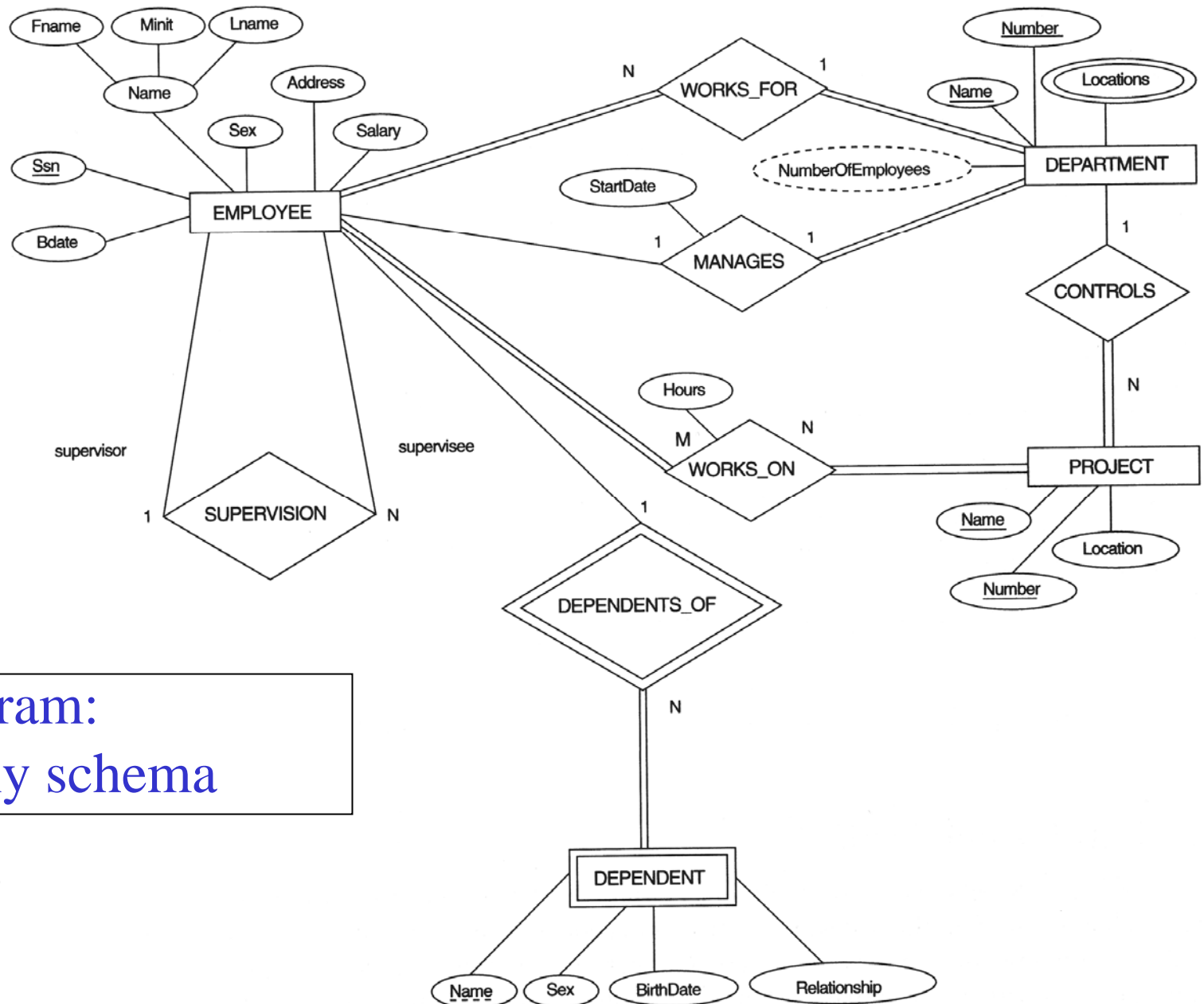
Mapping M:N Relationship

☐ For each binary M:N relationship type R, create a new relation S to represent R. Include PKs of relations that represents the participating entities as FK in S

☐ Their combination will form the PK of the new relation S. Also include any simple attributes of the relationship type.

☐ Example: WORKS_ON relation representing WORKS_ON relationship in company database

n-ary relationships

- For each n-ary relationship (with degree of n) type R, where n > 2, create a new relation S to represent R.

- Include PKs of all participating entities as FKs in S. Also include simple attributes of relationship type in S.

- The PK of the relation S will be combination of all FKs referencing to participating entities.

- For example: This **SUPPLY** ternary relationship will be represented by the relation SUPPLY(<u>S#,P#,PNO</u>, Qty)

Correspondence between ER and Relational models

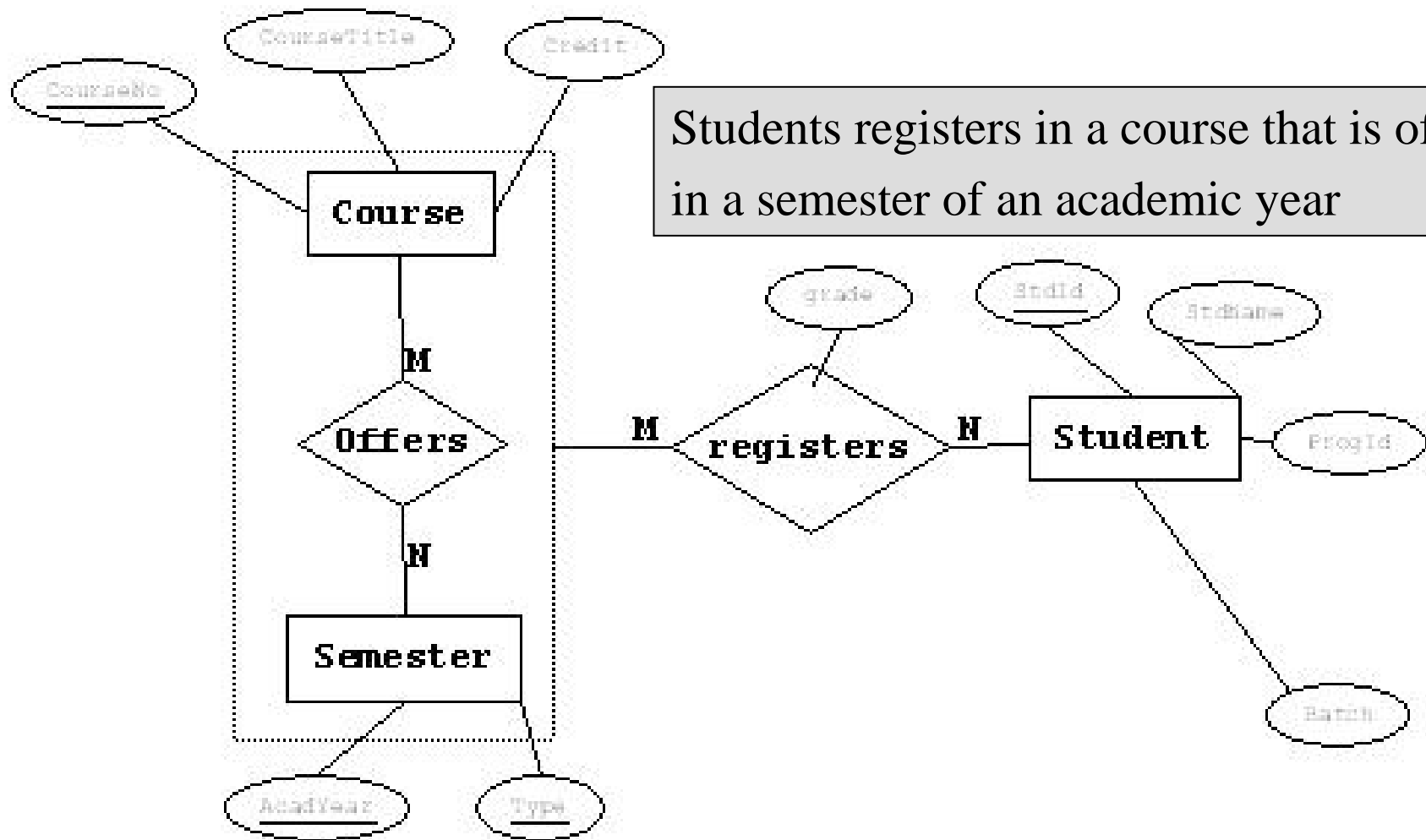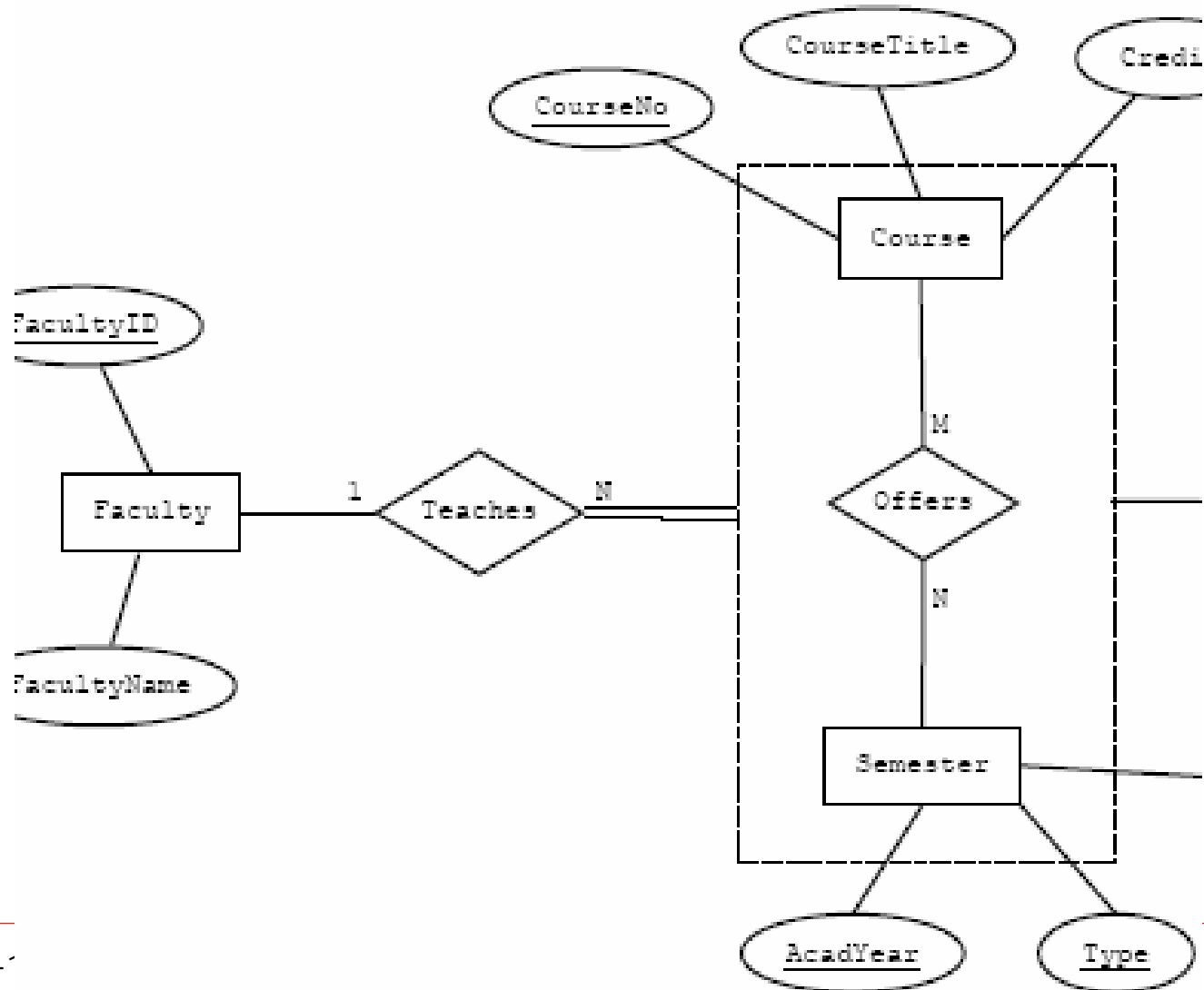| ER Model	Relational Model
Entity type	Entity relation
1:1 or 1:N relationship type	FK in Total participation/ FK in n-side relation
M:N relationship type	"Relationship" relation and two FKs
n-ary relationship type	"Relationship" relation and n FKs
Simple Attribute	Attribute
Composite attribute	Set of simple attributes
Multi-valued attributes	Relation and FK
Value set	Domain
Key attribute	Primary (or alternate) key

ER diagram:
Company schema

Data Modeling Using E-R Diagrams

Relational Company Schema

Data Modeling Using E-R Diagrams
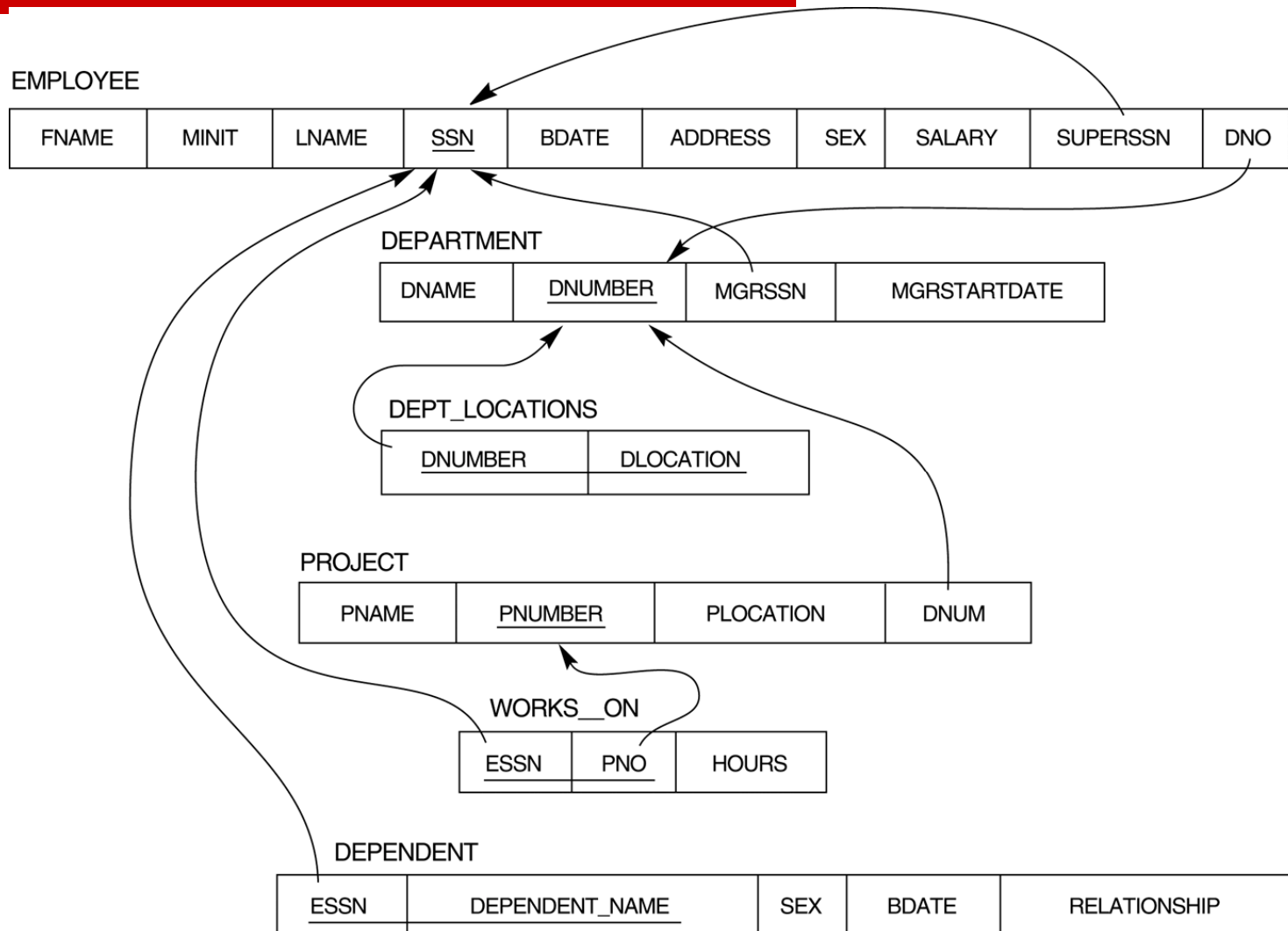
☐ How does Aggregation Maps to relations ?

Acad-DA

Students registers in a course that is offered in a semester of an academic year

Acad-DA

Mapping of aggregation into Relation(s)

☐ Is basically consists of two binary relationships, and all rules learned for binary can be applied here.

☐ For example in DA-Acad scenario;

■ First you create a relations offers for binary M:N relationship, i.e. Offers(CourseNo, AcadYear, Sem)

■ Then treating offers as an entity, and having many to many binary relationship with student, a separate relation is created registers for registers relationship, as following-
Registers(CourseNo, AcadYear, Sem, StudentID, Grade)

- ☐ Sometimes relationship may require modeling as entity - for Example, if we want to maintain department association history of an employee, and a person might be working for different interval of time for a department.

- ☐ How will we model this ?

- ☐ Another example can be Issues relationship in Library database.