COP 4710: Database Systems
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Chapter 2 – In Class Exercises

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School of Electrical Engineering and Computer Science
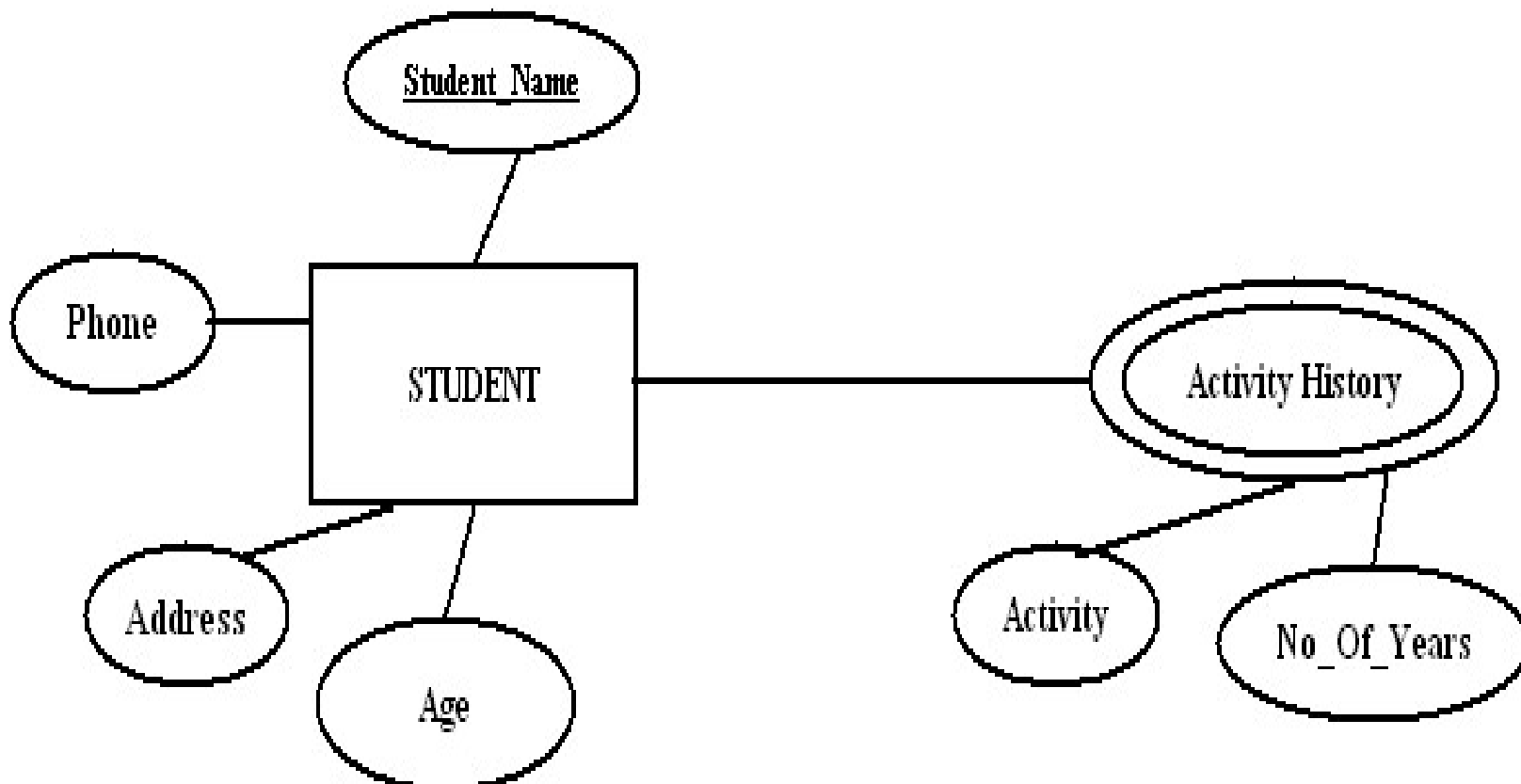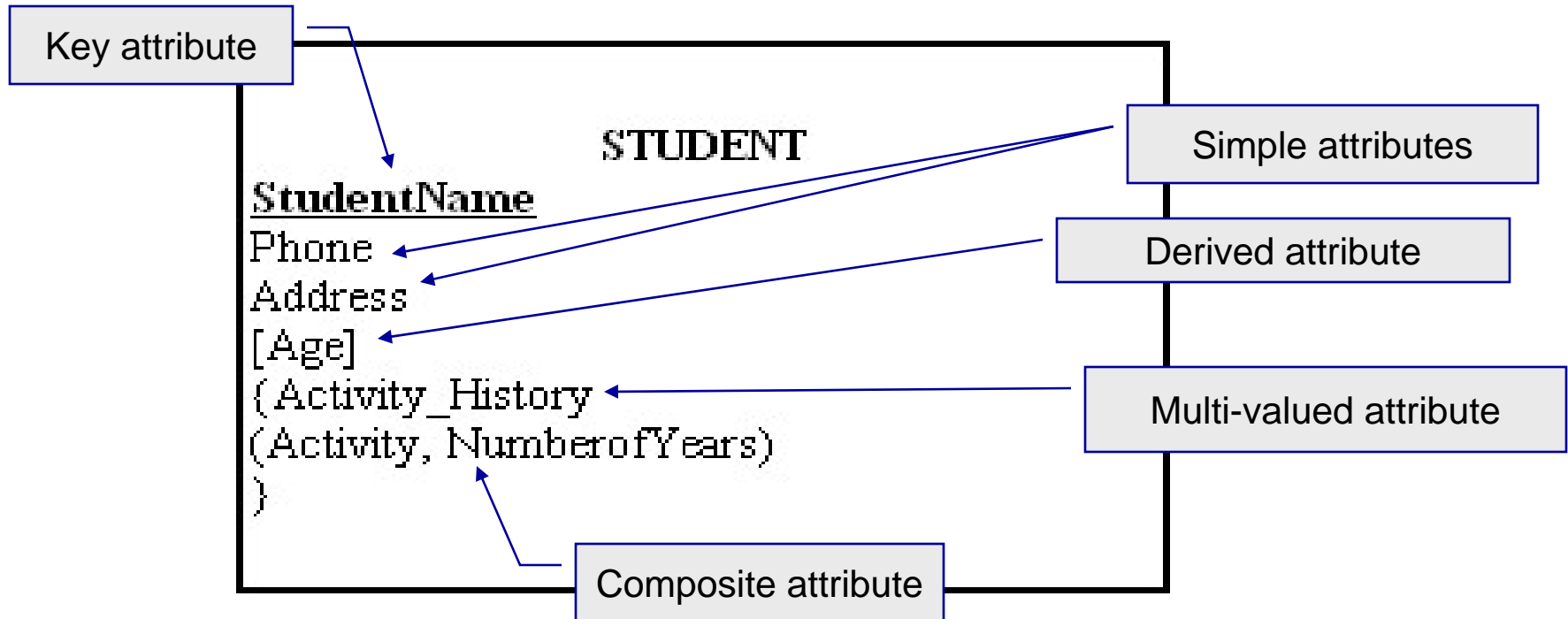**University of Central Florida**

Scenario #1

- The entity type STUDENT has the following attributes: Student_Name, Address, Phone, Age, Activity, and No_of_years. Activity represents some campus-based student activity, and No_of_years represents the number of years the student has engaged in this activity.

- A given student may engage in more than one activity.

ERD For Scenario #1
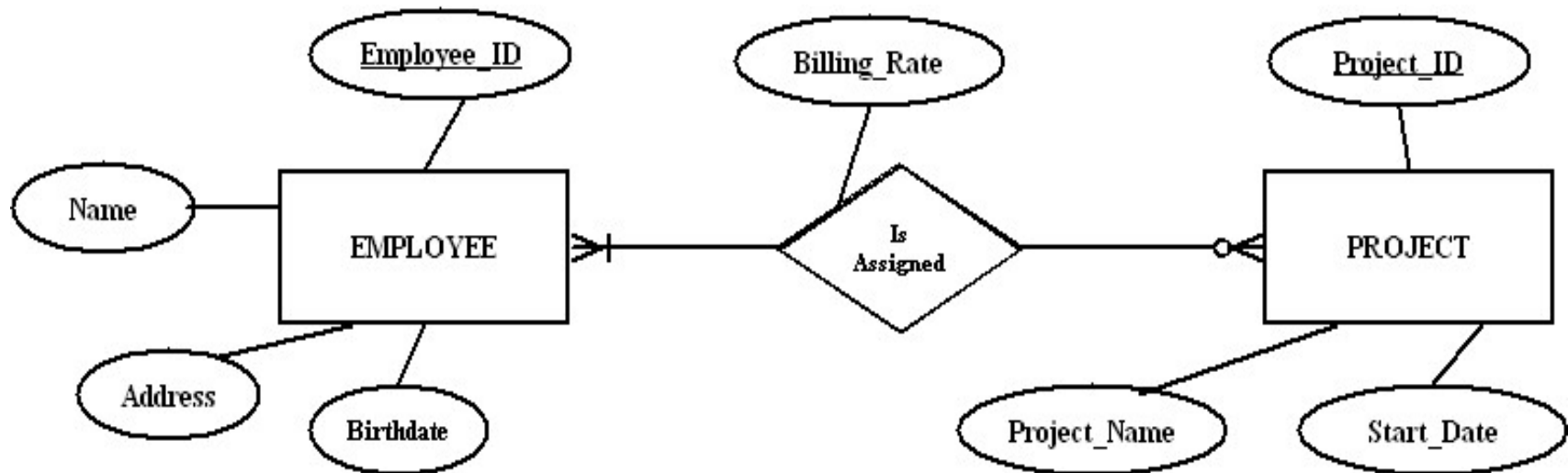
New Style ERD For Scenario #1

Key attribute

STUDENT

StudentName
Phone
Address
[Age]
{Activity_History
(Activity, NumberofYears)
}

Simple attributes

Derived attribute

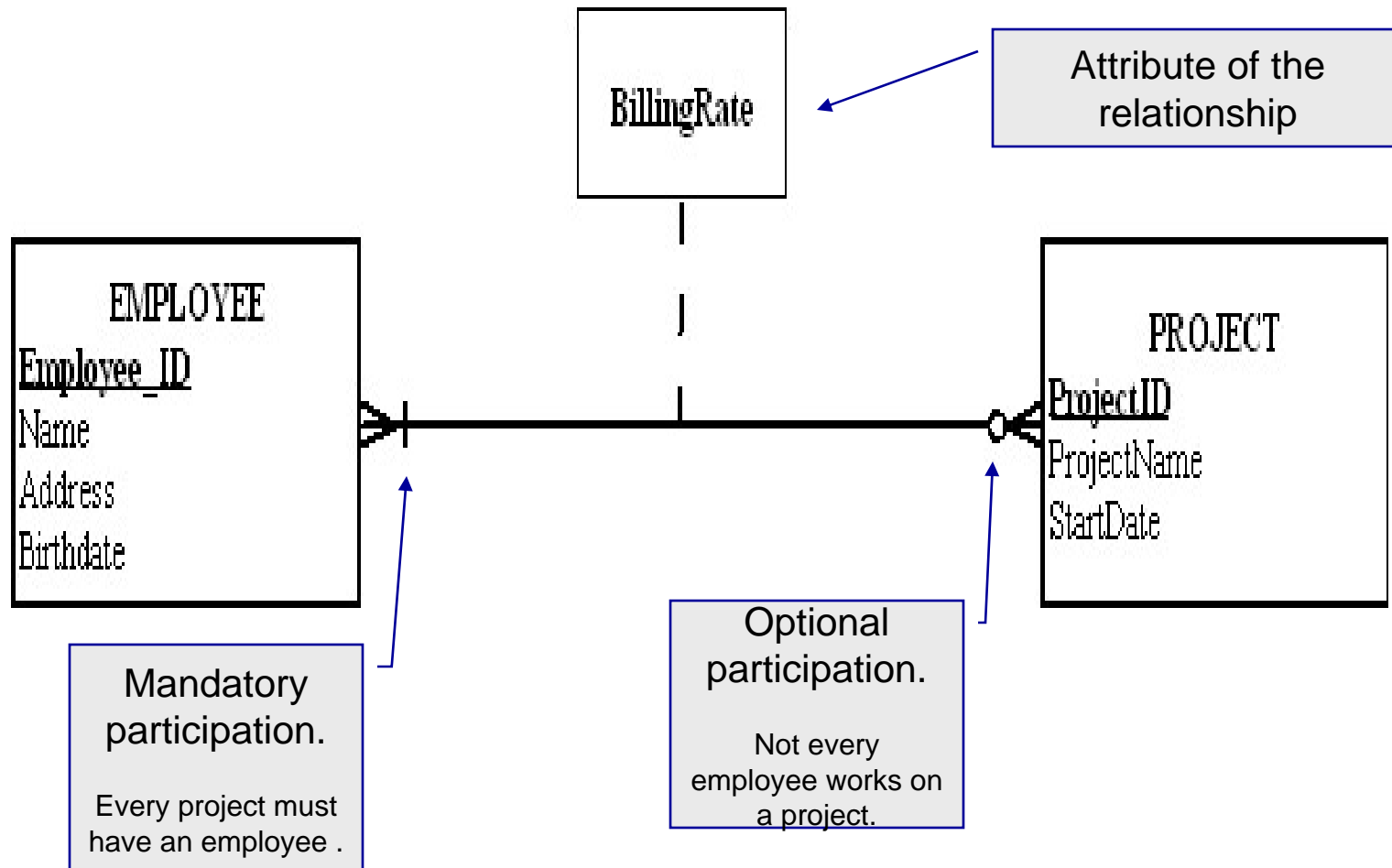Multi-valued attribute

Composite attribute

Scenario #2

- A company has a number of employees. The attributes of EMPLOYEE include Emp_ID (identifier), Name, Address, and Birthdate.

- The company also has several projects. Attributes of PROJECT include Proj_ID (identifier), Proj_Name, and Start_Date.

- Each employee may be assigned to one or more projects, or may not be assigned to any project.

- A project must have at least one employee assigned to it, and may have any number of employees assigner to it.

- An employee's billing rate may vary by project, and the company wishes to record the applicable billing rate (Billing_Rate) for each employee when assigned to a particular project.
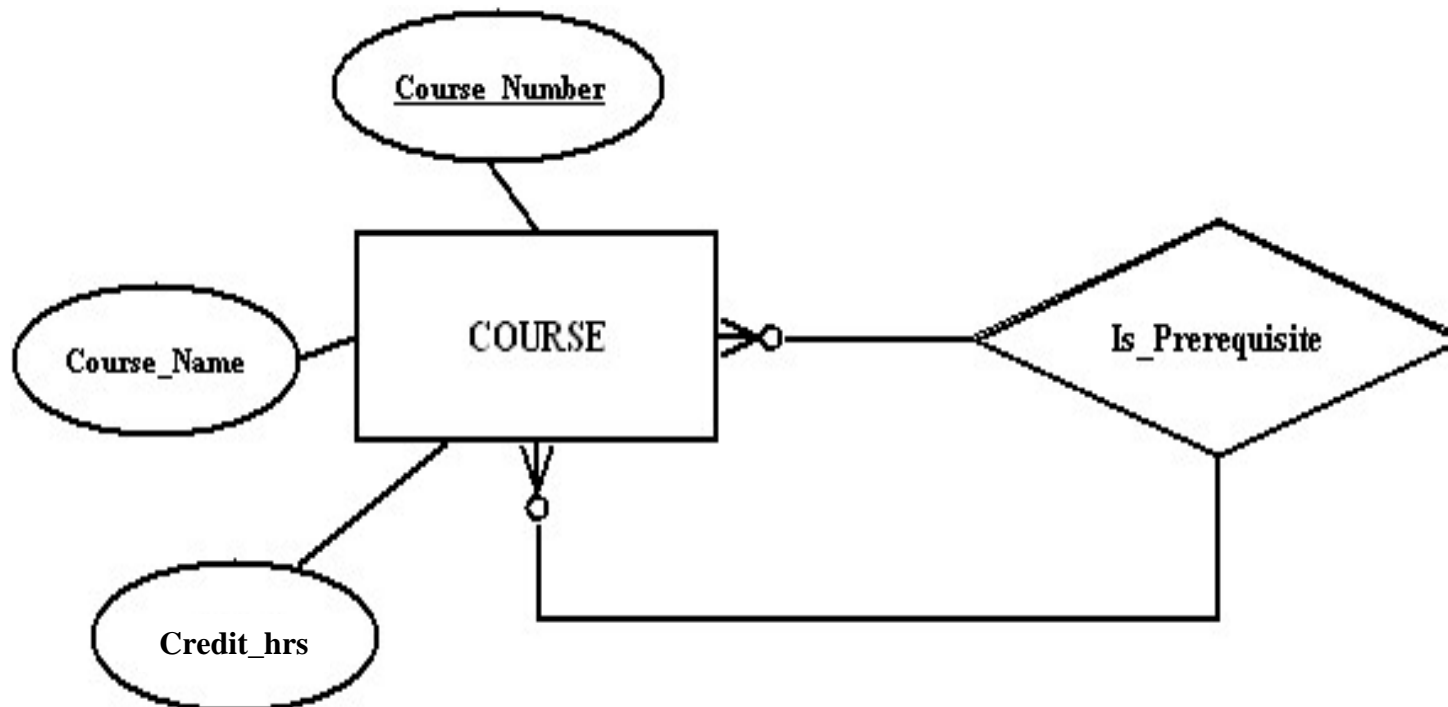
ERD For Scenario #2

New Style ERD For Scenario #2

BillingRate

Attribute of the relationship

EMPLOYEE
Employee_ID
Name
Address
Birthdate

PROJECT
ProjectID
ProjectName
StartDate

Mandatory participation.

Every project must have an employee .

Optional participation.

Not every employee works on a project.

Scenario #3

- A university has a large number of courses in its catalog.

- Attributes of COURSE include Course_num (identifier), Course_Name, and Credit_Hrs.

- Each course may have one or more different courses as prerequisites, or may have no prerequisites.

- Similarly, a particular course may be a prerequisite for any number of courses, or may not be a prerequisite for any other course.
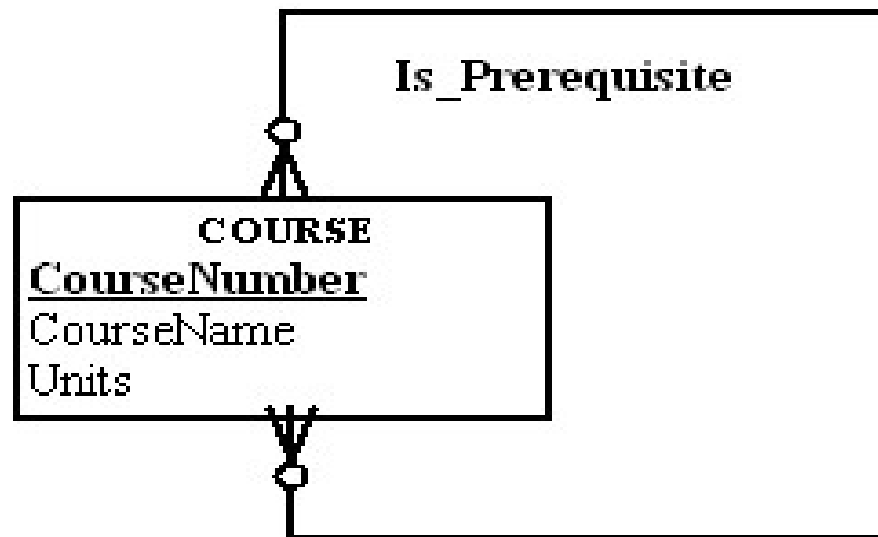
ERD For Scenario #3

New Style ERD For Scenario #3

Scenario #4

- A university course may have one or more scheduled sections, or it may not have a scheduled section.

- Attributes of COURSE include Course_ID (identifier), Course_Name, and Credit_Hrs.

- Attributes of SECTION include Section_Number and Semester_ID. Semester_ID is composed of two parts: Semester and Year. Section_Number is an integer that distinguishes one section from another for the same course but it does not uniquely identify a section.
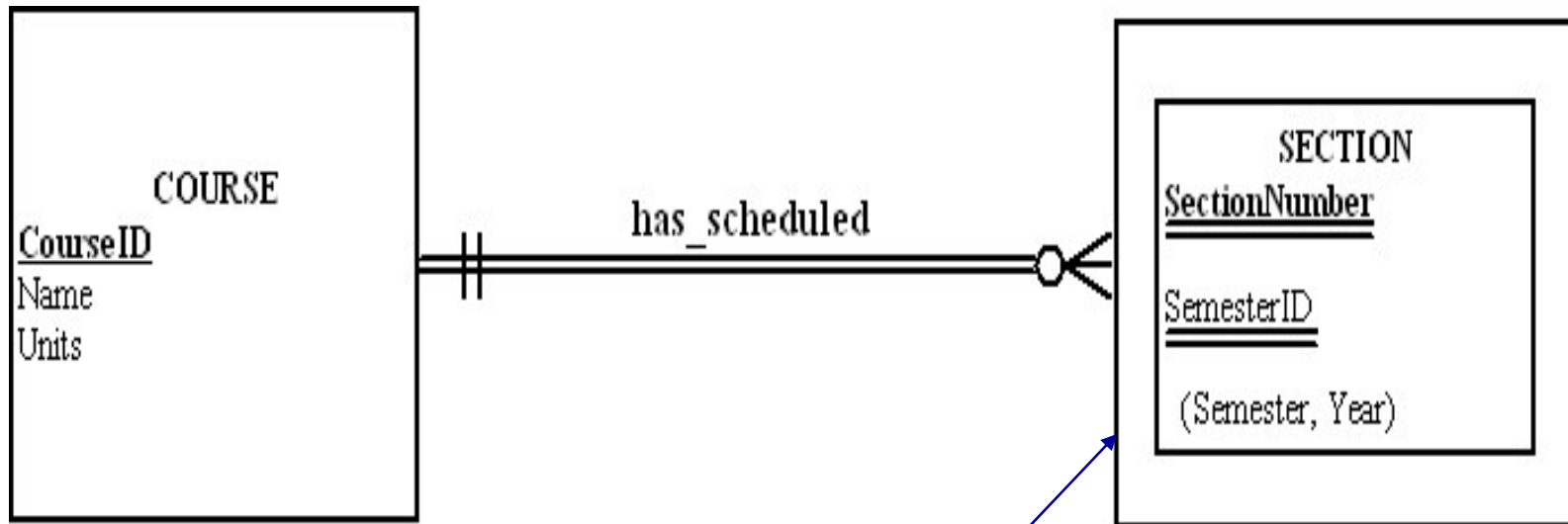
ERD For Scenario #4
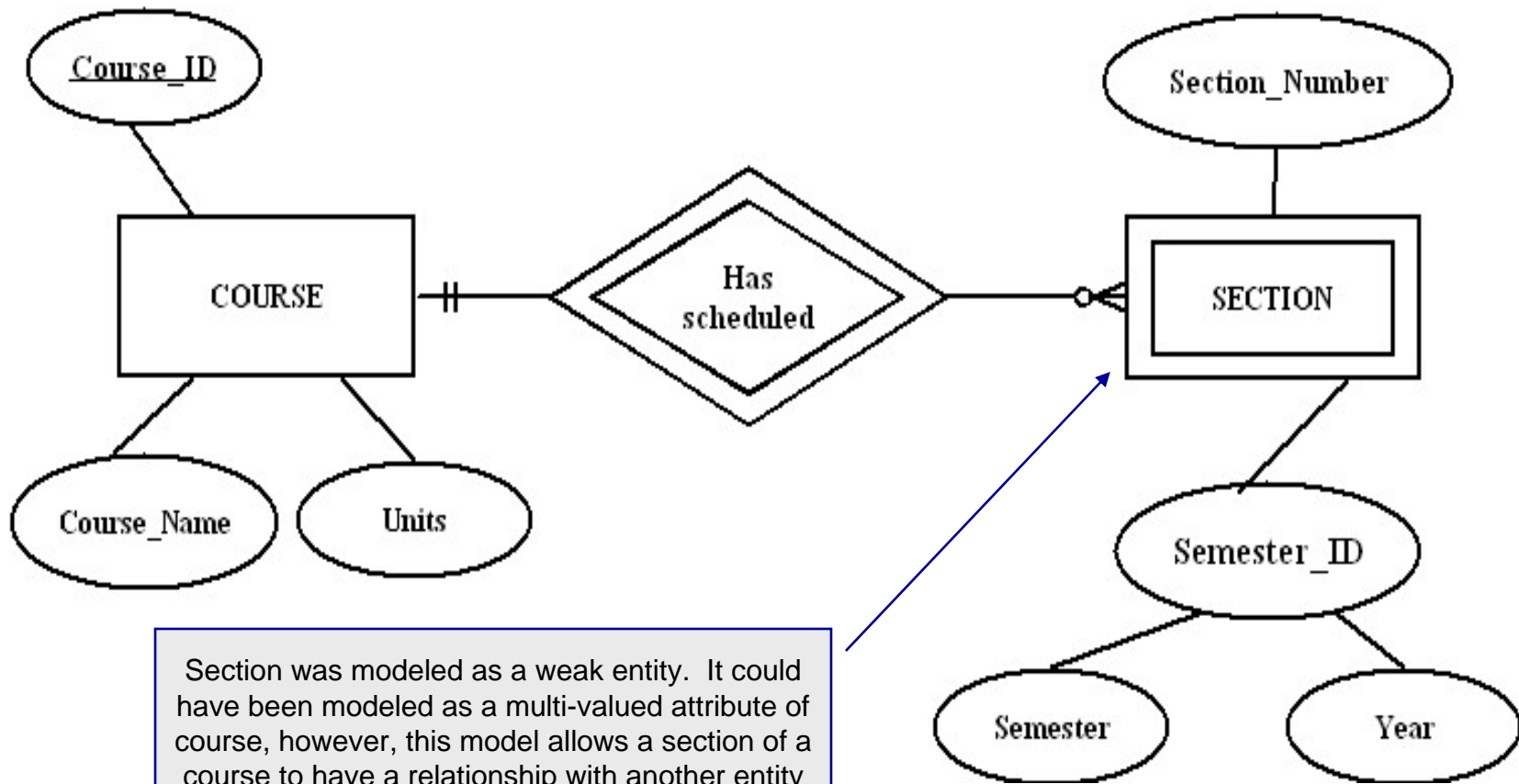
Section was modeled as a weak entity. It could have been modeled as a multi-valued attribute of course, however, this model allows a section of a course to have a relationship with another entity (think instructor or student)…the multi-valued attribute case would not allow this relationship.

New Style ERD For Scenario #4

COURSE
CourseID
Name
Units

has_scheduled

SECTION
SectionNumber

SemesterID

(Semester, Year)

Section was modeled as a weak entity. It could have been modeled as a multi-valued attribute of course, however, this model allows a section of a course to have a relationship with another entity (think instructor or student)…the multi-valued attribute case would not allow this relationship.
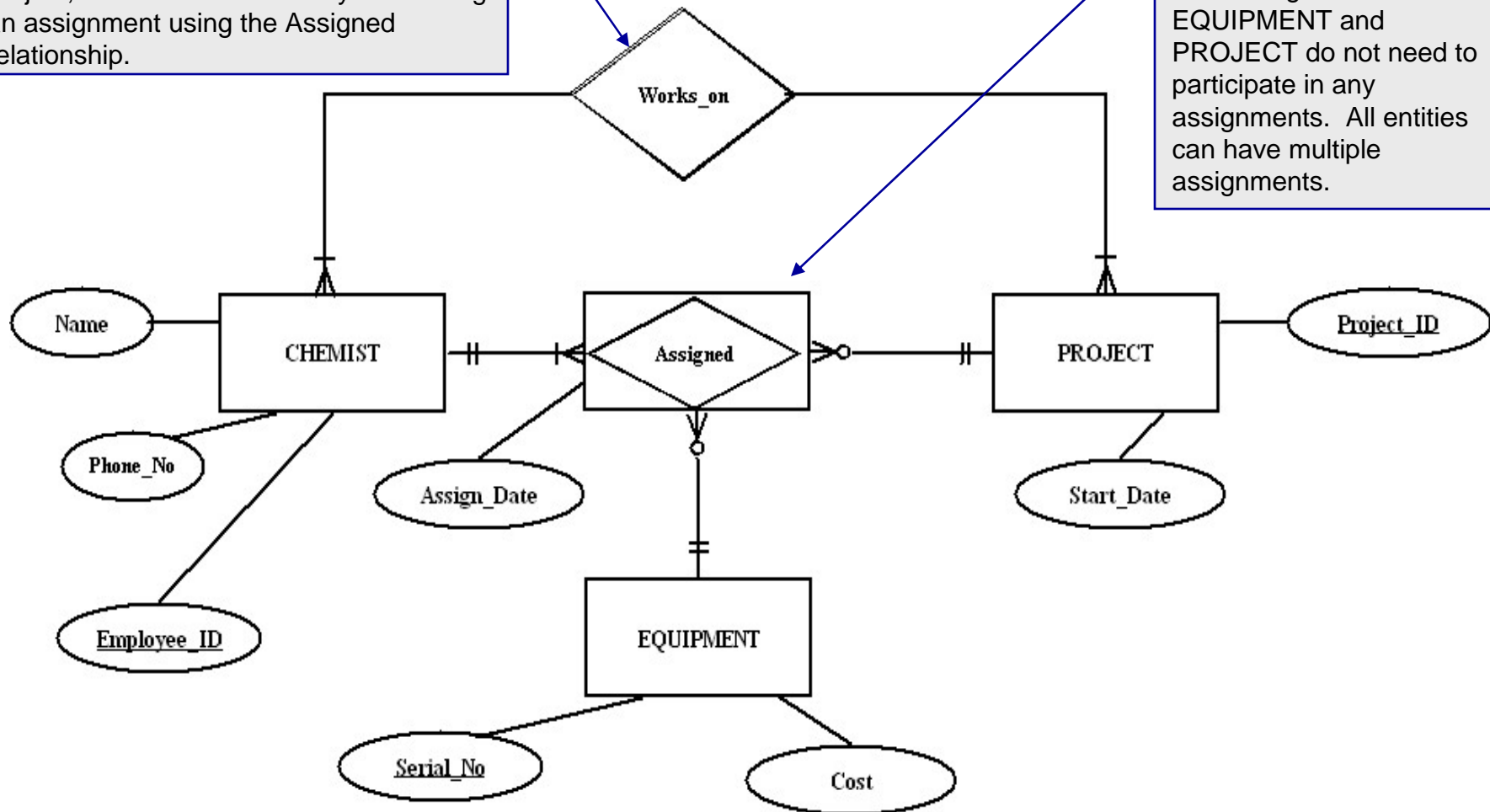
Scenario #5

- A laboratory has several chemists who work on one or more projects. Chemists may also use certain kinds of equipment on each project. Attributes of CHEMIST include Employee_ID (identifier), Name, and Phone_no.

- Attributes of PROJECT include Project_ID (identifier) and Start_Date.

- Attributes of EQUIPMENT include Serial_no. and Cost.

- The organization wants to record Assign_Date – that is, the date when a give equipment item was assigned to a particular chemist working on a specified project.

- A chemist must be assigned to at least one project and one equipment item.

- A given piece of equipment need not be assigned, and a given project need not be assigned either a chemist nor a piece of equipment.

ERD For Scenario #5

This relationship was created to show what projects a chemist works on. In the case where no equipment is used for a project, there would be no way of showing an assignment using the Assigned relationship.
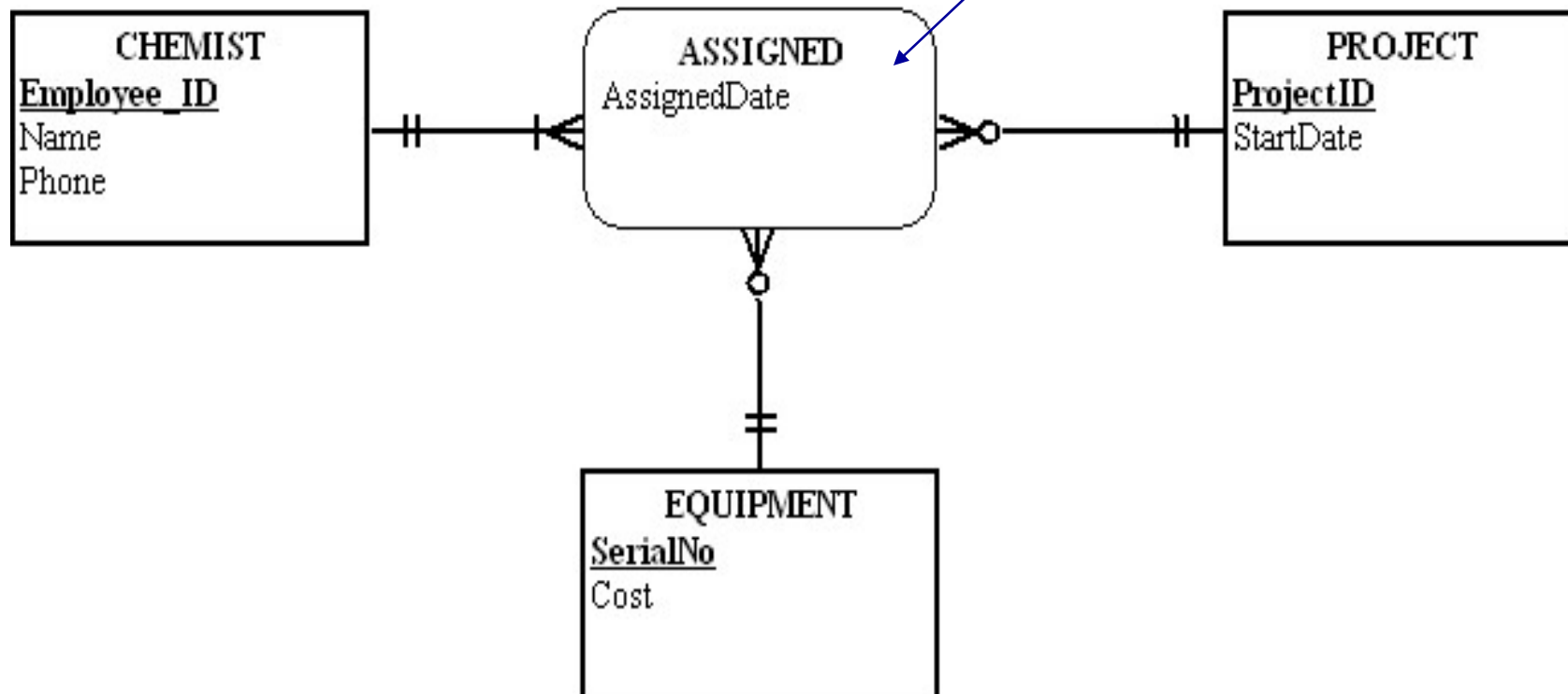
All three entities participate in an assignment. However, EQUIPMENT and PROJECT do not need to participate in any assignments. All entities can have multiple assignments.

Works_on

Name

CHEMIST

Assigned

PROJECT

Project_ID

Phone_No

Assign_Date

Start_Date

Employee_ID

EQUIPMENT

Serial_No

Cost

New Style ERD For Scenario #5

This relationship was created to show what projects a chemist works on. In the case where no equipment is used for a project, there would be no way of showing an assignment using the Assigned relationship.

All three entities participate in an assignment. However, EQUIPMENT and PROJECT do not need to participate in any assignments. All entities can have multiple assignments.

CHEMIST
Employee_ID
Name
Phone

ASSIGNED
AssignedDate

PROJECT
ProjectID
StartDate

EQUIPMENT
SerialNo
Cost

Scenario #6

- Projects Inc., is an engineering firm with approximately 500 employees. A database is required to keep track of all employees, their skills, assigned projects, and departments in which they work.

- Every employee has a unique number assigned by the firm, a name, and date of birth. If an employee is married to another employee of the firm, the data of the marriage and who is married to whom must be stored; however, no record of marriage is required if an employee's spouse is not also an employee. Each employee has a job title. Each employee does only one type of job at a time, and we only need to retain information about an employee's current job.

- There are 11 different departments in the firm, each with a unique name. An employee can report to only one department. Each department has a phone number.

- To procure various types of equipment, each department deals with many vendors. A vendor typically supplies equipment to many departments. We need to store the name and address of each vendor and the date of the last meeting between a department and a vendor.

- Many employees can work on a project. An employee can work on many projects, but can only be assigned to at most one project in a given city. For each city, we are interested in its state and population.

- An employee can have many skills, but they can use only a given set of skills on a particular project. Employees use each skill that they posses in at least one project. Each skill is assigned a number, and we will record a short description of each skill.

- Projects are distinguished by project numbers and we must store the estimated cost of each project.

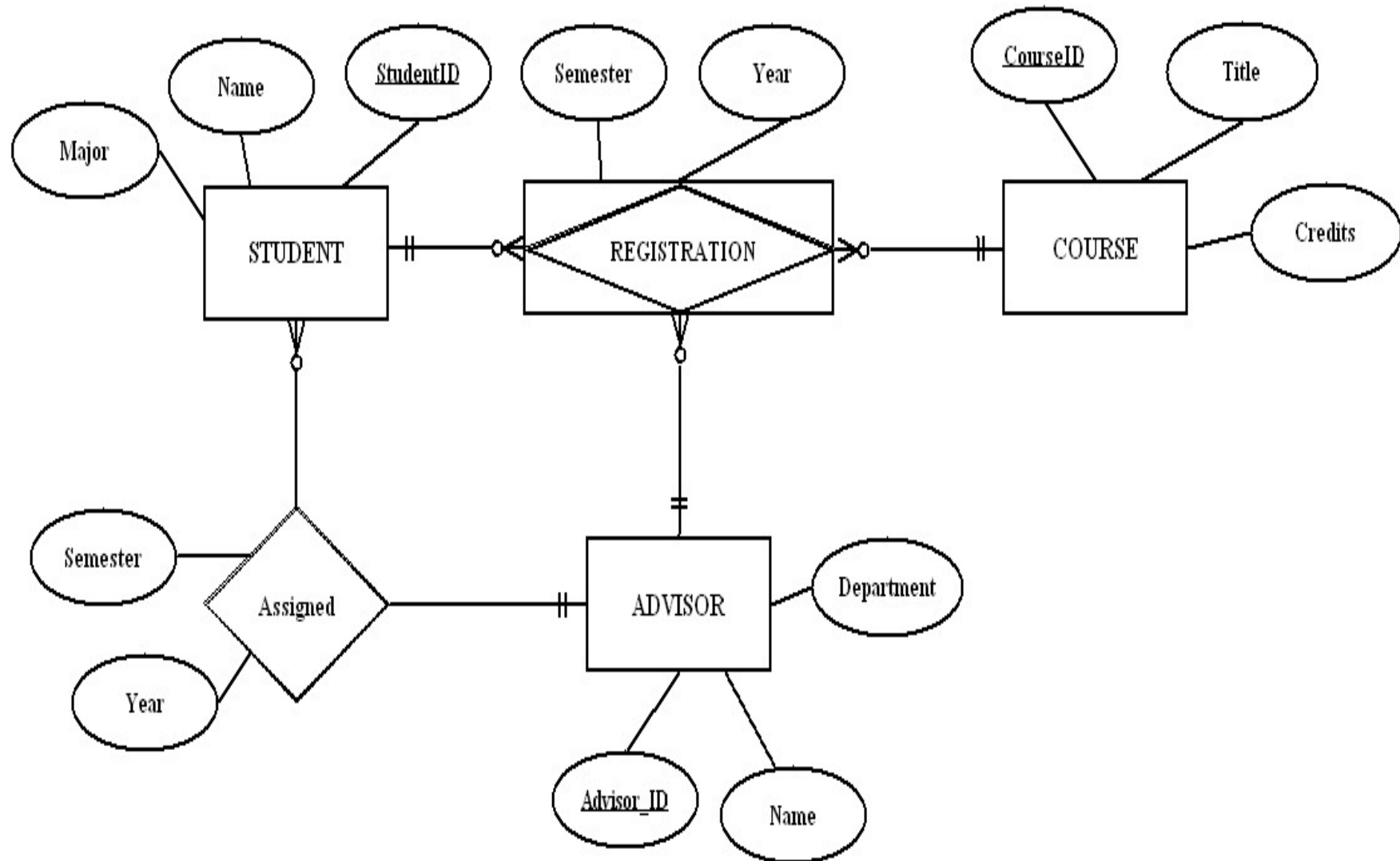# ERD For Scenario #6
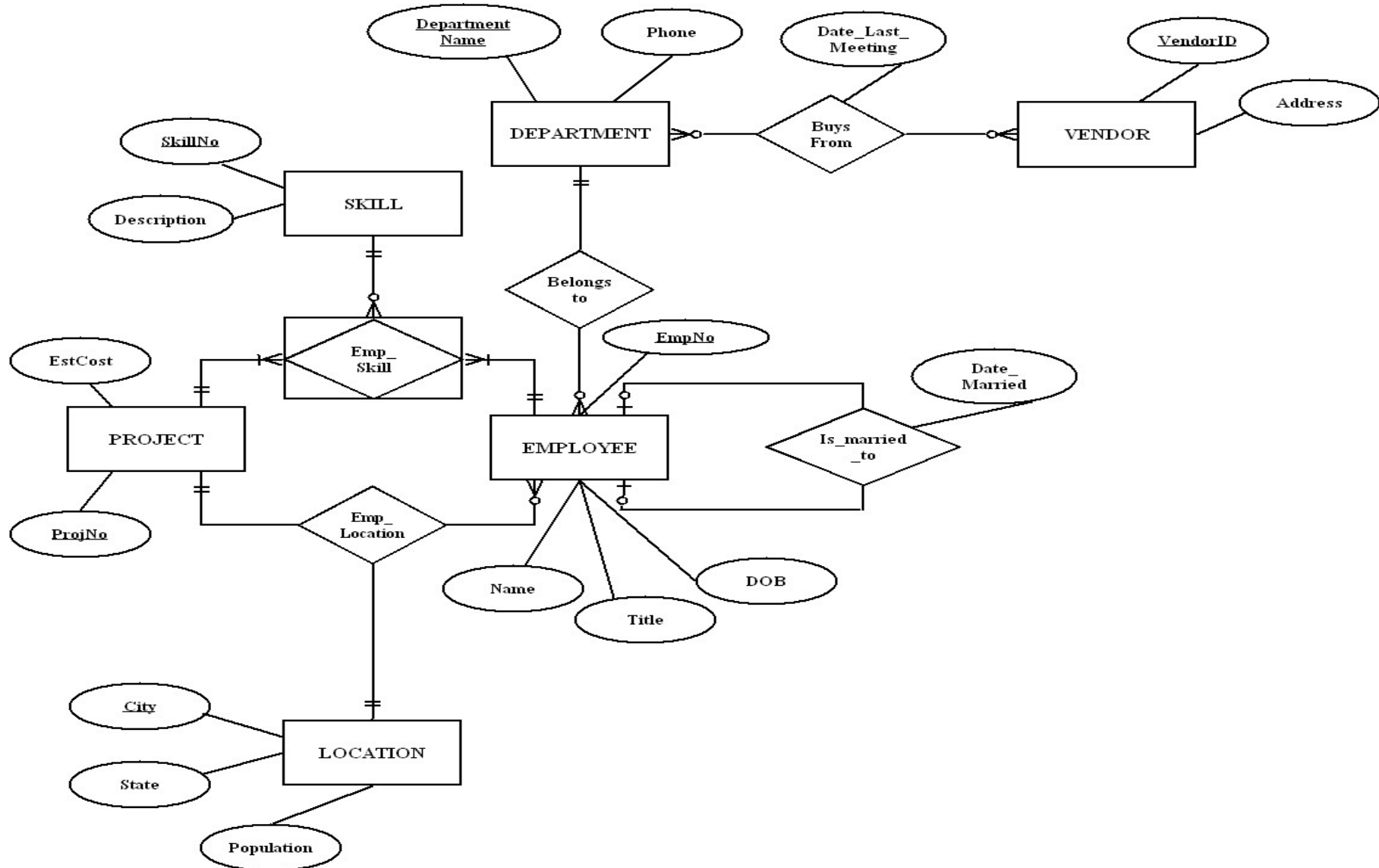
New Style ERD For Scenario #6
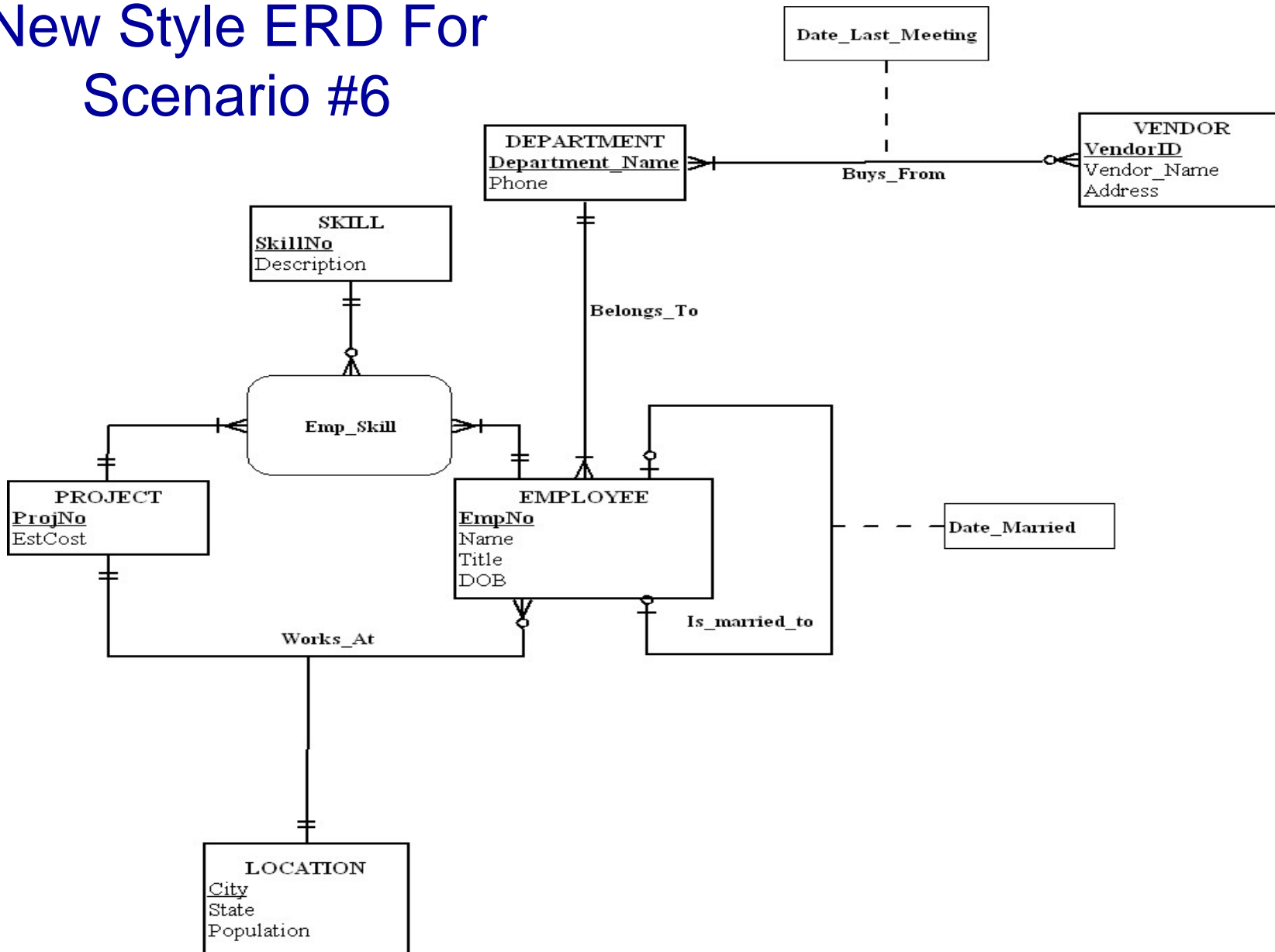
Scenario #7

- Each semester, each student must be assigned an advisor who counsels students about degree requirements and helps the students register for classes.

- Each student must register for classes with the help of an advisor, but if the student's assigned advisor is not available, the student may register with any advisor.

- We must keep track of students, the assigned advisor for each, and the name of the advisor with whom the student registerd for the current term.

ERD For Scenario #7

New Style ERD For Scenario #7