Solution to Exercise 1

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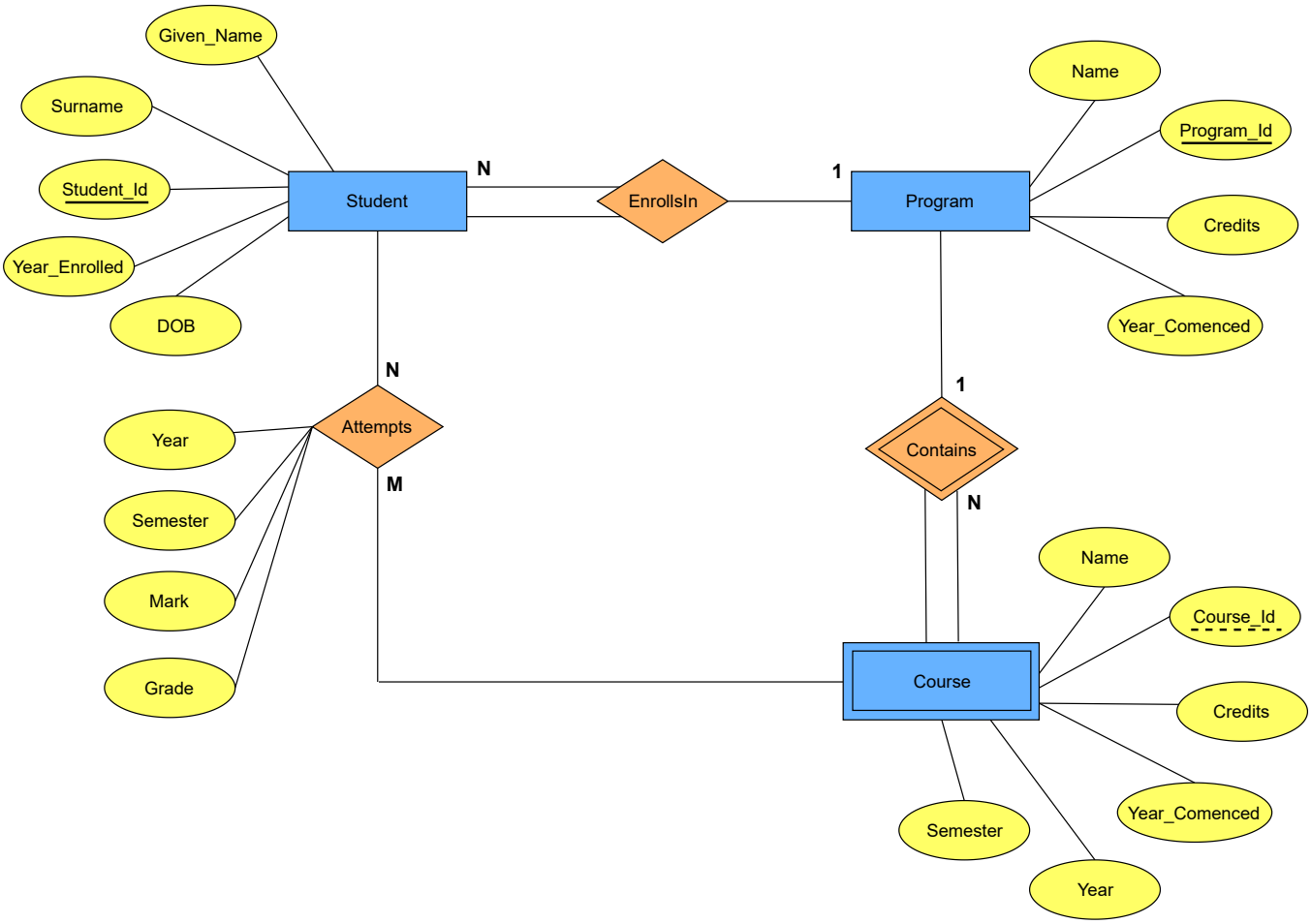
We'll cover the following

- Solution
- Explanation

Solution

The ER diagram derived from our requirements is shown below. The diagram uses some advanced features, including relationships that have attributes and weak entity types.



Explanation

In our design:

- STUDENT is a strong entity, with an identifier, `Student_Id`, created to be the primary key used to distinguish between students (remember, we could have several students with the same name).
- PROGRAM is a strong entity, with the identifier `Program_Id` as the primary key used to distinguish between programs.
- Each student must be enrolled in a program, so the STUDENT entity participates totally in the many-to-one ENROLLS_IN relationship with PROGRAM. A program can exist without having any enrolled students, so it participates partially in this relationship.
- A COURSE has meaning only in the context of a PROGRAM, so it's a weak entity, with `Course_Id` as a weak key. This means that a COURSE entity is uniquely identified using its `Course_Id` and the `Program_Id` of its owning program.
- As a weak entity, COURSE participates totally in the many-to-one identifying relationship with its owning PROGRAM.
- STUDENT and COURSE are related through the many-to-many, ATTEMPTS relationships; a course can exist without a student, and a student can be enrolled without attempting any courses, so the participation is not total.
- When a student attempts a course, there are attributes needed to capture the `Year`, `Semester`, `Mark` and `Grade` of that course.