Business School
UNIVERSITY OF COLORADO DENVER

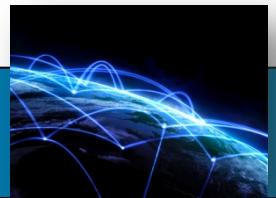
Information Systems Program

Module 5
Extended Query Formulation with SQL

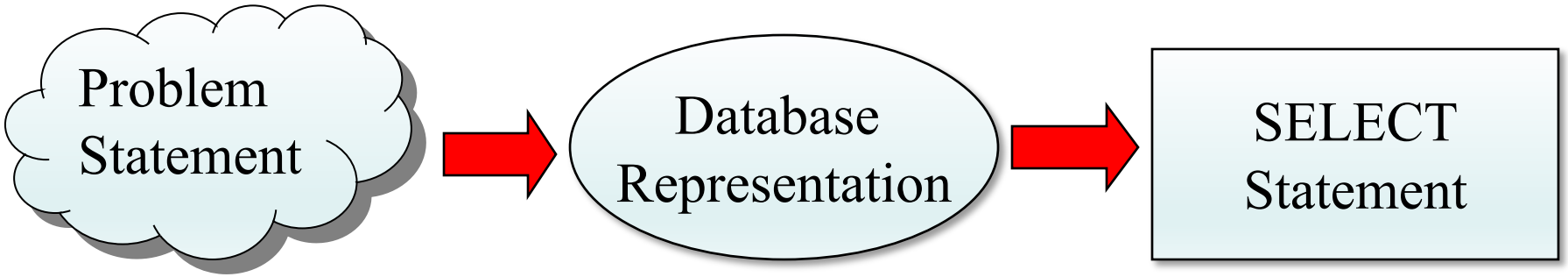
Lesson 1: Query Formulation Guidelines

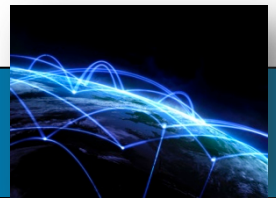
Lesson Objectives

- Convert a problem statement into a database representation using the critical questions
- Identify extra tables in a SELECT statement



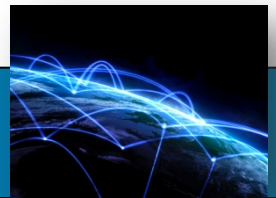
Query Formulation Process



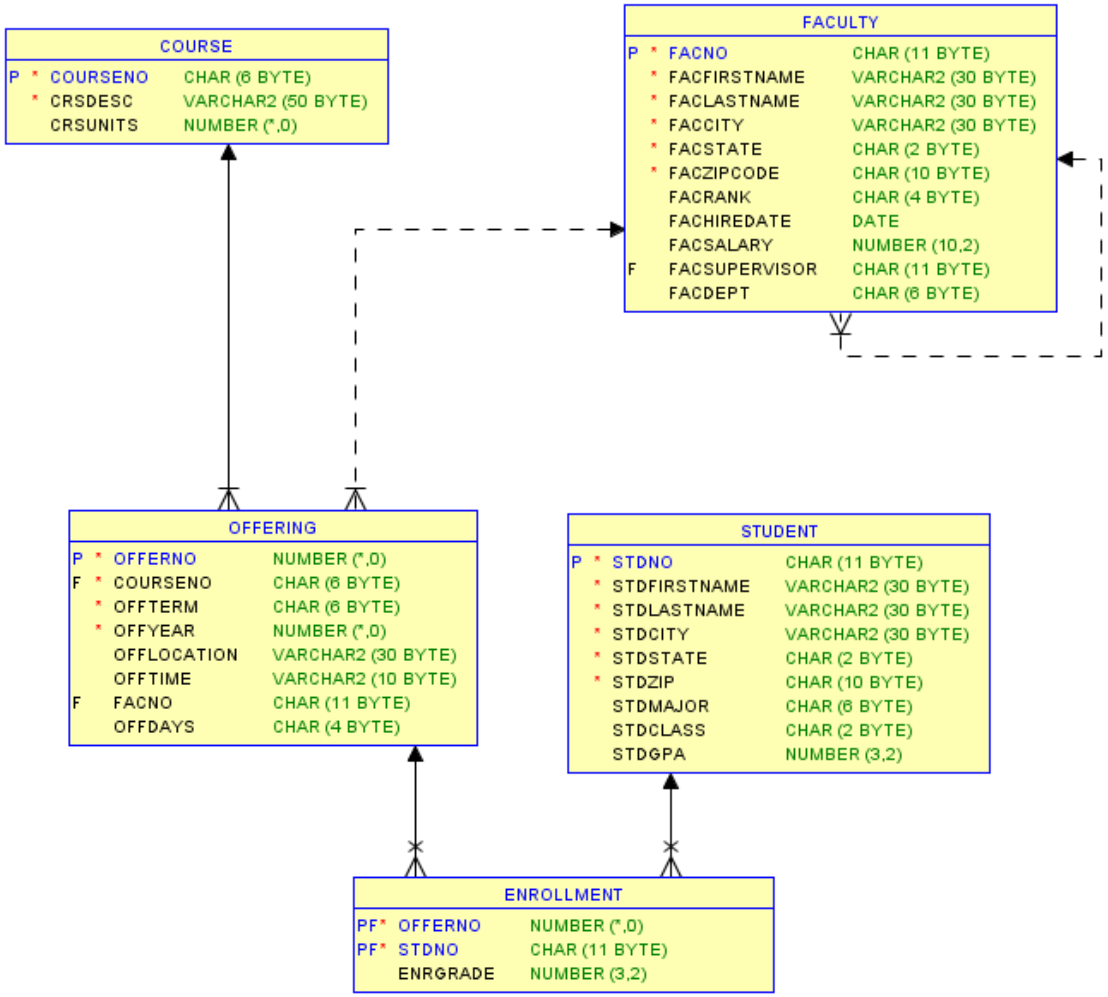


Critical Questions

- What tables?
  - Columns in result
  - Conditions to test (including join conditions)
- How to combine the tables?
  - Usually join of PK to FK
  - More complex ways to combine
- Individual rows or groups of rows?
  - Aggregate functions in result
  - Conditions with aggregate functions



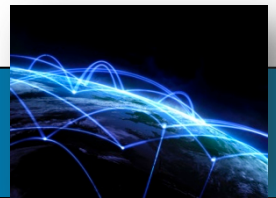
University Database Diagram



Summarization and Joins I

Example 1: List the number of students enrolled in each 2017 course offering showing the offer number and number of students in the result.

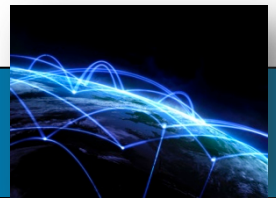
```
SELECT Offering.OfferNo,
       COUNT(*) AS NumStudents
 FROM Enrollment, Offering
 WHERE Offering.OfferNo = Enrollment.OfferNo
   AND OffYear = 2017
 GROUP BY Offering.OfferNo;
```

Summarization and Joins II

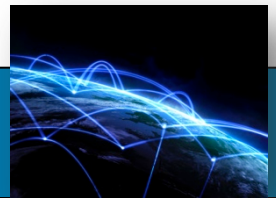
Example 2: List the offering number, course number, and average GPA. Only include courses offered in fall 2016 in which the average GPA is greater than 3.0.

```
SELECT Enrollment.OfferNo, CourseNo,
       AVG(StdGPA) AS AvgGPA
 FROM Offering, Enrollment, Student
 WHERE Offering.OfferNo = Enrollment.OfferNo
   AND Student.StdNo = Enrollment.StdNo
   AND OffYear = 2016 AND OffTerm = 'FALL'
 GROUP BY Enrollment.OfferNo, CourseNo
 HAVING AVG(StdGPA) > 3.0;
```

Efficiency Considerations

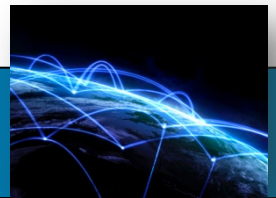
- Little concern for efficiency
- Intelligent SQL compilers
- Correct and non redundant solution
  - No extra tables
  - No unnecessary grouping
  - No missing join conditions



Extra Table Redundancy

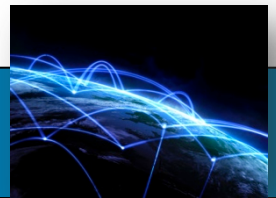
Example 3: List the offering number, course number, and average GPA. Only include courses offered in fall 2016 in which the average GPA is greater than 3.0.

```
SELECT Enrollment.OfferNo, Offering.CourseNo,
       AVG(StdGPA) AS AvgGPA
 FROM Offering, Enrollment, Student, Course
 WHERE Offering.OfferNo = Enrollment.OfferNo
   AND Student.StdNo = Enrollment.StdNo
   AND Course.CourseNo = Offering.CourseNo
   AND OffYear = 2016 AND OffTerm = 'FALL'
 GROUP BY Enrollment.OfferNo, Offering.CourseNo
 HAVING AVG(StdGPA) > 3.0;
```

Summary

- Remember the query formulation process
- Use critical questions to convert a problem statement into a database representation
- Check for unnecessary tables and missing join conditions
- Much practice with more difficult problems involving joins and grouping



Database Representation to SQL Statement