Chapter 4

Query Formulation with SQL

What is SQL?

- Structured Query Language
- Language for database definition, manipulation, and control
- International standard
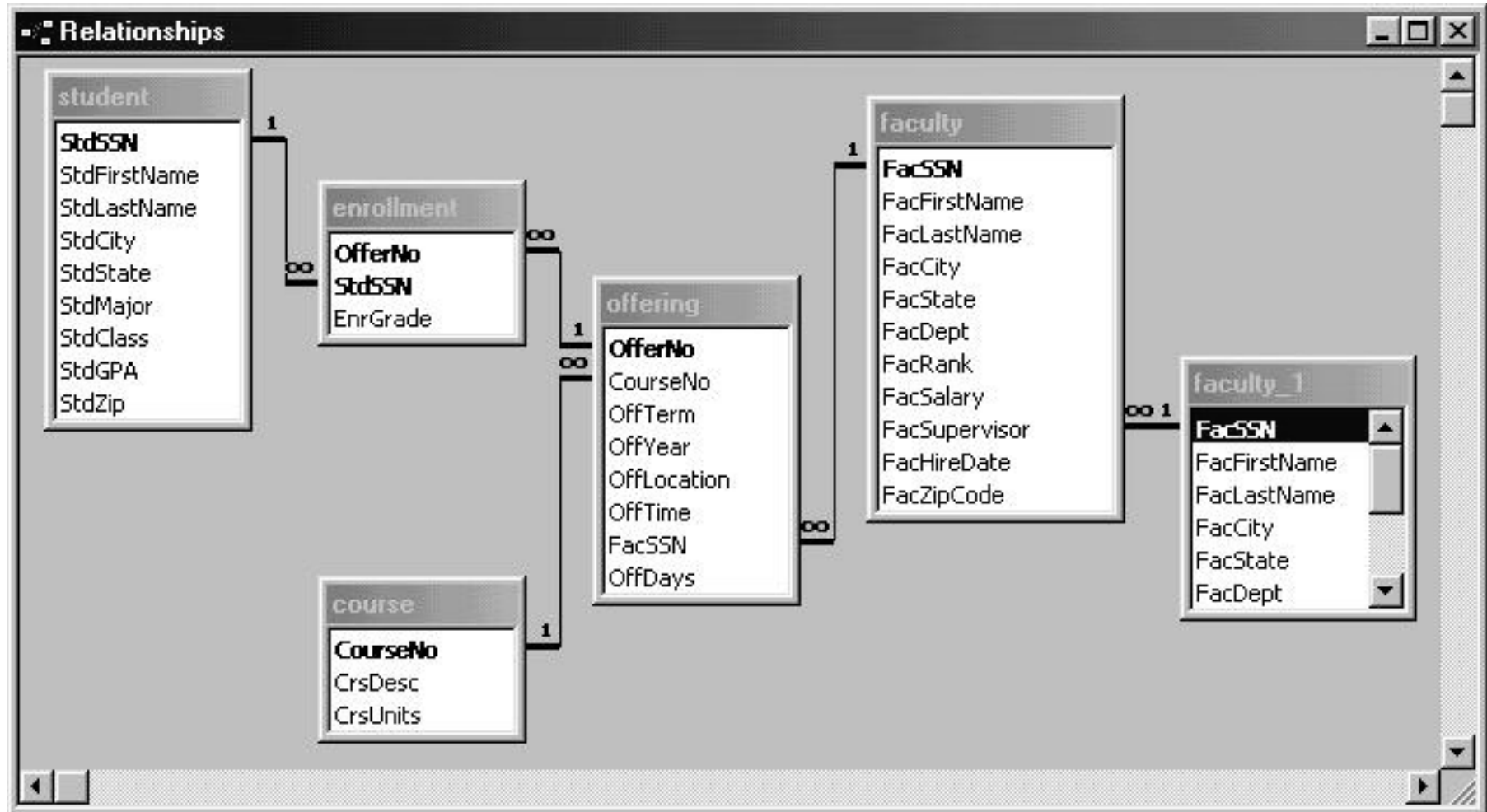- Standalone and embedded usage

DML * DDL * DCL

- Data Manipulation Language (DML) :
  INSERT, UPDATE, DELETE, SELECT

- Data Definition Language (DDL) :
  CREATE DATABASE, DROP DATABASE,
  CREATE TABLE, DROP TABLE, ALTER TABLE

- Data Control Language (DCL) :
  GRANT, REVOKE, COMMIT, ROLLBACK, ETC

SELECT Statement Overview

`SELECT` <list of column expressions>
 `FROM` <list of tables and join operations>
 `WHERE` <list of logical expressions for <u>rows</u>>
 `GROUP BY` <list of grouping columns>
 `HAVING` <list of logical expressions for <u>groups</u>>
 `ORDER BY` <list of sorting specifications>

- Expression: combination of columns, constants, operators, and functions

University Database

First SELECT Examples

Example 1
```
SELECT * FROM Faculty
```

Example 2
```
SELECT *
 FROM Faculty
 WHERE FacSSN = '543210987'
```

Example 3
```
SELECT FacFirstName, FacLastName, FacSalary
 FROM Faculty
```

Example 4
```
SELECT FacFirstName, FacLastName, FacSalary
 FROM Faculty
 WHERE FacSalary > 65000 AND FacRank = 'PROF'
```

Using Expressions

Example 5 (Access)
```
SELECT FacFirstName, FacLastName, FacCity,
        FacSalary*1.1 AS IncreasedSalary,
        FacHireDate
FROM Faculty
WHERE year(FacHireDate) > 1996
```

Example 5 (Oracle)
```
SELECT FacFirstName, FacLastName, FacCity,
        FacSalary*1.1 AS IncreasedSalary,
        FacHireDate
FROM Faculty
WHERE to_number(to_char(FacHireDate, 'YYYY'))
        > 1996
```

Inexact Matching

- Match against a pattern: LIKE operator

- Use meta characters to specify patterns

  – Wildcard (* or %)

  – Any single character (? or _)

Example 6 (Access)
```
SELECT *
 FROM Offering
 WHERE CourseNo LIKE 'IS*'
```

Example 6 (Oracle)
```
SELECT *
 FROM Offering
 WHERE CourseNo LIKE 'IS%'
```

Using Dates

- Dates are numbers

- Date constants and functions are not standard

Example 7 (Access)
```
SELECT FacFirstName, FacLastName, FacHireDate
 FROM Faculty
 WHERE FacHireDate BETWEEN #1/1/1999#
    AND #12/31/2000#
```

Example 7 (Oracle)
```
SELECT FacFirstName, FacLastName, FacHireDate
 FROM Faculty
 WHERE FacHireDate BETWEEN '1-Jan-1999'
    AND '31-Dec-2000'
```

Other Single Table Examples

Example 8: Testing for null values

```
SELECT OfferNo, CourseNo
 FROM Offering
 WHERE FacSSN IS NULL AND OffTerm = 'SUMMER'
    AND OffYear = 2006
```

Example 9: Mixing AND and OR

```
SELECT OfferNo, CourseNo, FacSSN
 FROM Offering
 WHERE (OffTerm = 'FALL' AND OffYear = 2005)
    OR (OffTerm = 'WINTER' AND OffYear = 2006)
```