COMP 3111
SOFTWARE ENGINEERING

TUTORIAL:
MANAGING DATA USING SQL SERVER

DESIGNING A RELATIONAL DATABASE

- A relational database is composed of one or more relations (represented as tables).

- Each relation consists of one or more attributes (represented as columns of a table).

- To design a relational database, you need to decide:

  1. What are the relations (tables) you want to have in the database.
  2. What are the attributes (table columns) each relation should have.
  3. Which attribute(s), if any, can be a unique identifier (i.e., a key) for records in a relation.
  4. How are the tables related to each other (i.e., what are the relationships between the tables).

DESIGNING A RELATIONAL DATABASE

Guidelines for Designing a Relational Database

Guideline 1: Clear Semantics for Attributes

– Do not put attributes into one relation that describe two different real world things.

Guideline 2: Minimize Null Values in Relations

– Avoid having attribvutes that can have no value.

Guideline 3: Minimize Redundant Values in Relations

– Avoid having redundant (duplicate) data in a relation.

DESIGNING A RELATIONAL DATABASE

- For the ASU application we will create a database named *Enrollment* with three tables and columns as shown below.

Student					
id	firstName	lastName	address	state	country

EnrolledIn					
studentId	courseCode	section	semester	year	grade

Course		
code	title	credits

DESIGNING A RELATIONAL DATABASE

- Generally, a table will represent either:
  - an *object* in the application domain (e.g., *Student* and *Course*).
  - a *relationship* between objects (e.g., *EnrolledIn* between *Student* and *Course*).

Student					
id	firstName	lastName	address	state	country

EnrolledIn					
studentId	courseCode	section	semester	year	grade

Course		
code	title	credits

DESIGNING A RELATIONAL DATABASE

- Some columns can be a key for a table.
  - *id* in *Student*
  - *code* in *Course*
  - *studentId* and *courseCode* in *EnrolledIn*

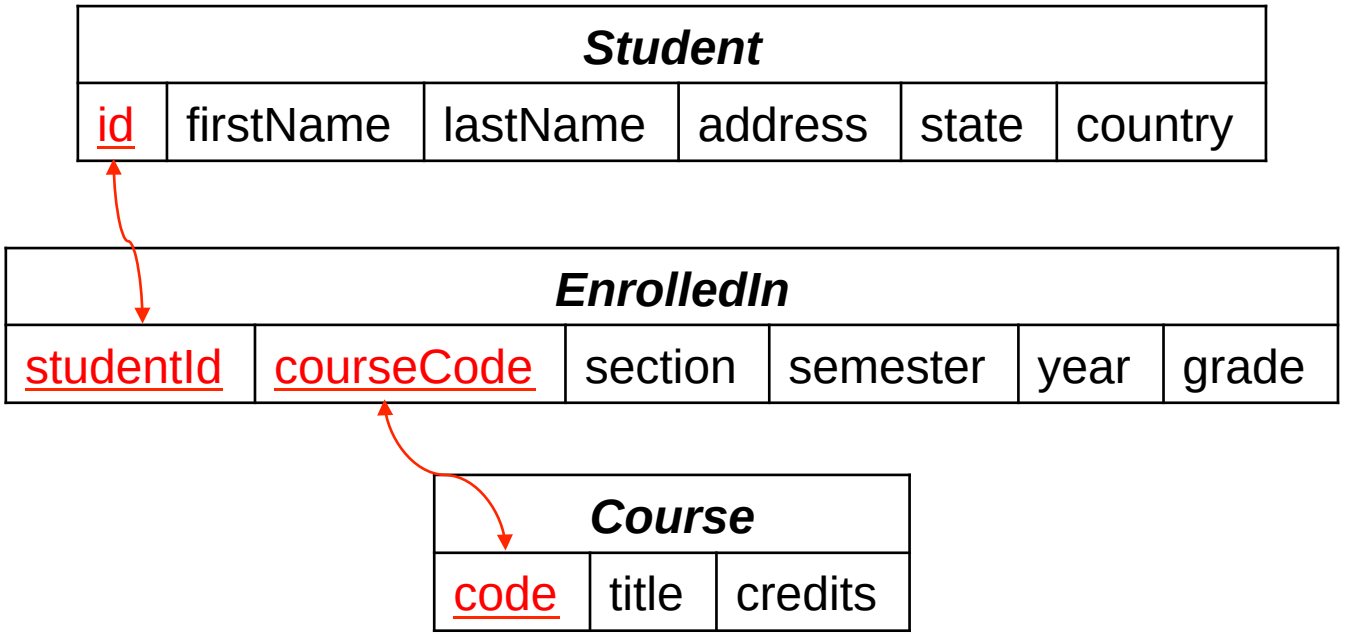
Student					
id	firstName	lastName	address	state	country

EnrolledIn					
studentId	courseCode	section	semester	year	grade

Course		
code	title	credits

DESIGNING A RELATIONAL DATABASE

- Tables are related according to common columns.
  - *Student* and *EnrolledIn* are related according to *id* in *Student* (primary key) and *studentId* in *EnrolledIn* (foreign key).
  - *Course* and *EnrolledIn* are related according to *code* in *Course* (primary key) and *courseCode* in *EnrolledIn* (foreign key).



SQL QUERY TYPES

Select Query

select [all | distinct] {* | *column_specification*}
from *table_specification*
[where *search_condition*]
[group by *column_specification*]
[having *search_condition*]
[order by {*column_specification* [asc | desc], …}];

SQL QUERY TYPES

Insert Query

insert into *table_name*
values (*value1*, *value2*, *value3*, ...);

or

insert into *table_name* (*column1*, *column2*, *column3*, ...)
values (*value1*, *value2*, *value3*, ...);

SQL QUERY TYPES

Update Query

update *table_name*
set *column1*=*value1*, *column2*=*value2*, ...
[where *search_condition*];

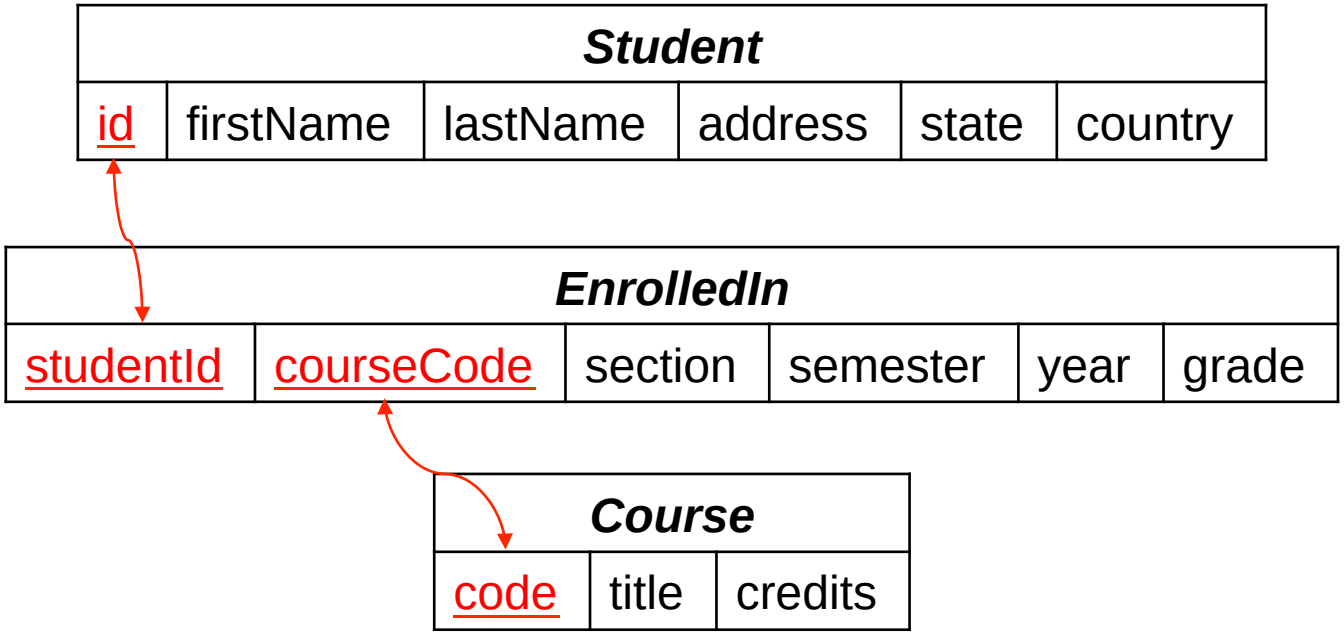
SQL QUERY TYPES

Delete Query

delete from *table_name*
[where *search_condition*];

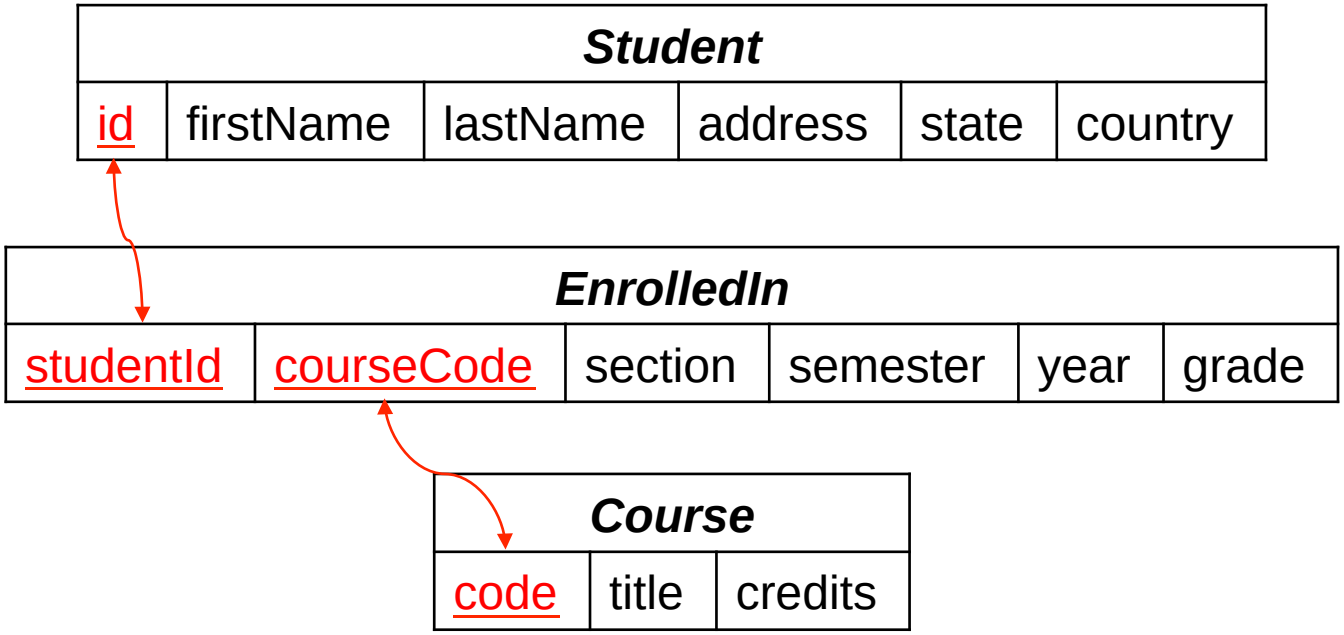
EXAMPLE QUERIES

1. Find the first name and last name of the students from Canada. Sort the result in ascending order first by last name and then by first name.



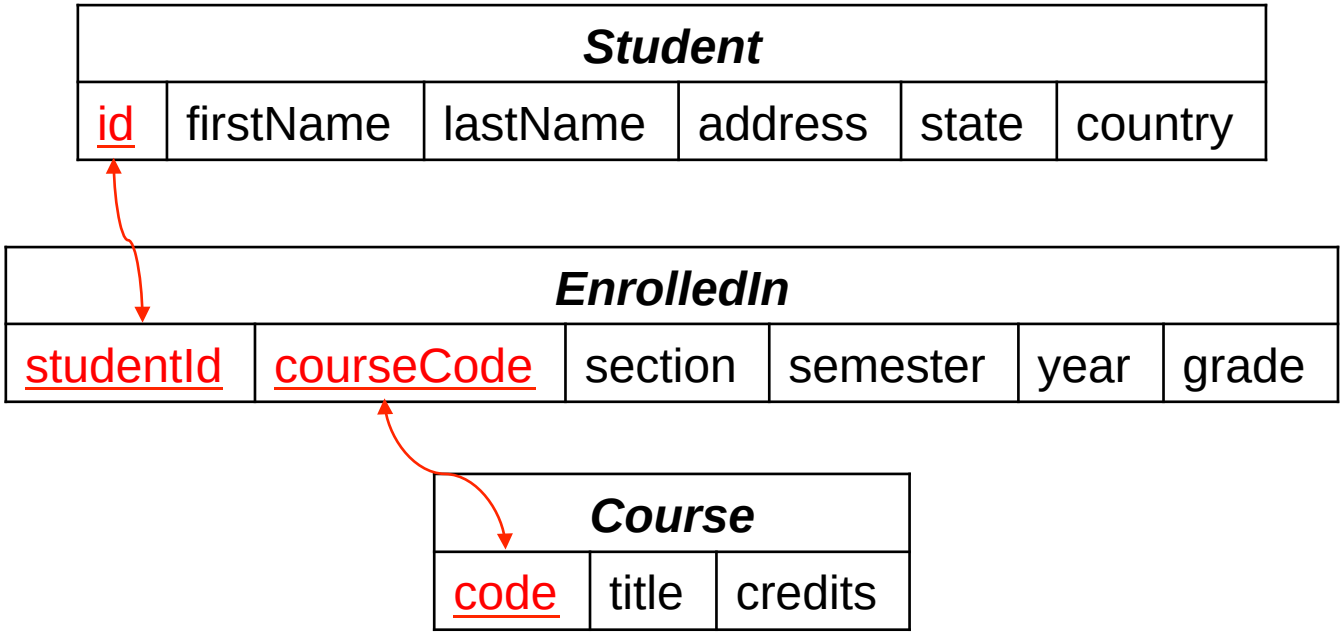
EXAMPLE QUERIES

2. Find the first name and last name of the students whose last names contain the string “au”.
   [**Hint:** You need to use the *like* comparison operator and the % wild card character.]



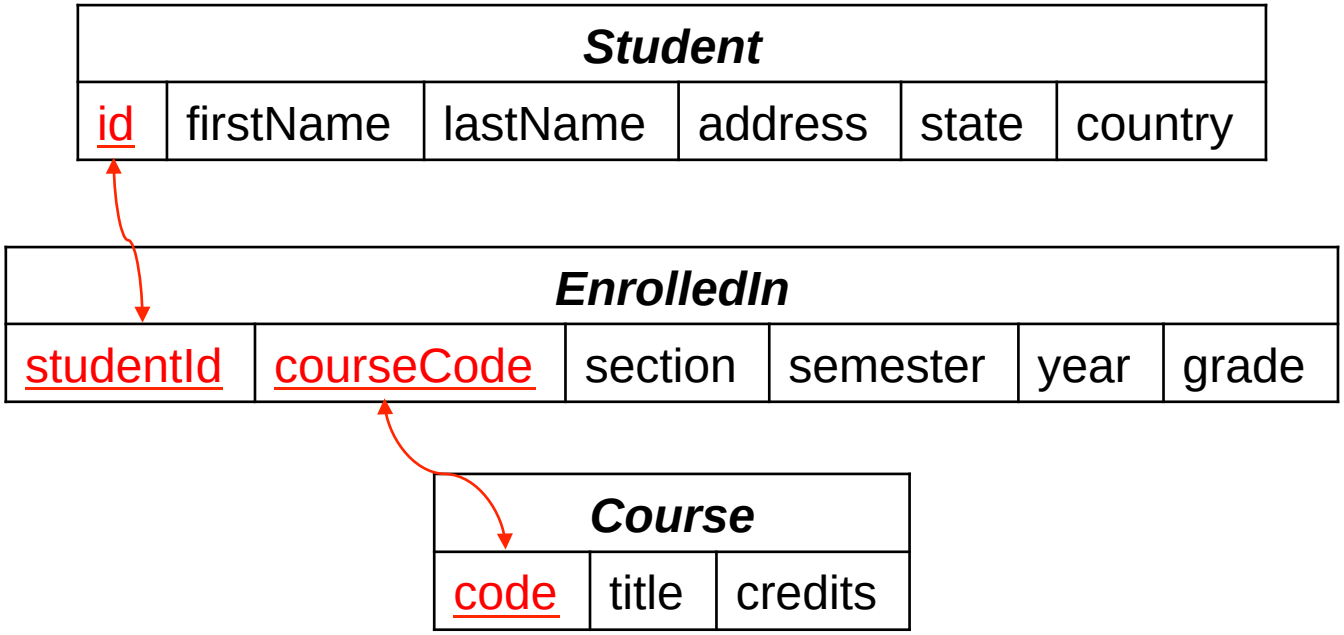
EXAMPLE QUERIES

3. Find the first name and last name of the students whose last names start with either H or Z.



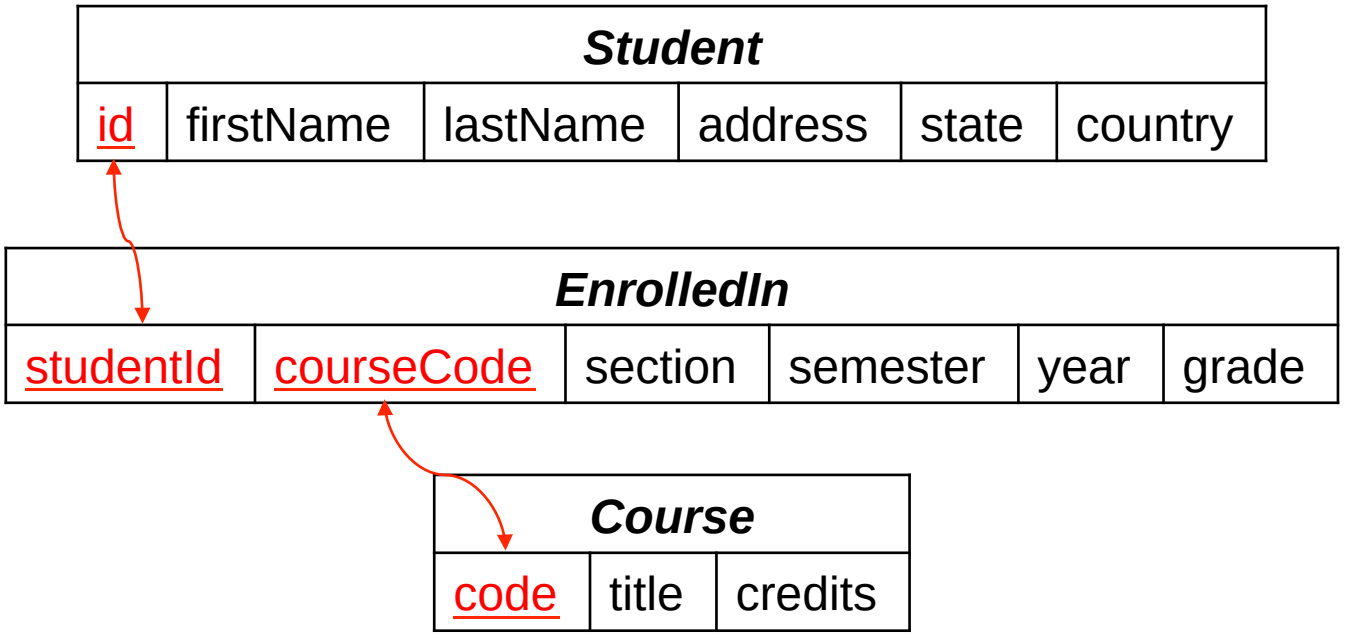
EXAMPLE QUERIES

4. Find the average grade in COMP 3311 in the Spring 2015 semester.



EXAMPLE QUERIES

5. Find the first name and last name of all students in ascending order with no duplication who have received a grade greater than or equal to 80 in any course.
[**Hint:** To specify that no duplication should appear in a result, you need to include the keyword “distinct” in the *select clause*.]



EXAMPLE QUERIES

6. For each course, find the course title and the number of students from the USA enrolled in the course.