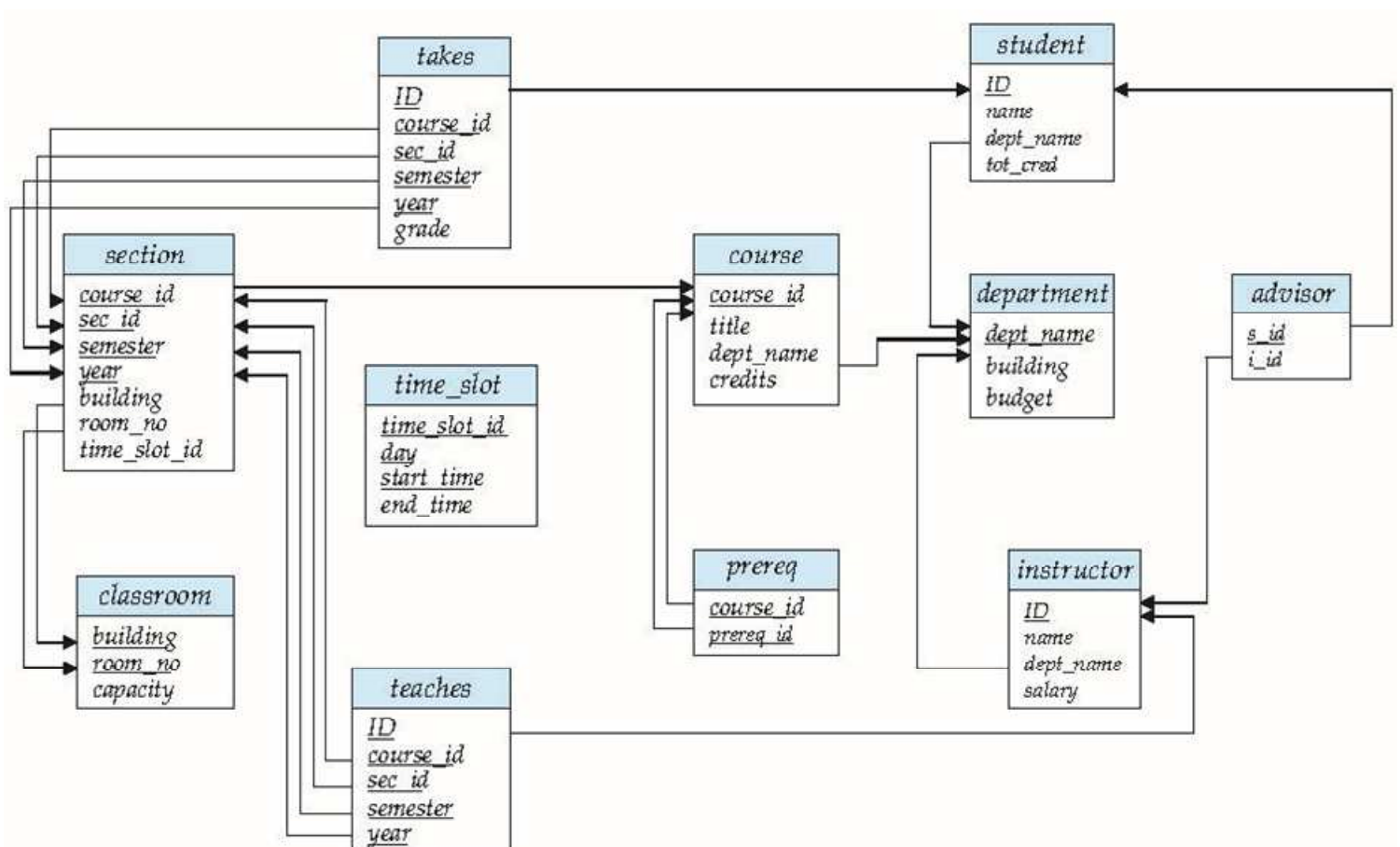


Database Technology

Exercise 1: Introduction

1.1. Analysis of university database

1. What is a section / what is the difference to course?
2. Why does relation *takes* and *teaches* have *course_id*, *sec_id*, *semester* and *year* as foreign keys?
3. What is *s_id* and *i_id* in relation *advisor*?
4. What is *prereq*?



1.2. Introduction to the Relational Model

1. Consider the foreign key constraint from the *dept* name attribute of *instructor* to the *department* relation. Give examples of inserts and deletes to these relations, which can cause a violation of the foreign key constraint.
2. Consider the *time_slot* relation. Given that a particular time slot can meet more than once in a week, explain why *day* and *start_time* are part of the primary key of this relation, while *end_time* is not.
3. Consider the following expressions, which use the result of a relational algebra operation as the input to another operation. For each expression, explain in words what the expression does.
 - a. $\sigma_{year \geq 2009}(takes) \bowtie student$
 - b. $\sigma_{year \geq 2009}(takes \bowtie student)$
 - c. $\Pi_{ID, name, course_id}(student \bowtie takes)$

1.3. Relational Model for employees

Consider the following relational database:

```
employee(person_name, street, city)
works(person_name, company_name, salary)
company(company_name, city)
```

1. What are appropriate primary keys?
2. Give an expression in the relational algebra to express each of the following queries:
 - a. Find the names of all employees who live in city “Miami”.
 - b. Find the names of all employees whose salary is greater than \$100,000.
 - c. Find the names of all employees who live in “Miami” and whose salary is greater than \$100,000.
 - d. Find the names of all employees who work for “First Bank Corporation.”

1.4. Questions

1. During the lecture you heard some major advantages of a database system. What are two disadvantages?
2. Keyword queries used in Web search are quite different from database queries. List key differences between the two, in terms of the way the queries are specified, and in terms of what is the result of a query.

1.5. Installing XAMPP and importing a dataset

1. Download XAMPP (<https://www.apachefriends.org/download.html>) for your OS
2. Start the XAMPP Control Panel and start MySQL/MariaDB and Apache
3. Open your Browser and browse to <http://localhost/phpmyadmin>
4. You see all databases on the left – create a new one and name it “university”
5. Click on the import tab and load
 - a. file “DB_Exercise_1_Schema.sql”
 - b. file “DB_Exercise_1_Small_Instances.sql”(Both are available in ILIAS)
6. Search for the instructor table and have a look at the instances