

B0B36DBS, BD6B36DBS: **Database Systems**

<http://www.ksi.mff.cuni.cz/~svoboda/courses/172-B0B36DBS/>

Practical Class 9

# Relational Algebra

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17. 4. 2018

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# Database Schema

Assume we have the following schema of a relational database for a simple **student information system**

**Student ( id, name, address )**

**Teacher ( id, name, phone, department )**

department  $\subseteq$  Department ( name )

**Department ( name, chair )**

chair  $\subseteq$  Teacher ( id )

**Course ( code, title, annotation )**

**Dependency ( course, requisite )**

course  $\subseteq$  Course ( code ), requisite  $\subseteq$  Course ( code )

**Schedule ( course, teacher, semester, day, time, room )**

course  $\subseteq$  Course ( code ), teacher  $\subseteq$  Teacher ( id ), room  $\subseteq$  Room ( number )

**Room ( number, building, capacity )**

**Enrollment ( student, semester, code, result )**

student  $\subseteq$  Student ( id ), code  $\subseteq$  Course ( code )

# Exercise 1

Express the following RA query

- **Names of teachers from department *KSI***

**Teacher** ( id, name, phone, department )

department  $\subseteq$  Department ( name )

**Department** ( name, chair )

chair  $\subseteq$  Teacher ( id )

# Exercise 2

Express the following RA query

- **Study results of a student with identifier *4301* from the previous semester (*171*)**
  - Return course codes, names, and the actual results

Student ( id, name, address )

Course ( code, title, annotation )

Enrollment ( student, semester, code, result )

student  $\subseteq$  Student ( id ), code  $\subseteq$  Course ( code )

# Exercise 3

Express the following RA query

- Names of teachers from all departments that have *Tomas Skopal* as their chief

**Teacher** ( id, name, phone, department )

department  $\subseteq$  Department ( name )

**Department** ( name, chair )

chair  $\subseteq$  Teacher ( id )

# Exercise 4

Express the following RA query

- **Codes and titles of all courses that are taught on *Mondays* or *Fridays* during this semester (172)**

Course ( code, title, annotation )

Schedule ( course, teacher, semester, day, time, room )

course  $\subseteq$  Course ( code ), teacher  $\subseteq$  Teacher ( id ), room  $\subseteq$  Room ( number )

# Exercise 5

Express the following RA query

- **Codes and titles of all courses that are not taught on *Mondays* and nor *Fridays* during this semester (172)**

Course ( code, title, annotation )

Schedule ( course, teacher, semester, day, time, room )

course  $\subseteq$  Course ( code ), teacher  $\subseteq$  Teacher ( id ), room  $\subseteq$  Room ( number )

# Exercise 6

Express the following RA query

- **Students without any enrolled course this year (semesters 171 and 172)**
  - Return student names and addresses

**Student** ( id, name, address )

**Enrollment** ( student, semester, code, result )

student  $\subseteq$  Student ( id ), code  $\subseteq$  Course ( code )



# Exercise 7

Express the following RA query

- **Identifiers of students who have enrolled in all the courses that are taught during this semester (172)**

**Schedule ( course, teacher, semester, day, time, room )**

course  $\subseteq$  Course ( code ), teacher  $\subseteq$  Teacher ( id ), room  $\subseteq$  Room ( number )

**Enrollment ( student, semester, code, result )**

student  $\subseteq$  Student ( id ), code  $\subseteq$  Course ( code )

# Exercise 8

Express the following RA query

- **Names of teachers who have time conflicts in their schedules for the next semester (181)**
  - Two events are in a conflict if...
    - they have overlapping times, but also
    - when there is less than 15 minutes for a break / 60 minutes for a transfer in case of events scheduled in rooms within the same building / in different buildings respectively
  - Assume that each event is 90 minutes long

**Teacher ( id, name, phone, department )**

department  $\subseteq$  Department ( name )

**Schedule ( course, teacher, semester, day, time, room )**

course  $\subseteq$  Course ( code ), teacher  $\subseteq$  Teacher ( id ), room  $\subseteq$  Room ( number )

**Room ( number, building, capacity )**