CS422 Principles of Database Systems
Course Overview

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Database Management Systems (DBMS)

- Efficient
- ACID
- SQL

Data

The Big Picture

Database (or Schema)

Database Management System (DBMS)

- Tables, views
- Indexes
- Functions and Stored procedures

Database

<table>
<thead>
<tr>
<th>students</th>
<th>id</th>
<th>name</th>
<th>address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>John</td>
<td>123 Main St.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Jane</td>
<td>456 State St.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>departments</th>
<th>name</th>
<th>acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Computer Science</td>
<td>cs</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>math</td>
</tr>
</tbody>
</table>

Other
- views
- indexes
- functions/procedures

Schema

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Other
- views
- indexes
- functions/procedures

Database Schema

Table schema
Database Development

- Problem
- Schema Design
- Attributes
- Constraints
- Data Access
- Database Implementation
  - Indexes
  - Views
  - Procedures
  - Triggers
  - Privileges
  - ...
- Application Development
- Client Applications
- Performance Tuning

Schema Design

- Entity-Relationship (ER) model
- Relational model
- ER → Relational conversion
- Normalization

Implementation and Access

- SQL
- Transactions
- Stored procedures and triggers

DBMS Internals

- Queries
  - Compiler and Optimizer
  - Execution Engine
  - Index and Table Manager
- Transaction and Concurrency Control
- Buffer Manager
- Disk Manager
- Logging and Recovery
- Index and Table Manager
  - Index files
  - Data files
  - System catalog
- Execution Engine
- Memory management
- Disk access
- Record organization
- Concurrency control
- Failure recovery
- Indexes