Course and Examination Fact Sheet: Autumn Semester 2018

7,330: Data Handling III: Databases

ECTS credits: 4

Overview examination/s

(binding regulations see below)
Decentral - Active participation (25%)
Decentral - examination paper written at home (individual) (75%)

Attached courses

Timetable -- Language -- Lecturer
7,330,1.00 Data Handling III: Databases -- Englisch -- Grossniklaus Michael

Course information

Course prerequisites

- **Mathematics**: algebra, discrete mathematics, statistics
- **Computer Science**: elementary programming skills

Course content

The course will provide a basic overview of the functionality, architecture, and implementation of database systems as a foundation for computer-based information systems. A database system is a **general-purpose platform** to manage and process data. Information is represented, stored, and managed according to a **data model**, while it is queried (retrieved) and manipulated using a **special-purpose language**. The course is organized around three main parts, which follow the steps that are typically required to design, use and maintain a database. The first part is dedicated to data modelling. Conceptual database design is introduced based on the Entity-Relationship (ER) model, whereas logical database design is studied in the context of the relational model of data and its normal forms. The second part is dedicated to database languages. After presenting the relational algebra as a formal foundation, the course will provide a thorough introduction into SQL, which is currently the most widely-used and most important database language. The third and final part of the course is dedicated to the benefits that arise for database users due to the platform-based approach. In this part, the course will give a brief overview of the internal structures and functioning of a database system, such as currency control, indexing, and query processing.

Apart from the theoretical background, the course will feature a practical project that will enable students to apply the new knowledge by going through the process of setting up and querying their own database. These practical assignments will be based on the open-source database management system PostgreSQL, which students will install on their own computers as it is available for many operating systems and platforms.

Course structure

Part I: Data Modelling

- Introduction and Overview
- Data Modelling with the ER Model
  - Entities, Attributes, and Relationships
  - Constraints
  - Extended ER models and UML
- Relational Database Design Theory
  - Relational model of data
  - Normal forms and normalization
  - Translating ER models to relational models

Part II: Database Languages

- Relational Database Languages
    - Relational algebra
    - Equivalences of the relational algebra
- SQL
    - Basic queries (SELECT… FROM… WHERE…)
    - Advanced queries: nested and recursive queries
    - Other functionalities: database management and data manipulation

Part III: Database Systems

- Transactions, Concurrency Control, and Recovery
    - Schedules and serializability
    - Logging
- Indexing
    - Hash-based indexes
    - Tree-based indexes
- Query Processing
    - Query optimization
    - Query evaluation

Course literature

- Alfons Kemper und André Eickler: Datenbanksysteme: Eine Einführung (9. Auflage), 2013
- Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems (3rd Edition), McGraw-Hill, 2002

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form
Decentral - Active participation (25%)

Remark
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Examination-aid rule
Practical examination
No examination-aid rule is necessary for such examination types. The rules and regulations of the University of St. Gallen apply in a subsidiary fashion.

Supplementary aids
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Examination languages
Question language: English
Answer language: English

2. Examination sub part (2/2)

Examination time and form
Decentral - examination paper written at home (individual) (75%)

Remark
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Examination-aid rule
Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2015), Lern- und Arbeitsstrategien (11th ed., 4th printing). Aarau: Sauerländer).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
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Examination languages
Question language: English
Answer language: English

Examination content

All three parts of the course, i.e., "Data Modeling" , "Database Languages", and "Database Systems" will be part of the examination. Student are expected to be able to create an ER data model for a specific use case application, to map it into the relational model, and to write SQL queries against the resulting relational database. Furthermore, students need to be able to explain the algorithms that are implemented by the components of a database management system, e.g., index structures or transaction control.

Examination relevant literature

The slides used in the course is the main basis for the examination. Additionally, the following books provide further reference.

- Alfons Kemper und André Eickler: Datenbanksysteme: Eine Einführung (9. Auflage), 2013
- Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems (3rd Edition), McGraw-Hill, 2002

Please note

We would like to point out to you that this fact sheet has absolute priority over other information such as StudyNet, faculty members' personal databases, information provided in lectures, etc.When will the fact sheets become binding?

- Information about courses and examination time (central/decentral and grading form): from the start of the bidding process on 23 August 2018
- Information about decentral examinations (examination-aid rule, examination content, examination relevant literature): after the 4th semester week on 15 October 2018
- Information about central examinations (examination-aid rule, examination content, examination relevant literature): from the start of the enrolment period for the examinations on 05 November 2018

Please look at the fact sheet once more after these deadlines have expired.

University of St.Gallen