

**Module Description, available in: EN**

## Data Management

### General Information

**Number of ECTS Credits**

3

**Module code**

TSM\_DataMgmt

**Valid for academic year**

2023-24

**Last modification**

2022-03-09

**Coordinator of the module**

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**Explanations regarding the language definitions for each location:**

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne	Lugano	Zurich
<b>Instruction</b>	X E 100%		X E 100%
<b>Documentation</b>	X E 100%		X E 100%
<b>Examination</b>	X E 100%		X E 100%

**Module Category**

TSM Technical scientific module

**Lessons**

2 lecture periods and 1 tutorial period per week

### Entry level competences

**Prerequisites, previous knowledge**

- UML Class Diagrams
- Relational Models, Relational Algebra
- Relational Database Management System (RDBMS) Architectures
- Normalization
- SQL:92 (i.e. queries with SELECT-FROM-WHERE and GROUP BY)
- Transaction Processing, Concurrency Control
- Security in Relational Database Systems
- Query Optimization, Indexes

## Brief course description of module objectives and content

This course is about Data Engineering and Information Retrieval. It covers methods and technologies for managing, processing and analyzing potentially large and distributed data collections for transactional or analytical use, including multi-model databases and NoSQL stores. And it covers also mastering data in unstructured form (full text search). The course consists of four parts: 1. Database Management; 2. Data Warehousing and Data Analytics (Business Intelligence); 3. Data Integration including Data Synthesis; and 4. Information Retrieval.

## Aims, content, methods

### Learning objectives and acquired competencies

This module covers following important aspects of Data Engineering:

- Students understand the use of modern database technologies for processing and managing potentially large and distributed data collections for transactional or analytical use.
- Students will be proficient in modern query languages such as the post-relational SQL 2016 (et seq.).
- Reaching beyond RDBMS, students learn about data structures (data types) and know which of these to use depending on the requirements and type of data available (polyglot persistence, multi-model databases).
- Students know NoSQL stores and selected cloud data stores.
- Students know methods and tools to integrate, to cleanse and to synthesize data.
- Students know how to deal with full text information using databases and search engines (information retrieval).
- Students can also apply the acquired knowledge in their own working environment.

### Contents of module with emphasis on teaching content

The course is divided into four parts:

1. Database Management (DB): New data structures (types) and alternatives to RDBMS: storage of data and with the post- and non-relational aspects, including technologies such as NoSQL and cloud data stores.
2. Data Warehousing and Data Analytics (DW): methods and tools for data aggregation and data analytics such as the ones involved in business intelligence.
3. Data Integration (DI): methods and tools for data integration, data cleansing and data synthesizing (e.g. for training and testing) are explained.
4. Information Retrieval (IR): methods and tools for finding information in full text using databases and (enterprise) search engines, including crawling.

Weighting between the parts will be confirmed at the beginning of semester. Tentative weighting:

1. DB: ~4-6 weeks
2. DW: ~2-4 weeks
3. DI: ~1-3 weeks
4. IR: ~3-5 weeks

### Teaching and learning methods

Frontal teaching, case studies, exercises, discussions, (group) work assignments.

### Literature

Optional literature suggestions (books):

- DB: Advanced Data Management for SQL, NoSQL, Cloud and Distributed Databases. R. Wiese. De Gruyter Textbook. 2015. ISBN 978-3-11-044140-6.
- DB: SQL for Data Scientists: A Beginner's Guide for Building Datasets for Analysis. R. Teate. Wiley. 2021. ISBN 978-1-119-66936-4.
- IR: Introduction to Information Retrieval. C.D. Manning, P. Raghavan, H. Schütze. Cambridge UP, 2008.
- IR: Information Retrieval in Practice. B. Croft, D. Metzler, T. Strohman. Pearson Education, 2009.

## Assessment

### Certification requirements

Module does not use certification requirements

## Basic principle for exams

**As a rule, all the standard final exams for modules and also all resit exams are to be in written form**

## Standard final exam for a module and written resit exam

**Kind of exam**

written

**Duration of exam**

120 minutes

**Permissible aids**

*Aids permitted as specified below:*

**Permissible electronic aids**

Scientific calculator (without communication functions).

**Other permissible aids**

Summary on one A4 page (possibly written on both sides).

## Special case: Resit exam as oral exam

**Kind of exam**

oral

**Duration of exam**

30 minutes

**Permissible aids**

No aids permitted