

SELECTION OF COURSES

FACULTY OF INFORMATION TECHNOLOGY FULL-TIME GRADUATE PROGRAMME

Name and surname:

(fill in capital letters)

FULL-TIME STUDIES

Each student of the first semester is required **to declare the choice of the specialization** (in case of the *Engineering of software, business processes and databases* consider also the subject area of your interest, though the latter does not have to be declared yet) **and select two of the elective courses listed below**.

Make sure your selections match the requirements of the specialization.

Data exploration and visualization (EWD)

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The aim of the course is to introduce the fundamental cycle and methods of data exploration and visualization. After covering techniques for data preprocessing, visualization, summarization, and preliminary (exploratory) analysis, the course presents basic statistical machine learning models for tasks such as regression, classification, and clustering, as well as methods for model evaluation. The course also includes practical labs in Python, where students practice the aforementioned topics using real-world data.

Related specializations or subject areas:

the *Data Science* specialization

- **required course** (as a prerequisite for the subsequent specialization courses)

the *Interactive multimedia* specialization

- **required course** (as a prerequisite for the subsequent specialization courses)

Generative Artificial Intelligence (TEG)

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The aim of the course is to develop skills in designing, implementing, and deploying applications that utilize generative technologies, with a particular emphasis on large language models (LLMs) and foundation models. Students should learn practical use of language models, including training, fine-tuning, and integrating them with their own applications. The course also covers advanced methods such as Retrieval Augmented Generation (RAG), the design and implementation of agents and GenAI chains, as well as the use of graphs and multi-agent structures. Students will learn practical aspects of running their solutions in various environments, including cloud and their own infrastructure, and will learn best practices in UX and interface design in the context of GenAI. The course is supplemented with topics related to software engineering using GenAI, creating and implementing test scenarios, documentation, and integration with developer tools. Additionally, students will become familiar with practical aspects of deploying generative technologies in a business context, deployment strategies, and current development trends in this field.

Prerequisites: The candidate is expected to have the following competencies: Basic knowledge of the Linux operating system: creating files and directories, installing packages, and managing virtual environments; Foundations of programming in Python and working with databases; Creating and sharing simple web services using packages such as Flask; Familiarity with key machine learning algorithms (segmentation, classification, and regression), as well as methods for training and evaluating them.

Related specializations or subject areas:

the *Data Science* specialization

- **recommended course** (as a prerequisite for one of the following specialization courses)

the *Interactive multimedia* specialization

- **recommended course** (as a prerequisite for one of the following specialization courses)

Data integration and data warehouses (IDH)

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The first module of the lecture presents the topic of data-level integration. The other module is devoted to data warehousing, which includes the development of integrated data stores containing the organization's uniformed historical data. The solutions of this kind are built for the purpose of analytical processing, including data exploration and knowledge discovery tools, as well as for archiving. Due to high data volumes and because of specific usage patterns, the approach to design, maintenance and evolution of data warehouses require a specific approach, much different than in case of traditional, transactional databases. The main goal of the lecture is to present main principles and methods for designing and optimizing data warehouse applications.

Related specializations or subject areas:

the **Databases** area of the *Engineering of software, business processes and databases* specialization
- **required course**

Linguistic Engineering (INL)

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The lecture aims to present issues concerning processing of unstructured text data (mainly in English but also include information how to deal with other types of languages). During the course different levels of natural language description will be presented and the methods of morphological, syntactic, and semantic analysis (as well as various formalisms used for these tasks) will be shown. This includes rule-based approaches, statistical methods and neural networks. The course also contains an overview of different types of natural language processing applications: information extraction, named entity recognition, terminology extraction and machine translation.

Related specializations or subject areas:

the **Software Engineering** area of the *Engineering of software, business processes and databases* specialization
- **recommended course**