

SYLLABUS

Applied data analysis for engineers 7.5 credits K0021N

Tillämpad dataanalys för ingenjörer

Course syllabus admitted: Autumn 2024 Sp 1 - Present

**DECISION DATE
2024-02-14**

Applied data analysis for engineers 7.5 credits K0021N

Tillämpad dataanalys för ingenjörer

First cycle, K0021N

| Education level | Grade scale | Subject | Subject group (SCB) |
|-----------------|-------------|-----------------|---------------------------------------|
| First cycle | G U 3 4 5 | Kvalitetsteknik | Industrial Engineering and Management |

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and completed courses of at least 60 credits within a technical subject area, with at least the grade Pass. This must include the following courses: Mathematical Statistics (S0001M) 7,5 credits, Programming and digitalisation (D0028E) 7,5 credits and Linear Algebra and Calculus (M0048M) 7,5 credits, or equivalent knowledge. Good knowledge in English, equivalent to English 6.

Selection

The selection is based on 1-165 credits.

Course Aim

After completing the course, the student must be able to demonstrate knowledge and understanding of the following:

- Challenges offered by large datasets, including, for example, data preprocessing,
- how modern data analysis methods developed in fields such as AI, machine learning and statistics work and can be used to provide decision support
- Limitations of data analysis methods, and
- The role of data visualisation in data analysis and presentation.

After completing the course, the student must be able to demonstrate the following proficiency and ability:

- Ability to import, analyse and visualise data in spreadsheet and statistics software as well as in programming-driven software for data analysis,
- Ability to analyse data using so-called dependent analysis methods, such as prediction and classification methods. Relevant methods for this purpose can be drawn from fields such as AI, machine learning and statistics.
- Ability to analyse data using so-called independent techniques such as clustering and dimensionality reduction methods. Relevant methods for this purpose can be drawn from fields such as AI, machine learning and statistics.
- Ability to present results from data analysis in writing and orally in a well-structured way and give relevant feedback on other students' work.

After completing the course, the student must be able to demonstrate the following ability to critically reflect and evaluate:

- Ability to evaluate the statistical and practical relevance of the analysis results via statistical and engineering assessments, for example, by evaluating predictive performance of models.

Contents

The course covers theory on analysing large datasets and practical work that involves compiling and importing datasets from various sources into intended software for data analysis. Software used in the course also includes programming language-driven software. The student analyses datasets relevant to engineers such as production or business data. Tools can include regular commercial spreadsheet programs, commercial statistical software, but also programming-driven open source software such as R or Python. Specific examples of course content are:

- Introduction to software-driven data analysis,
- Data preprocessing for data mining,
- Basic methods for analysing and visualising data,
- Data analysis using dependent and independent techniques with dedicated software,
- Advanced data analysis using programming-driven software, and
- Student-driven project work.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

The teaching and learning materials will be in English. Teaching and supervision in Swedish is an option if both teaching staff and students are Swedish-speaking. The teaching is conducted via lectures (synchronous and recorded), but mainly via interactive computer lab assignments, where the student works with data analysis in the software that the course uses. The student will work in groups with other students with the laboratory parts of the course. The student also works in groups with other students to analyze a larger dataset based on a problem definition. This problem may, for example, involve the analysis of manufacturing data or logistics or business data. The student trains the ability to retrieve, process, analyze and visualise data to produce decision-making material via the course's laboratory and project assignments.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided. Course aims related to knowledge and understanding are primarily examined via a final exam according to the grading scale: U, 3, 4, 5. A written final exam is the default option. The examiner can decide on an oral exam in the case of a small number of registered final exam candidates. Course aims related to proficiency and ability as well as to ability to critically reflect and evaluate are primarily examined via reporting/presentation of laboratory and project assignments according to the grading scale: U (fail) and G (pass). All elements must be passed for a passed course. The final grade on the course is determined by the grade on the final exam.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Remarks

Students must register for the courses themselves, or contact ETKS educational administration eduetks@ltu.se, not later than three days after the quarter commences. Failure to do so can result in the place being lost. This rule also applies to students with a guaranteed place.

Course offered by

Department of Social Sciences, Technology and Arts

Modules

| Code | Description | Grade scale | Cr | Status | From period | Title |
|------|--|-------------|-----|-----------|-------------|-------|
| 0001 | Written exam | G U 3 4 5 | 4 | Mandatory | S24 | |
| 0002 | Lab assignments and project assignment | U G# | 3.5 | Mandatory | S24 | |

Last revised

by Director of Undergraduate Studies Daniel Örtqvist, Department of Social Sciences, Technology and Arts 2024-02-

14

Syllabus established

by Director of Undergraduate Studies Daniel Örtqvist, Department of Business Administration, Technology and Social Sciences 2023-02-15