Course information

TNK125 Fundamental programming for data analytics, 6hp

1 Course content

1.1 Learning outcomes

In this course, you will learn how to use programming for problem solving and analysis of data.

After completing the course, the student should be able to:

- Write scripts for data analysis using Python
- Use basic data structures for problem solving in Python
- Apply tools available in some commonly used Python packages
- Generalize programming skills in Python to other script languages, specifically Matlab

For more information on the content covered, see the course plan accessible through https://studieinfo.liu.se.

1.2 Course literature

The course literature consists of:

- Downey, A. B. (2024). Think Python: How to Think Like a Computer Scientist, 3rd Edition. O'Reilly Media.

- McKinney, W. (2022). Python for Data Analysis: Data wrangling with pandas, NumPy and Ipython, 3rd Edition. O'Reilly Media.

- Attaway, D. C. (2022). MATLAB: A Practical Introduction to Programming and Problem Solving. Nederländerna: Elsevier Science.

The course material includes besides the course literature also other documents uploaded to Lisam (lecture slides, lab instructions, etc.).

2 Organisation

2.1 Lisam

Lisam is used to distribute all information and documents within the course, and it is your responsibility to periodically check for updates. Emails to all students are used only in urgent cases. Student submissions are submitted using the submission function on Lisam.

2.2 Teaching plan

A detailed teaching plan is made available on Lisam. The teaching plan contains more information about each session in the course. It also contains the deadlines for submissions. The teaching plan will be kept up to date during the course.

2.3 Lectures

The purpose of lectures is to give an overview about the topics covered in the course. However, not all knowledge needed to pass the labs and exam is covered in the lecture. For each lecture there is additional material in the form book chapters. Students are expected to prepare *before* the lectures by studying the material. During each lecture there will be time to ask questions about the topic covered in the material and in the lecture.

2.4 Tutorial

A tutorial session is scheduled before the first lab. The purpose is to introduce the practical work with Jupyter notebooks. It is strongly recommended to participate if you have either no or little experience in working with Jupyter notebooks. To get most out of the session, you are welcome to install Jupyter notebook before the session on your computer and bring it to the session.

2.5 Labs

During the weekly labs you will apply the knowledge gained from the lectures and other material to solve practical problems.

The labs should be solved in groups of two students. The registration to a group is done on Lisam no later than the deadline given on Lisam. You must register separately for a group for each lab module, LAB1 (Python) and LAB2 (Matlab). However, you may work together with the same lab partner for both models.

The labs are held in a computer room. General lab instructions and specific instructions for each lab are distributed on Lisam. Each lab consists of an

introduction with some examples and several practice exercises which should be solved during the lab session. LA2 to LA6 also contain homework assignments which are examined by a submission on Lisam at latest at the deadline giving in the teaching plan. LA2 to LA6 are also examined orally during a timeslot booked by the lab group (see more information in Section 3).

2.6   Teachers

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3   Examination

3.1   DAT1 – Computer exam Python, 3hp

The examination *DAT1* is graded U, 3, 4, 5. The same rules as for written exams apply, but the exam will take place in a computer room, and you write your answers in a Jupyter notebook.

During the computer exam, you will have access to the same programming environment as during the computer labs. However, during the exam you will have **no access to the internet** and **no access to your private folder**. The following files will be provided in a folder on the computer:

- Exam PDF including instructions and the exam questions.
- Downey, A. B. (2024). Think Python: How to Think Like a Computer Scientist, 3rd Edition. O'Reilly Media. (PDF-version)
- McKinney, W. (2022). Python for Data Analysis: Data wrangling with pandas, NumPy and Ipython, 3rd Edition. O'Reilly Media. (PDF-version)
- Python 3.11 documentation (HTML-version)

More practical information on the computer exam is provided during the final lecture (FÖ7). Read and follow the hand-in instructions carefully to make sure that your answers are submitted correctly before you leave the exam room.

3.2   LAB1 – Laboratory work in Python, 1,5hp

The examination module *LAB1* is graded pass or fail. The labs are to be done in groups of at most two students. No collaboration between different groups is allowed. The examination module is passed when for the each of Python lab assignments (LAB2–LAB4)

- the written submission has been approved and
- the solutions have been successfully examined orally.

Each group needs to book a time slot for each oral examination on Lisam at latest the day before the examination session is scheduled. No presentation is needed but students should be prepared to explain and motivate their submitted solution. The oral examination is expected to take around 10 minutes per group.

It is your responsibility to contact the responsible lab assistant to plan a re-examination if your whole group or one group member missed a regular oral examination during the lab session or if an oral examination was not approved.

Re-examination will be booked, preferably during the dedicated session in the end of the course (EX7).

3.3   LAB2 – Laboratory work in Matlab, 1,5hp

The examination module *LAB2* is graded pass or fail. The examination module is passed when for the each of Matlab lab assignments (LAB5 and LAB6)

- the written submission has been approved and
- the solutions have been successfully examined orally.

Otherwise, the same rules as for *LAB1* apply.

3.4   Grading criteria

The following table shows the minimum criteria that a student need to able to fulfil to achieve grade 3 and grade 5 in the course. Grade 4 is given when the requirements for grade 3 and significant parts of the requirements for grade 5 are fulfilled.

Outcome	Grade 3	Grade 5
Write scripts for data analysis using Python	Write and explain scripts to solve simple data analysis tasks in a mostly correct way	Write and explain scripts to solve given simple and more advanced data analysis tasks in a correct and efficient way
Examination	LAB1, DAT1	DAT1
Use basic data structures for problem solving in Python	Use and understand lists, dictionaries, iterators with some confidence	Use and understand lists, dictionaries, sets, iterators, generators with good confidence
Examination	LAB1, DAT1	DAT1
Apply tools available in some commonly used Python packages	Solve simple tasks by applying Python packages with some confidence	Solve simple and more advanced tasks by applying Python packages with good confidence
Examination	LAB1, DAT1	DAT1
Generalize programming skills in Python to other script languages, specifically Matlab	Write scripts in Matlab that solve simple data analysis problems	-
Examination	LAB2	

3.5   Course grade

All examination modules must be passed before a course grade is given. The course grade is equal to the grade for the computer exam (*DAT1*).

3.6   Completions and alternative examination

It is generally not possible to deviate from the form of examination as described above and in the course plan. Exceptions apply only if you have been approved special support by the coordinators for students with disabilities. In that case you need to inform the examiner when the course starts.

For completions and re-examination these rules apply if nothing else is stated:
- Re-examination is possible at most two times for the same written submission or oral examination.
- Written completions after the regular end of the course will only be graded during the re-exam periods. Submissions handed-in no later than **10 January 2025** will normally be graded within 3 weeks after this date. Submissions handed-in no later than **30 August 2025** will normally be graded within 3 weeks after this date.
- After the end of the course, oral re-exams are normally only possible during re-exam periods. Contact the lab assistant to schedule a re-exam.
- If an examination module has not been approved after the last re-exam period, the whole module (*LAB1* respectively *LAB2*) must be repeated the next time the course is given. If you have for example passed all labs expect one Python lab, you must redo **all** Python labs the next time the course is given (even those that you have passed earlier).
- For re-examination of the computer exam (*DAT1*) the general rules for written exams apply. Two re-exams are offered in-between the regular exam. Make sure to register if you want to participate in the re-exam.
- While re-examination is possible, do not expect further supervision after the regular end of the course.

3.7   Plagiarism and cheating

For the lab assignments, no cooperation between lab groups is allowed. It is strictly forbidden to copy answers or parts of answers including code between groups or from other sources.

You may use AI-tools/chatbots for inspiration and help when debugging but be aware that you must check every answer for correctness, for example using other sources. It is strictly forbidden to directly copy code from an AI-tool/chatbot or elsewhere. The code and answers you submit need to be written only by your group, otherwise the case will be reported to the discipline board.

Keep in mind that you need to be able to explain your code in the oral examination and that you will have no access to the internet (including AI-tools) during the computer exam!