

SF2524 Matrix computations for large-scale systems
7.5 ECTS

Course data

- Study period 2. Exam in January. Lectures: 15. Exercise sessions: None
- Homeworks (3): corresponding to 3.5 ECTS
- Exam: corresponding to 4 ECTS
- Four blocks
 - Eigenvalue problems
 - Linear systems
 - QR-method
 - Matrix functions
- Learning activities:
 - Lectures (with black-board, slides and live programming)
 - Homeworks
 - Course training area (moderated wiki) collected into exam prep problems
 - Online video demos
 - Quizzes (with videos **new**)

Aim

In this course we will learn some of the most common numerical techniques and algorithms used to efficiently solve problems expressed using large matrices. We focus on detailed understanding about the performance of these methods when they are applied to large-scale systems and study topics such as convergence, accuracy and efficiency.

Changes compared to last year

The quizzes were updated, and made mandatory part of homework. This was viewed as successful. The quiz-updates included adding several short (5 minutes) videos, e.g. concerning breakdown of Arnoldi. This made the lectures less stressful (for the teacher and students) since certain parts could be covered briefly and made the lectures less intense. Since the students are forced to do the quizzes, there was not much fear that the students would just skip that topic.

The course training wiki was also viewed as successful, although the students were less active on the wiki this year in comparison to previous years. This might be due to an intimidation factor since the PhD students taking SF3580 (of which SF2524 is a subset) were very active. Next year, we will try to encourage students more.

More written material was added. In particular, a background.pdf was extended to include things that were covered in basic linear algebra courses (but the students do not have fresh). This was complemented with an optional quiz on that material. All students did this optional quiz and a lack of linear algebra prerequisite knowledge, was not seen as a problem this year (partially previous years).

The course material are now self-contained based on the teacher written PDF-files. References to the text book by Trefethen were given for further reading.

Based on discussions with students after the exam, several students did not understand the importance of collected problems from the course training wiki for exam preparation. This

should be further stressed next year.

Several minor things were updated in homeworks (e.g. semilogy-plotting).

Conclusions

Overall the teacher is satisfied with the achieved level of understanding. The students results on exam and homeworks were satisfactory from teachers perspective. Very few students filled out the course evaluation, but the answers were consistent with the teachers view of the course.

Some comments from evaluation and during course comments

- The MATLAB programming part. I didn't understand this at first, but thank heavens I got it later. I must admit Dr. Elias did a good job with the "Wiki Concept" and the lecture notes. Kudos !!!
- The large number of 8:00am lectures were awkward for anyone living a long way from campus.
- **The CANVAS quizzes were both interesting and introduced some easier topics, leaving more space in the lectures for harder and more interesting concepts.**
- Comments to next year students: Trust me, the course is actually fun. Don't give up in trying to understand it. Try the wiki problems and home assignments as early as possible. They are actually not so difficult (Note, I said they are not so difficult i.e. they are difficult, but not so difficult). The difficulty is actually where the fun lies. That's the interesting part.
- Comments to next year students: Find a homework partner within the first couple of lectures and start the homework tasks earlier rather than later.
- The workload was about right if assignments were done in pairs.
- The mix between black board and live-programming is very suitable for numerics.

Previous year, one student requested a couple of exercise session. I don't feel this is proportionate considering the size of the student group taking this course and the fact that they have moderated wiki as well as access to TA during specified hours.

For next year

We will certainly continue and develop the course. Further videos in the quizzes can be added. Some parts of the written PDF-files for block 1 and 3 can be slightly extended. If this is completed, the course can be based on the PDF-files instead.