Institut for Matematik og Datalogi
Syddansk Universitet

August 25, 2023
JBJ

DM551/MM851 – Fall 2023 – Weekly Note 1

Welcome to DM551/MM851

Why English?
The weekly notes will be in English in order to allow non danish participants to read it also. To the danes: Hvis der er noget som I ikke forstår, så spørg endelig.

Teacher and instructors (TAs)
The lectures will be given by Jørgen Bang-Jensen and the exercise classes by Mads Anker Nielsen (email: madsn@student.sdu.dk)

Note that this is the last time DM551 will be taught so make a strong effort to follow the course carefully!

Literature (will be extended a bit along the way)

(Ros) Main text: K. Rosen, Discrete Mathematics and its applications 8th edition 2019 McGraw Hill. We will use Chapters 6,7 and 8.

(KT) J. Kleinberg and E. Tardos, Algorithm Design, parts of Chapter 13 on randomized algorithms. This will be available via itslearning before we start using it.

(CLRS) Parts of Chapters 5, 26 and 32 in Cormen, Leiserson, Rivest and Stein 3rd ed. (DM507 book).

(Notes) Some notes or parts of books/papers which be put on the home page in due time

I will assume that everyone has the relevant material in front of him/her at the lectures!.

Exam
The exam consists of 3 parts

- One set of problems that you must solve alone and hand in your solutions
- One set of problems that you may solve together with up to two other participants in the course and hand in one solution per group.
- Oral exam in January with external examinator.

The grade will be given based on an overall impression of your performance in the three parts (you do not get a separate grade for the written part). Thus doing well in the problem sets will help you get a good grade at the exam. Do notice, though, that the oral exam has a larger weight towards the grade. At the oral exam we may ask questions related to the problem sets and of course also to the other parts of the course.

Exercises in general
As always, you are strongly advised to try to solve all exercises BEFORE seeing their solution in the classroom. This is the only way to make sure you understand the techniques and in particular, having tried the problems yourself you will know which ones you understood easily and for which

ones you need extra help. There is a direct correlation between the number of exercises you did yourself and your chance of passing the exam.

This course is (among other things) about combinatorial arguments. Often you will calculate something (a number) but the actual result is not as important as the way you apply the techniques. It may be difficult to see why your result is correct/wrong if you do not have the details that lead you to it. So at the exercises you will spend time discussing why a particular method can or cannot be applied to the problem at hand.

Course schedule:

See the faculty web pages and ITS-learning.
Note that, as indicated in the course description, some of the lectures will be given as video lectures. For those lectures I will upload the video in itslearning at least one day before the scheduled lecture which it replaces (and then cancel the physical lecture). I will reserve some time at the following physical lecture to discuss any questions you may have to the video lecture. I will do my best to inform you several days in advance when a physical lecture will be replaced by a video lecture.

Lectures September 5 and 7:

- Short overview of the course.
- Rosen Chapter 6.1-6.2.
- Rosen 6.3-6.5
- If there is time left, we may start on Rosen Section 7.

Exercises for September 11:

You should try to do ALL these exercises. At the exercise class Mads will select some of those to cover. This will be all of them if there is enough time, but if he feels that it is better to spend more time on fewer exercises, not all may be covered. If there is a particular exercise that you wish to see explained, tell your TA at the class.

- Section 6.1: 1,3,5,21,28,34,41,46,50,64,76
- Section 6.2: 2,4, 10
- Section 6.2: 12 recall the formula for the midpoint and observe that the midpoint has non-integer coordinates if and only if either the parity of the two first coordinates is different or the parity of the two second coordinates is different or both. Now apply the pigeon hole principle.
- Section 6.2: 20, 24, 28, 35, 40, 42
- Section 6.3: 16,18,32,36