



Figur 1: QR codes for course homepage, schedule LTH and schedule NF

Program for Lectures, Seminars and Exercises in Discrete Mathematics spring 2019

Schedule

The schedule can be found at <https://cloud.timeedit.net/lu/web/lth1/> for LTH and at <https://cloud.timeedit.net/lu/web/n1/> for Faculty of Science. Most weeks there will be lectures Mondays and Thursdays 13-15, and seminars on Wednesdays but the first two weeks the seminars will be on Thursday instead of Wednesday. During the Easter week there will be no seminar, but a second lecture on Wednesday.

There are separate exercise groups for LTH and NF students, but you may switch to the other group depending on what suits your schedule best.

Textbooks

Grimaldi, Ralph: *Discrete and Combinatorial Mathematics, An Applied Introduction*. Pearson, 2014, ISBN: 9781292022796.

The following parts of Grimaldi are included in the course: Chapter 1, sections 5.3 and 5.5, sections 8.1-8.3, Chapter 9 and sections 10.1-10.4.

Karl-Gustav Andersson: *Finite Fields and Error-Correcting Codes*, Lund University (2015)
This can be downloaded from the course webpage.

Course Webpage

Important information about the course as well as all the material handed out at lectures or seminars can be found on the webpage

www.maths.lth.se/matematiklu/personal/annat/undervisning/DiskretMatematikNALTH/diskret2019/index.htm

For inquiries on course registration, registration for writing an exam go to www.ctr.maths.lu.se/utbildning/matematiklth/

if you are an LTH student and to

www.maths.lu.se/utbildning/kandidatprogram-matematik/

if you are at Faculty of Science. Note that the standard procedure is that you register yourself in LADOK, but if you encounter problems use the contact details from the links above.

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Office hours: I have no fixed office hours, but you are welcome to make an appointment.

Plan for the lectures

Below is a tentative plan for what each lecture (L) will cover. G refers to the book by Grimaldi and A to the booklet by Andersson.

L1	G: Chapter 1, Section 5.5	Course overview. Basic Combinatorics. The pigeonhole principle.
L2	G: Sections 5.3, 8.1-8.3	Functions. The principle of exclusion and inclusion.
L3	G: Sections 9.1-9.3	Generating functions.
L4	G: Sections 9.4-9.6 and 10.1-10.2	Exponential generating functions. Linear homogenous recurrence relations.
L5	G: Sections 10.3-10.4	Non-homogenous recurrence relations. Solving recurrence relations with generating functions.
L6	A: Section 1.1	Definition of ring and field.
L7	A: Section 1.2	Congruence calculations.
L8	A: Section 1.3-1.4	Vector spaces. Polynomial rings.
L9	A: Section 1.5	Finite fields.
L10	A: Section 2.1-2.2	Introduction to codes. Linear codes.
L11	A: Section 2.3	Control matrices and decoding.
L12	A: Section 2.4	Some Special Codes.
L13	A: Section 2.5	Vandermonde Matrices and Reed-Solomon Codes.
L14		Repetition.

Recommended Exercises

For each exercise session there is a list of problems to work on. It is preferable to look at the problems before class. In class we will first work on the problems together in groups and then present and explain to each other at the black board. In the seminars I plan two types of activities. First we will try to straighten out any remaining questions from the previous couple of lectures and exercise sessions. Suggestions on what to bring up are most welcome! After that I will present some problems on the previous week's topic that we work out together on the blackboard.

E1	1.2.26, 1.2.32, 1.3.13, 1.3.30, 1.4.1, 1.4.7, 20 on page 42[44], 5.3.4, 5.5.7 and 5.5.10 in [G]
E2	8.1.5, 8.1.12, 8.1.17, 8.1.23, 8.1.25, 8.3.1, 8.3.11, 26 on page 43[45], 12 and 14 on page 332[306] in [G]
E3	9.1.1, 9.2.1ace, 9.2.5, 9.2.7, 9.2.12, 9.3.1, 9.3.2, 9.3.3, 9.3.4a and 4 on page 457[413] in [G]
E4	9.4.1c, 9.4.6, 9.5.3, 10.1.1b, 10.1.2c, 10.2.1ade, 10.2.4, 10.2.7a, 10.2.8a, 9.2.13, 9.3.9 in [G]
E5	10.3.3, 10.3.5, 10.3.6, 10.3.11, 10.4.1a and 4, 6 on page 491[445]
E6	1.1.1, 1.1.2, 1.1.4, 1.1.8, 1.1.9, 1.1.10, 1.1.12a
E7	1.2.1, 1.2.2, 1.2.4, 1.2.5, 1.2.9, 1.2.11, 1.1.13, 1.1.14
E8	1.3.1, 1.3.2, 1.4.1, 1.4.2, 1.4.3a, 1.4.4, 1.4.5, 1.2.6
E9	1.5.1, 1.5.2, 1.5.4, 1.5.7, 1.3.3, 1.4.8, 1.4.9
E10	2.1.1, 2.1.3, 2.1.4, 2.2.1, 2.2.2, 2.2.4, 2.2.5
E11	2.3.1, 2.3.3, 2.3.4, 2.3.7, 2.1.2, 2.2.3
E12	2.4.1, 2.4.3, 2.4.4, 2.4.5, 2.4.6, 2.3.5 and the written exam from 29 May 2018
E13	2.5.1, 2.5.2, 1.1.11, 1.1.12b, 1.2.3, 1.5.5 and the written exam from 25 August 2018

Written Exam: Saturday 1 June, 2019 kl 8.00 – 13.00. Venue to be announced.

Oral exam: The examination consists of a written and an oral part. The oral exams will take place 4-13 June by appointment. Most of the questions will be from the *Review Questions* available at the course webpage. The course grade will be based on both parts of the exam with emphasis on the written part (weights 3 and 1 respectively).