Linnaeus University
Department of Mathematics
Marcus Nilsson

Discrete Mathematics, 1MA462, Spring 2025

Welcome to the course in Discrete Mathematics. In this course we will learn about the mathematics that is behind computer science. We start looking at logic, sets and functions and continue to induction, recursion and combinatorics. In the last part of the course we will cover relations and graphs.

This is a large course of about 200 students. You will be divided into 9 seminar groups. Students on Campus Växjö will be divided into six seminar groups, V1 to V6. Group K is for the students on Campus Kalmar. Finally the distance students will be divided into the groups D1 and D2. In each seminar group the students will be divided into study groups of 3–4 students.

Teachers

Peter Gålén	Seminar group K (Swedish)
Måns Olsson	Seminar group V1(Swedish) and D2 (Swedish)
Tim Sandberg	Seminar group V2 and D1
Zied Ksouri	Seminar group V3
Christina Xintara Mendys	Seminar group V4 (Swedish)
Isuru Kumarasiri	Seminar group V5
Ihsan Arharas	Seminar group V6
Marcus Nilsson	Course coordinator. Lectures

Literature

We will use *Discrete Mathematics and its applications* by Kenneth H. Rosen (eighth edition, ISBN 9781260091991). Earlier editions works almost as good as this. If you want a book in Swedish I can recommend *Diskret matematik och diskreta modeller* by Kimmo Eriksson and Hillevi Gavel.

Schedule

The lectures will often be Tuesdays, 13:15 – 15:00 and Thursdays, 13:15 – 15:00 on campus Växjö and on Zoom. But, there are exceptions, see your schedule for the correct date and time.

Seminars will be on Wednesdays, 15:15 –17:00 in Both Växjö and Kalmar. For distance students there will be seminars on Wednesday or Thursday evening (17:15–19:00), see separate information on Moodle.

Note that the seminars are mandatory (but you can miss a few of them without it affecting your grade, see details below).

The schedule below is for campus Växjö.

Time	**What**	**Contents**
April 1, 13–15	Lecture	Introduction, Logic, propositional logic and quantifiers (1.1 – 1.4)(1.5*)

Time	What	Contents
April 2, 10–12	Lecture	Logic, Rules of inference and proofs (1.6–1.7) (1.8*)
April 2, 15–17	Seminar	Logic. Divide into study groups
April 8, 13–15	Lecture	Sets, functions, sequences (2.1–2.4)
April 8	**Due date Homework 1**	
April 9, 15–17	Seminar	Presentation HW 1. Work on HW2.
April 10, 13–15	Lecture	Algorithms, Growth of functions (3.1 – 3.3)
April 15, 13–15	Lecture	Number theory, modulo arithmetic (4.1–4.3)
April 15	**Due date Homework 2**	
April 16, 15–17	Seminar	Presentation HW 2. Work on HW3.
April 17, 13–15	Lecture	Induction and recursion (5.1 – 5.4)(5.5*)
April 22, 13–15	Lecture	Combinatorics (6.1–6.5)
April 22	**Due date Homework 3**	
April 23, 15–17	Seminar	Presentation HW 3. Work on HW 4.
April 24, 13–15	Lecture	Inclusion and exclusion (8.5 – 8.6)
April 29, 13–15	Lecture	Recurrence relations (8.1–8.3)
April 29	**Due date Homework 4**	
April 30, 13–15	Lecture	Generating functions (8.4)
April 30, 15–17	Seminar	Presentation HW 4. Work on HW 5.
May 6, 13–15	Lecture	Relations (9.1–9.3)
May 6	**Due date Homework 5**	
May 7, 15–17	Seminar	Presentation HW 5. Work on HW 6.
May 8, 13–15	Lecture	Equivalence rel. and partial orders (9.5–9.6)
May 13, 13–15	Lecture	Introduction to graphs (10.1–10.4)
May 13	**Due date Homework 6**	
May 14, 15–17	Seminar	Presentation HW 6. Work on HW 7.
May 15, 13–15	Lecture	Euler and Hamilton paths (10.5–10.6)
May 20, 13–15	Lecture	Planar graphs and coloring (10.7–10.8)
May 20	**Due date Homework 7**	
May 21, 13–15	Lecture	Trees (11.1–11.5)
May 21, 15–17	Seminar	Presentation HW 7. Work on HW 8.
May 27, 13–15	Lecture	Review
May 27	**Due date Homework 8**	
May 28, 13–15	Lecture	Review
May 28, 15–17	Seminar	Presentation HW 8.
June 3, 8–13	**Written exam**	
August 23, 12–17	**Retake**	
October 18, 12–17	**Retake**	

NOTE! This schedule is preliminary. Changes can be announced on MyMoodle.

Examination

Project part – Homework Assignments (3.5 credits)

During the course there will be 8 homework assignment. Together they form the project part of the course. The homework assignments are submitted on Moodle and presented at the seminars. You work together in your study group on the assignments. Homework assignments 3 and 6 are submitted per study group. For the rest of the assignments you submit your solutions individually. For HW 3 and HW 6 you submit one pdf-file per study group written in LaTeX by for example using *Overleaf*. There are template files available on Moodle. For the rest of the homework assignments the submitted solutions can be handwritten (scanned to a pdf-file), but LaTeX can be used also here if you want to.

The score for the project part is the weighted average of the oral presentation score S_{Or} and the written report score S_{Wr}. To pass, you need $S_{\text{Or}} \geq 0.5$ and $S_{\text{Wr}} \geq 0.5$

The oral presentation score S_{Or} is computed by the formula

$$S_{\text{Or}} = \frac{1}{5} \sum_{\text{5 best HW}} \frac{\#\text{ Problems you can present from HW } i}{\#\text{ Problems on HW } i},$$

where the sum is over your five homework assignments (out of 8) with best scores. To get a score for a homework assignment you need to: 1) submit it on time, 2) attend the seminar and 3) be prepared to explain your solutions in the seminar. See each homework assignment for details.

The written report score S_{Wr} is

$$S_{\text{Wr}} = \frac{1}{2} \sum_{i=3,6} \frac{\text{Your group's score on HW } i}{\text{Maximum score on HW } i}.$$

The total score of the project part is

$$S_{\text{Pr}} = 0.7S_{\text{Or}} + 0.3S_{\text{Wr}}.$$

Again, note that $S_{\text{Or}} \geq 0.5$ and $S_{\text{Wr}} \geq 0.5$ are needed to pass.

The grade of the Project part is computed in the following way:

$S_{\mathbf{Pr}}$	**Grade**
0.5–0.59	E
0.6–0.69	D
0.7–0.79	C
0.8–0.89	B
0.9–1.0	A

The grade of the course is in general the same as the grade on the written exam, but with the following exceptions:

Exam	**Project**	**Course**
E	C	D
E	B	D
E	A	C
D	B	C
D	A	C
C	A	B

Written exam (4.0 hp)

The written exam is to large extend based on similar problems like those on the homework assignments. There will also be more theoretical problems related to definition, proofs and applications that we talked about on the lectures. The grade is computed in the same way as in the table above. Hence, you need for example 50% for grade E and 70% for grade C.

Retakes

There will be two retakes of the written exam. See the schedule.

If you do not pass the project part (Homework assignments) there will be some arrangements in connection to the retakes of the written exam. You need to submit (new) assignments and do oral presentation of the solutions.

Zoom if needed

Lectures and seminars can be canceled in very rare cases. If the instructor cannot have the lecture or the seminar on campus the first alternative is to find a substitute and the second alternative is to do it through Zoom instead. It is important that you check MyMoodle for latest news about the course.

Python and Cocalc

During the course I will use the programming language Python in some examples. In the homework assignments you might also need to do some simple programming. You can for example use the online computing resource CoCalc (`http://cocalc.com`). Here you can run ordinary Python programs but also programs written in SageMath (a computer algebra system). I recommend you to create an account on CoCalc, you can do it for free. You will get limited computational power in the free version but it will definitely be enough for things we will do in this course.