Aalto University
School of Electrical
Engineering

ELEC-A7200 Signals and systems

5 op Fall 2023

General information and course arrangements

Course personnel and prerequisites

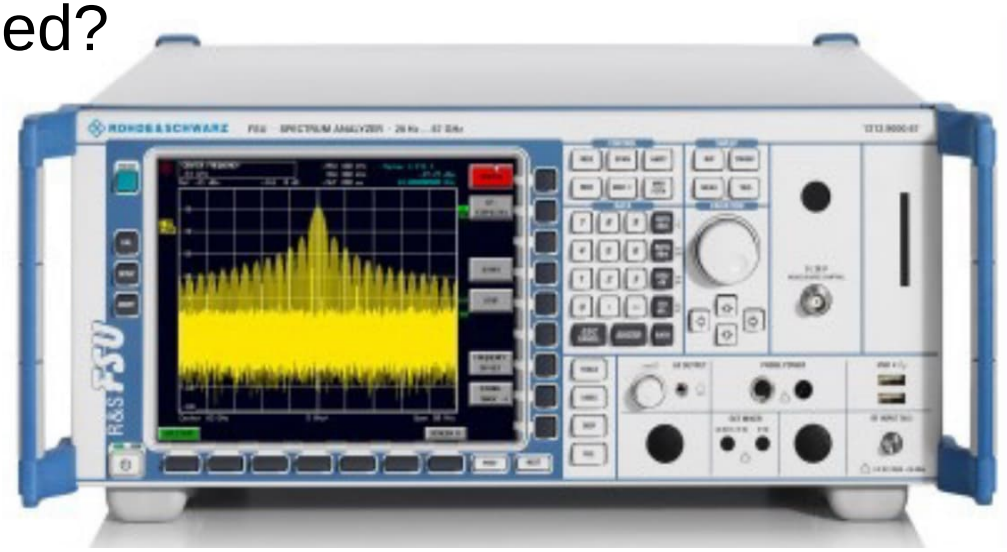
- Responsible teacher
  - Riku Jäntti (Riku.Jantti@aalto.fi)
- Exercises
  - Head assistant: Pasi Lassila (Pasi.Lassila@aalto.fi)
  - Student assistants:

    Linnea Haapio — Stella Levander
    Milja Harju — Jori Laesvuori
    Sanni Mäkinen — Quang Ngo
- Prerequisite information
  - 1st year math (calculus, matrices, basic probability)

Course objectives

- What is covered in the course?
  - basic concepts of signals and systems
  - basic methods of signal and system analysis
  - basics of signal transmission
  - basics of signal measurement

- Where is this information needed?
  - when something is measured
  - when a signal is transmitted
  - when the signals are filtered
  - when the signals are generated
  - when any system is controlled



Course materials

- All study material is in A+ (opens on Mon 4.9.2023)

  https://plus.cs.aalto.fi/elec-a7200/autumn-2023/

  - Lecture videos and slides
  - Lecture handout material and exercises
  - Sketches of model solutions to exercises

- Mycourses
  - General information, announcements
  - Results from midterm exams, normal exams and final assessment

Course language

- Course content in A+, lecture slides and videos in English
- Digital lecture handout without exercises is available as a single pdf file in Finnish in A+ (as reference material with terminology in Finnish)
- In exercises you can get support in Finnish and English
- In all exams you can answer in Finnish, English or Swedish

Teaching events

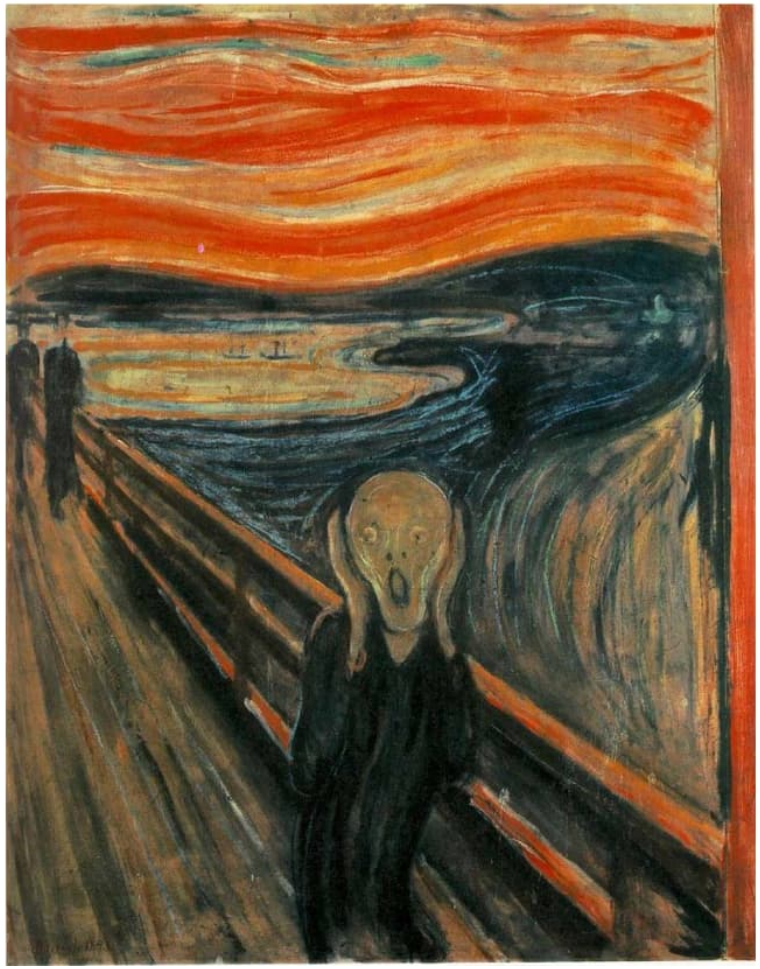
- Lecture
  - Only this opening lecture!
- Exercises
  - 4 sessions / week
  - Assistants are present to support you in solving the weekly exercises
  - No need to enroll to sessions, you can freely come to any session
- Midterm exams
  - Week 42 (Fri 20.10.2023) and 49 (Fri 8.12.2023)

Course schedule and working methods

- Course schedule
  - Spans 12 weeks and each week corresponds to a chapter in course material in A+
  - Note! Amount of work to complete weekly exercises may vary, i.e., some chapters require more work than others
  - Typical experience is that material during period I is more challenging
- Learning happens (mostly) individually through the lecture videos and studying the material in A+ and solving exercises
- Ideal weekly schedule for a student:
  - Monday/Tuesday: go through the lecture videos associated with the chapter
  - Then start reading the chapter in A+ and solve the exercises to get practice and points
  - Attend exercise sessions to solve exercises together with other students and to get support

How to study?

- The course is demanding!
  - Allow enough time (approx. 10 h /week) for reading, understanding and completing the assignments.
  - As you read the material, try to understand everything!
- If you don't understand, just ask
  - Friends
  - Assistants during exercises
  - Professor
  - in Zulip
- Give feedback also during the course
  - We will try to improve the material based on your feedback



Contents and weekly schedule

- Chapter 01: Introduction - Signal Power and Energy (week 36)
- Chapter 02: Special Signals and Convolution (week 37)
- Chapter 03: Signal Space (week 38)
- Chapter 04: The Fourier Series (week 39)
- Chapter 05: Fourier Transform I (week 40)
- Chapter 06: Fourier Transformation II (week 41)
- Midterm exam 1 (week 42)
- Chapter 07: Sampling and Discrete Fourier Transform (week 43)
- Chapter 08: LTI Systems in time domain (and Laplace transform) (week 44)
- Chapter 09: LTI Systems in the frequency domain.(week 45)
- Chapter 10: Linear Filtering of Signals. (week 46)
- Chapter 11: Modulation and Memoryless Nonlinear Systems (week 47)
- Chapter 12: Random Signals (week 48)
- Midterm exam 2 (week 49)

Weekly exercises

MON	TUES	WED	THURS	FRI
	8.15-10.00 U5			
			14.15-16.00 U3	
	16.15-18.00 U351		**16.15-18.00** U351	

More about exercises

- Working methods generally
  - Students can freely organize into groups or work individually
  - Can work on any problem in any order
  - Assistants are present to give support
  - Don’t be afraid to ask questions!

- Tue 16:15 - 18:00 session
  - Main assistant (Pasi Lassila) will also be present
  - Idea is to go through briefly the weekly exercises and discuss them
  - Starting week 37! (not yet this week)

Assessment

- You get points from weekly exercises in A+
  - 100 points / week
  - Max points = 1200 + 10 points (from introduction)
- 2 midterm exams
  - Each midterm exam contains 3 problems, each 6p (max 18 points / midterm exam)
  - Max points: 2 x 18 = 36 points
- In the final grade, weekly exercises have weight 30% and midterm exams have weight 70%
  - Normalized grade (NG) is obtained from your total weekly exercise points (WEP) and midterm exam points (MEP) by

    NG = 0.3 x (WEP / 1210) + 0.7 x (MEP / 36)

  - Final grade (FG) is then given by the table on the right
  - Threshold for passing is that NG ≥ 0.4

Normalized grade (NG)	Final grade (FG)
NG < 0.4	0
0.40 ≤ NG < 0.52	1
0.52 ≤ NG < 0.64	2
0.64 ≤ NG < 0.76	3
0.76 ≤ NG < 0.88	4
0.88 ≤ NG ≤ 1	5

Assessment

- If you miss one midterm exam or just want to raise your score, you can do it at any of the retake exams
  - 2 possibilities in a year (29.1.2024 and 25.3.2024)

- Alternatively, you can also substitute both midterm exams by doing the **full exam** at retake exam dates
  - Retake exam consists of 6 problems, 3 for midterm exam 1 and 3 for midterm exam 2
  - To take the **full exam**, student solves 5 problems out of 6
  - In this case, max points in computing normalized grade for exams is 30 points (see previous slide)
  - However, if grade is better without exercise points (i.e., 100% weight for exam) then your grade is given by this

Assessment

- Points from exercises and midterm exams **are only valid for 1 academic year!**
- After 1 year, student can take the full exam which will be evaluated as a standalone activity (100% weight) or enroll again to the course
- In all exams, you can answer in **Finnish, English or Swedish**