



# Signals and Systems

EE2S1

Rob Remis

Delft University of Technology

September 2, 2024



## ① Course details and overview

Welcome to the **Signals and Systems** course!

**Course code:** EE2S1

**Lecturers:**

- ▶ Rob F. Remis  
Room 18.060  
EEMCS building  
Email: R.F.Remis@TUDelft.NL
- ▶ Alle-Jan van der Veen  
Room 17.040  
EEMCS building  
Email: A.J.vanderVeen@TUDelft.NL

▶ **Exam:**

- 1 Partial exam 1: 30-09-2024
- 2 Partial exam 2: 07-11-2024
- 3 Resit exam: 17-12-2024

For each (partial) exam you are allowed to bring one A4 (2 sides) with *handwritten* notes

▶ **Book:**

Signals and Systems Using Matlab

Third edition

Luis F. Chaparro

Aydin Akan

Available as an e-book at the TU Delft library

## Lectures part 1

Weeks 1 – 4

### ▶ Weeks 1 and 3

- > Monday, 13:45, lecture hall Boole
- > Wednesday, 08:45, lecture hall Boole

### ▶ Weeks 2 and 4

- > Monday, 13:45, lecture hall Boole
- > Wednesday, 08:45, lecture hall Boole
- > Friday, 08:45, lecture hall Boole

## Course labs

- ▶ Three lab sessions in the Tellegen hall after the midterm
- ▶ Lab sessions are on Wednesday
- ▶ You complete a lab session in a group of two students  
You can define your own group
- ▶ Lab sessions consist of programming exercises (Python)
- ▶ Each exercise has to be signed off (pass/fail)
- ▶ You need passes on all exercises to pass the course
- ▶ In case you already passed the course labs of EE2T11 then you do not need to do the course labs.  
Please contact Alle-Jan van der Veen
- ▶ Details can also be found on Brightspace

- ▶ **Course content**

- > Indicated chapter and sections from the book
- > Slides

- ▶ **Note:** Starting this academic year (24/25), results, methods, and techniques from complex analysis are no longer used in our treatment of the Laplace transform

## List of topics

### Part 1

- ▶ Standard signals and the Dirac distribution
- ▶ Linear and time-invariant systems (LTI systems)
- ▶ The Laplace transform
- ▶ Fourier series

### Part 2

- ▶ The Fourier transform
- ▶ Sampling and reconstruction
- ▶ Discrete time LTI systems
- ▶ The Z-transform
- ▶ The discrete time Fourier transform
- ▶ Analog and digital filter design



# 1 Prerequisites

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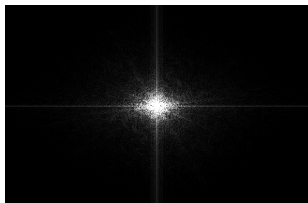
- ▶ Linear algebra and analysis
- ▶ Linear circuits
- ▶ Differential equations
- ▶ Complex numbers and Euler's formula

- ▶ Circuit analysis
- ▶ Filter design
- ▶ Stability analyses
- ▶ Signal processing
- ▶ Image processing (image = 2D signal)
- ▶ ...

# 1 Applications

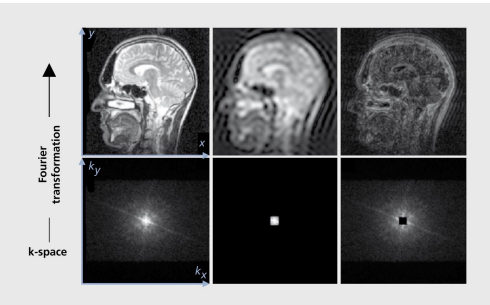


Fourier transform



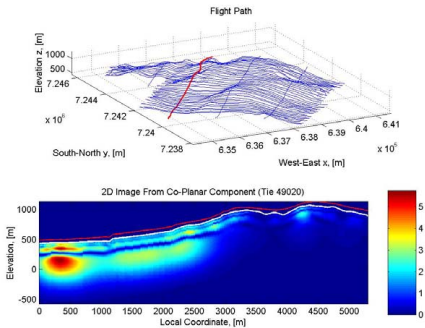
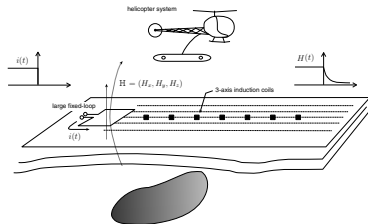


MRI scanner



MR images and their spatial Fourier transform

## Imaging in geophysics



**Signal processing:** How to mount an audio/video or other data signal on some carrier that can easily be transmitted over great distances?

