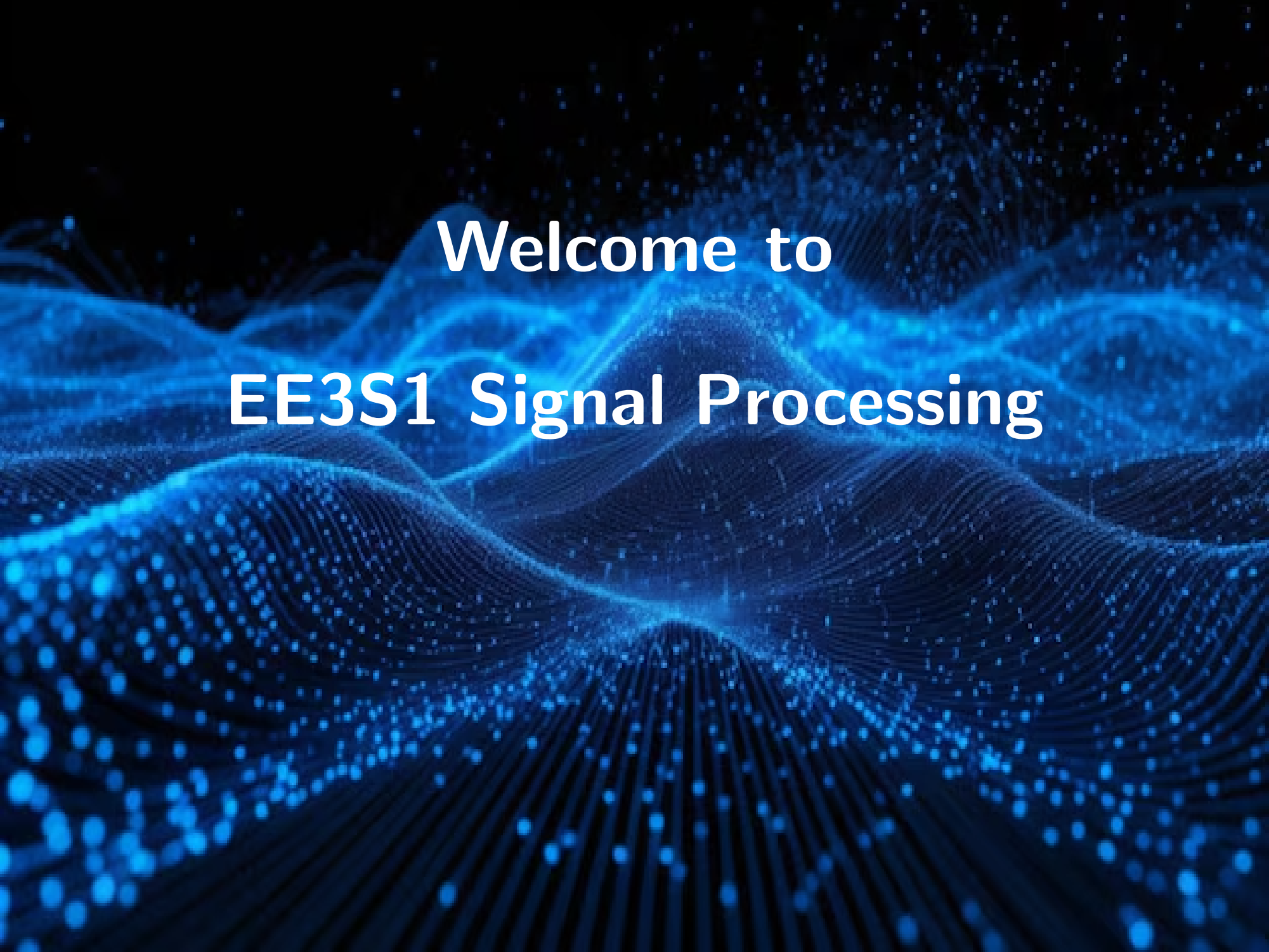
Welcome to
EE3S1 Signal Processing

Lecturers

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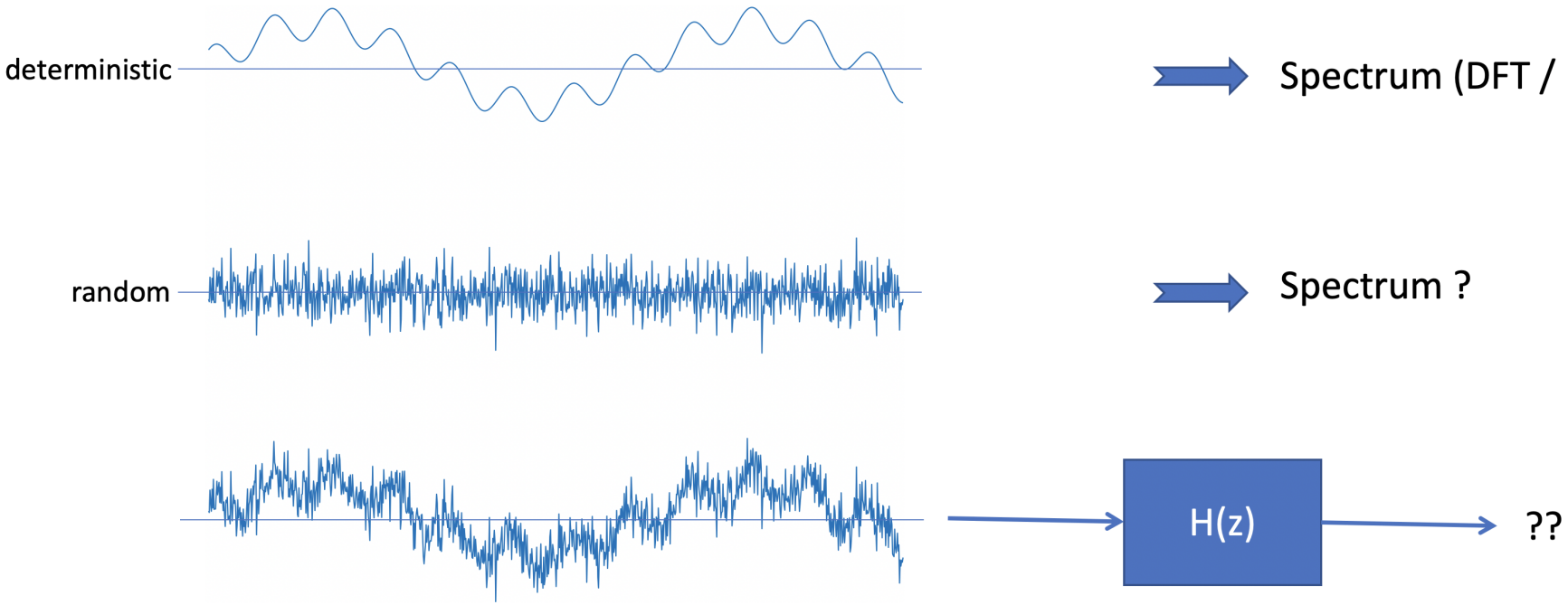
Organization

- Lectures (2 or 3 per week), recorded on Collegerama
- Course labs (once per 2 weeks, 4 in total)
- Self-study:
  - Book
  - Recorded video lectures (Collegerama)
  - Exercises from the book; past exams (cf. EE2S31)

Two "independent" tracks, combined in the course labs:

- Statistical Signal Processing (SSP)
- Digital Signal Processing (DSP)

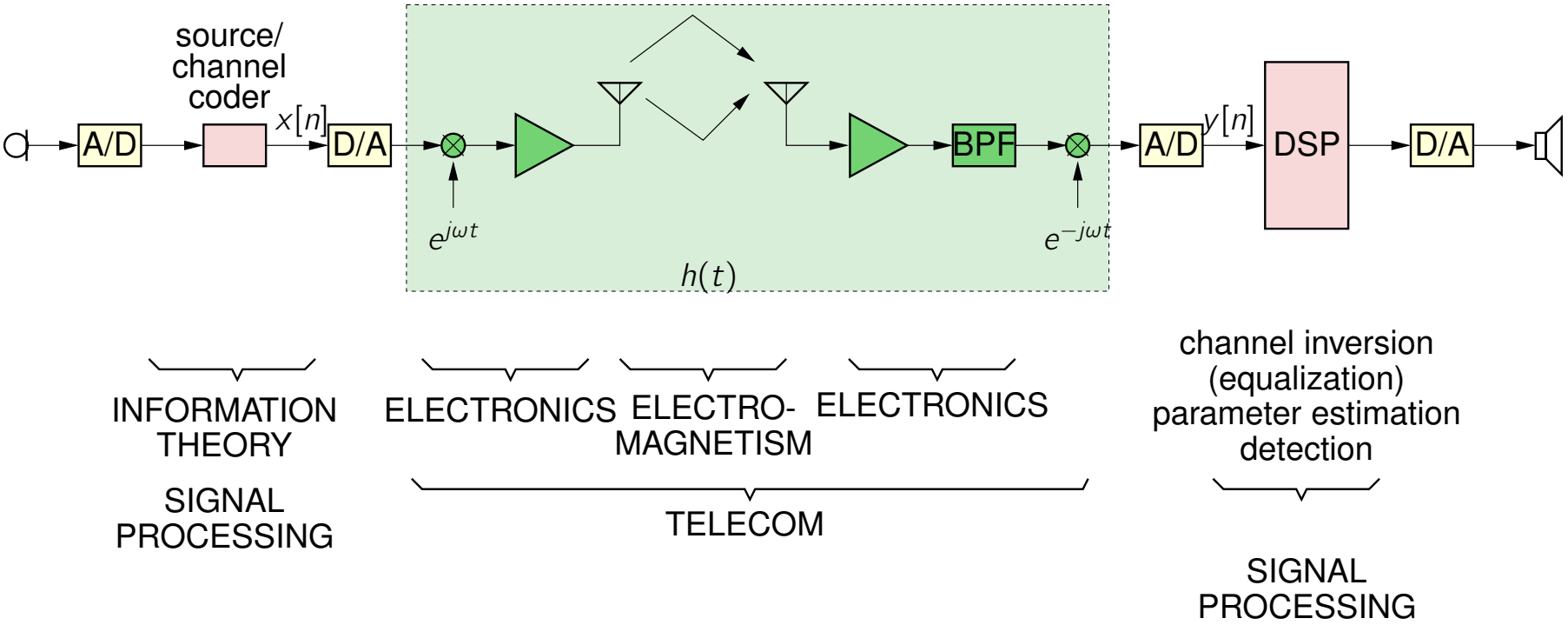
Signal Processing



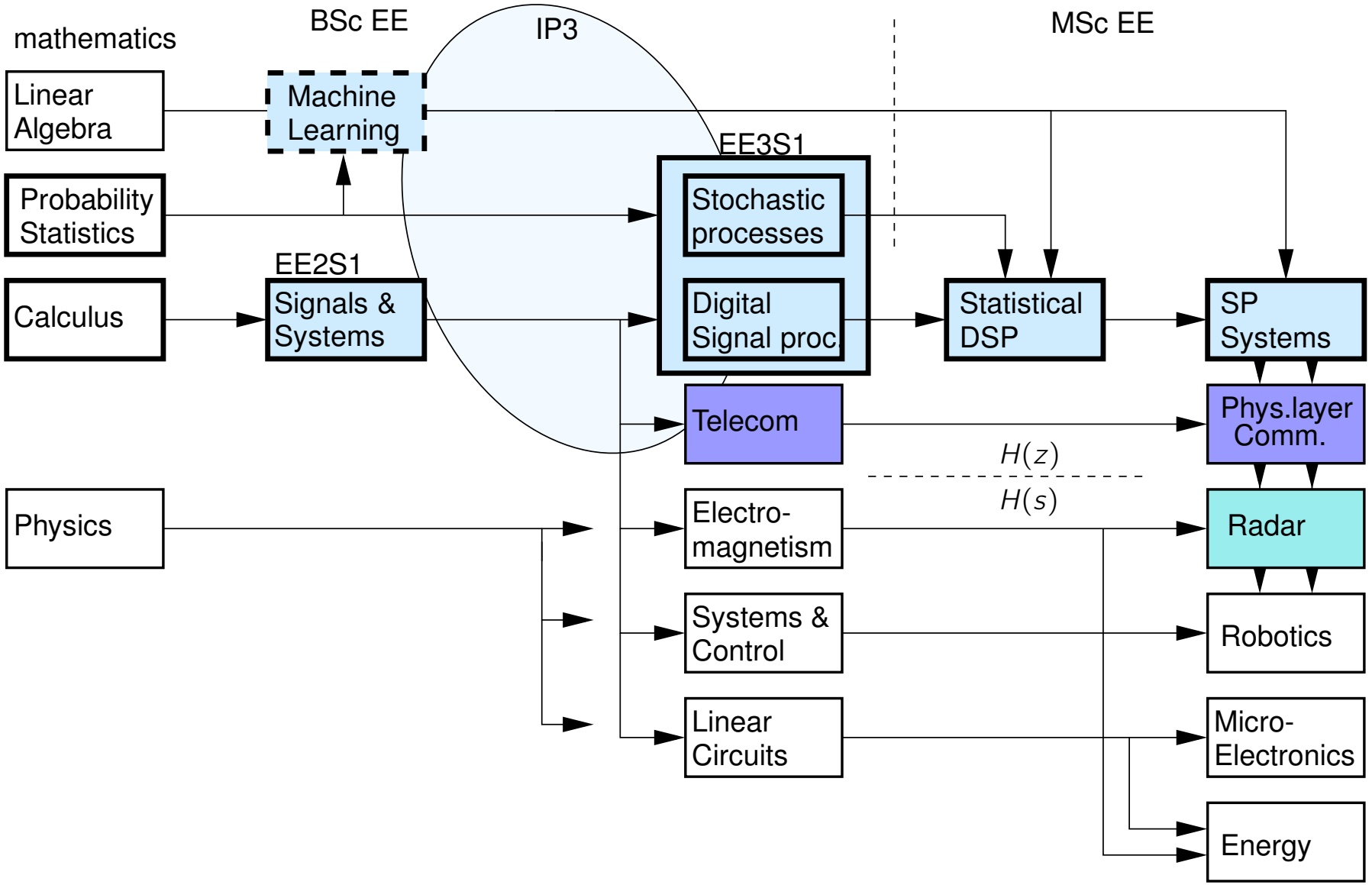
Overview of signal processing

- **Techniques and Methods**
  - Sampling and reconstruction (compressive sensing)
  - Statistical signal processing (parameter estimation, detection), machine learning
  - Analytical techniques (e.g. linear algebra, optimization)
  - Distributed processing, graph signal processing
  - DFT, filters, filter banks
  - Adaptive filters, neural networks
  - DSP hardware, fast algorithms/architectures
- **Applications**
  - Communication, radar, sonar, sensor arrays (multichannel signal processing), information theory
  - Speech and audio processing
  - Image, video and multimedia processing
  - Biomedical/bioinformatics

Example: Telecom



Context


mathematics
BSc EE
IP3
MSc EE
Linear Algebra
Machine Learning
EE3S1
Probability Statistics
Stochastic processes
EE2S1
Calculus
Signals & Systems
Digital Signal proc
Statistical DSP
SP Systems
Telecom
Phys.layer Comm.
$H(z)$
$H(s)$
Physics
Electro-magnetism
Radar
Systems & Control
Robotics
Linear Circuits
Micro-Electronics
Energy

Prerequisites

EE2S1 Signals and Systems

- Continuous-time vs discrete-time signals, sampling
- Linear time-invariant systems, convolution
- Fourier Transform, spectral representation
- Discrete-time Fourier transform

EE2M1 Probability and Statistics

- Random variables, pdf, cdf
- Conditional pdf, Bayes' theorem
- Expectation

Course labs

The course has 4 courselabs, in week 2, 4, 6, 8.

- The course labs are pass/fail; you need a pass on each of the labs
- Work in groups of 2 (create your own groups in Brightspace)
- Python using Jupyter Colab
- Tellegenhall (presence required; some audio equipment needed)

Exam

Dates:

- Final exam in week 10
- Resit in the summer

Content and evaluation:

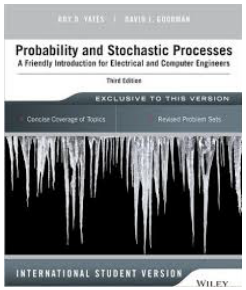
- The exam consists of exercises from both SSP and DSP (50/50)

Format:

- Written exam
- Closed-book, you can bring a 1 page cheat sheet (handwritten)

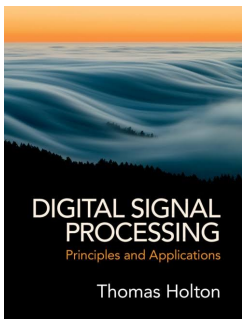
Literature

- **Stochastic Processes:**



R.D. Yates and D.J. Goodman, Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers, Wiley, 2014
+ Supplement (online)
+ Solution manual

- **Digital Signal Processing:**



Thomas Holton: Digital Signal Processing. Cambridge Univ. Press, 2021