

Stochastic Processes

Session 1 — Introduction

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Outline for Session 1 — Introduction

Welcome to The Course!

Random Variables and Vectors (Recap)

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Course Information and Material

Course material is available via Moodle (<http://sict.moodle.aau.dk/>)

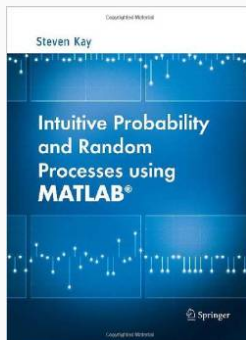
The Course Document is also available at Moodle. It contains

- ▶ the topic of the day,
- ▶ reading material and exercises, and
- ▶ intended learning outcomes (ILOs).

The ILOs is our interpretation of the study regulations. The ILOs describe *what you should be able to do* after the course and *what the exam will measure*.

The course document will be updated as the course progresses.

- ▶ We will use the *book*: “Intuitive Probability and Random Processes using Matlab” by Steven M. Kay:



- ▶ and *Lecture Notes* available via Moodle.

Building blocks:

5 Lecture Sessions - (0.2 ECTS each)

(3 × 40mins session + 2 × 15mins break)

Exercises and simulation tasks supporting each lecture

15 Group Work Sessions - (0.2 ECTS each)

(Exercises and simulation tasks)

Made in pairs/groups, together in a seminar room with teaching assistants

Preparation prior to these sessions is highly recommended: read recommended material and/or watch session videos *before the session*

1 Exam - (1 ECTS)

Written and graded, covering the material from lectures and exercise sessions.

Workload of the Course

The Study Board use the definition $1 \text{ ECTS} = 30 \text{ hours}$ of student workload.

This is a 5 ECTS course, which thus corresponds to a load of 150 hours.

- ▶ Lectures ($0.2 \text{ ECTS} = 6 \text{ hours}$): Lecture time: 2.5 hours, study time: 3.5 hours (to read, do exercises, discuss with others).
- ▶ Group Work Sessions ($0.2 \text{ ECTS} = 6 \text{ hours}$) last 3.5 hours, study time: 2.5 hours.
- ▶ The Exam (1 ECTS), i.e. 30 hours, including 4 hours for the exam itself.

Keep a record over the time you spend on the course. Try not to over- or under-spend!

PART 0: RECAP OF RANDOM VECTORS

S1&S2 Random variables/vectors, conditional distributions, expectations

PART 1: STOCHASTIC PROCESSES

S3&S4 Definition of stochastic processes and strict-sense stationarity

S5&S6 Wide-sense stationary stochastic processes

S7&S8 The power spectral density and its estimation

S9&S10 Response of LTIV systems to random inputs

S10&S11 ARMA processes, simulation and estimation

S12&S13 Point processes in 2D (binomial and Poisson)

PART 2: DETECTION AND ESTIMATION

S14&S15 Hypothesis testing and detection theory

S16&S17 MMSE estimation and vector LMMSE estimation

S18,S19&S20 Kalman filters (scalar and vector version)

Main Teachers:

- ▶ Troels Pedersen (troels@es.aau.dk), Fredrik Bajers Vej 7, A4-214.
- ▶ Carles Navarro (cnm@es.aau.dk), Fredrik Bajers Vej 7, A4-216.

Teaching Assistants (Group Work Sessions):

- ▶ Thomas L. Hansen
- ▶ Henning Thomsen

You are welcome to come to our offices with your doubts on topics/exercises, but:

- ▶ Try to discuss them first with your fellow students.
- ▶ Use the time available in lectures and group work sessions.
- ▶ Contact by e-mail if teachers not in the office.

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Welcome to The Course!

Random Variables and Vectors (Recap)

Random Variables and Vectors

We will run this recap session as Group Work.
Reading material and video lectures are specified in the course document.