

Stochastic Processes

Session 1 — Lecture

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Fall 2016

Outline for Session 1 — Lecture

Welcome to The Course!

Random Variables (Recap)

Multiple Random Variables / Random Vectors (Recap)

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Course Information and Material

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

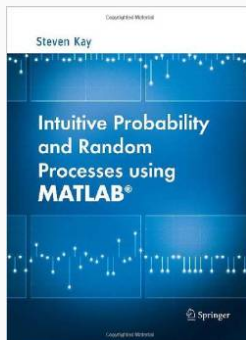
The Course Document also available at Moodle. It contains

- ▶ 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:

6–8 Lecture Sessions - (0.2 ECTS each)

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

Exercises and simulation tasks supporting each lecture

12–14 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.

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

- ▶ Try to discuss them first with your fellow students.
- ▶ Contact by e-mail if teachers not in the office.

Teaching Assistant (Group Work Sessions):

- ▶ Thomas L. Hansen.

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