Detection and Estimation Theory
Schedule for Spring 2010
Erik G. Larsson

This schedule may be updated during the course.

Last updated: February 21, 2010

Lecture 1: February 15, 9-12 (Hammingrummet)

- Introduction.
- Binary hypothesis testing.
- Bayesian cost criteria and optimum decision rules.
- Deterministic tests: Neyman-Pearson criterion.

Reading: Chapter 1 and Sections 2.1-2.2.1
Homework 1: **2.2.1, 2.2.2, 2.2.5, 2.2.10** (from book), **EL1, Kay-II-3.14** (see webpage)
Deadline homework: March 8, 2010

Lecture 2: February 22, 9-12 (Hammingrummet)

- M-ary hypothesis testing
- Gaussian problems

Reading: Sections 2.2.2, 2.3, 2.6
Homework 2: **2.3.2, 2.3.3, 2.3.5** (only part 1)**, 2.6.6, 2.6.7, EL2** (see webpage)
Deadline for homework: March 8, 2010

Homework session 1: March 8, 9-12 (Glashuset)

- Presentations and discussions of homework 1-2

Lecture 3: March 9, 9-12

- Estimation of parameters
- Bayesian estimates, MMSE, MAP
- Deterministic estimation, ML, bias, variance
- Cramer-Rao bound

Reading: Section 2.4
Homework 3: **2.4.1, 2.4.11, Kay-I-3.9, EL3, EL4** (see webpage)
Deadline for homework:

Lecture 4: March 22, 9-12

- Composite hypotheses
- Bounds and approximations

Reading: Sections 2.5, 2.7, 2.8
Homework 4: **2.7.1, 2.5.1, 2.5.3, 2.5.7(a), EL5, EL6** (see web)
Deadline for homework:

Homework session 2: April 12, 9-12

Presentations and discussions of homework 3-4

Lecture 5: April 19, 9-12 (Glashuset)

- series expansion of deterministic waveforms
- Karhunen-Loeve series expansion of random processes
- bandlimited random processes, degrees of freedom
- white noise

Reading: VT-I Chapter 3. Focus on Sections 3.1-3.4 and 3.8. Sections 3.5-3.6 are less important.
Homework 5: **3.3.1, 3.3.6, 3.4.4, EL7**
Deadline for homework: May 17

Lecture 6: April 26, 9-12 (Glashuset)

- binary and M-ary signal detection in white Gaussian noise
- parameter estimation based on waveforms observed in white Gaussian noise

Reading: VT-I Sections 4.1, 4.2
Homework 6: **4.2.2, 4.2.5, 4.2.6, 4.2.25**
Deadline for homework: May 17

Homework session 3: May 17, 9-12 (Glashuet)

Presentations and discussions of homework 5-6

Lecture 7: May 25, 13-16 (Hammingrummet)

- detection and estimation in colored Gaussian noise

Reading: VT-I Section 4.3
Homework 7: **4.3.5, 4.3.14, 4.3.19, 4.4.41, EL8**
Deadline for homework: June 27

Lecture 8: June 1, 9-12 (Hammingrummet)

- composite hypothesis testing in continuous time

Reading: VT-I Sections 4.4, 4.7. Also read briefly Sections 4.5, 4.6
Homework 8 **(last homework for the course)**: **4.4.5, 4.4.18, 4.4.27, 4.4.42**
Deadline for homework: June 27

Homework session 4: June 28, 9-12 (Glashuset)

Presentations and discussions of homework 7-8

Individual follow-up sessions: July 1, start at 9.15 (Hammingrummet)

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