Tentative syllabus for graduate course in Information Theory

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This will be a basic graduate course in Information Theory offered at the Department of Automatic Control. No preliminary knowledge of Information Theory will be assumed. Basic probability and linear algebra as well as a minimum of mathematical maturity will be the only prerequisites.

The course will be worth 9 credits. In order to be granted such credits, students will be have to do the homework's assignments (tentatively 4 sheets, assigned on a weekly basis) as well as some final reading and presentation/discussion (to be arranged with the lecturer on an individual basis).

Lectures will be mostly based on the following textbooks:

[1] T.M. Cover and J.A. Thomas, *Elements of Information Theory*, 2nd ed., Wiley, 2006;

[2] I. Csiszàr and J. Körner, *Information theory: coding theorems for discrete memoryless systems*, 2nd ed., Cambridge University Press, 2011.

Notes and other material to complement the above will be made available if needed.

Here is a tentative schedule (subject to change if needed). Meetings at 10:00 in Conferenzrummet (1167B in the 1st floor of the M-building):

4/9 Preliminary meeting / Lecture 0

5/9 Lecture 1

6/9 Lecture 2

11/9 Exercise session 1

12/9 Lecture 3 (time subject to change)

13/9 Lecture 4

18/9 Exercise session 2

19/9 Lecture 5

20/9 Lecture 6

25/9 Exercise session 3

26/9 Lecture 7

27/9 Lecture 8

2/10 Exercise session 4

3/10 Lecture 9 (possibly guest from LCCC focus period in Information and Control in Networks)

4/10 Lecture 10 (possibly guest from LCCC focus period in Information and Control in Networks)

Here is a tentative program:

- Information measures and their properties: entropy, Kullback-Leibler divergence, mutual information
- Asymptotic Equipartition Theorem, types, and typical sequences
- source coding theorem
- channel coding theorem
- rate distortion theory, quantization
- maximum entropy principle
- error exponents in: hypothesis testing, source coding, and channel coding
- rudiments of network information theory