USC EE 565A – INFORMATION THEORY – FALL 2008

Webpage: http://den.usc.edu/
(login with your DEN username and password)

Instructor: Giuseppe Caire
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Office Hours: Room EEB 528, Wednesday 4:00 – 6:00PM

Teaching Assistant: Ozgun Bursalioglu
Office: EEB 106
(213) 740-3487 (Voice, during office hours)
(include EE565 in subject line)

Office Hours: TBD

Lectures: Tuesday, Thursday 3:30 – 4:50PM in OHE 132
(handouts and video available through DEN website)

Discussion: none

Pre-req: See the course flowchart
on the CSI web page http://csi.usc.edu/

Other Requirements: Probability theory, Linear algebra, Calculus

Exams and grading policy:

- Midterm Exam (1h:20min): tentative on Tuesday October 21, during class hours.

- Final Exam (2h): Tuesday December 16, 2:00–4:00 PM.

Notice: both Midterm and Final are CLOSED BOOKS. Don’t forget to bring you calculator, it might be required. You are allowed to use *one* sheet of paper (i.e., two sides) of standard Letter size (8 1/2 × 11 in.) in order to annotate formulas and whatever you find useful to solve exercises in the exams).

Homework correction and grading policy:

Homework consists of occasional problem sets in preparation of midterm and final exams. You are strongly encouraged to solve the problems by yourself. Homeworks will *not* be graded.

Final Grading: the final score $S$ is a weighted mean of midterm and final exam scores. The final grade is obtained by a quantization of the final score $S$ into the levels A, A−, B+, B, B−, C, C−. The *median* of the score distribution falls in the middle of the $B$ range.

Course Objective: This course presents the fundamentals of Information Theory, that stays at the basis of modern digital communications, data compression and lossy source coding.

The course depends primarily on lecture notes, although the textbook will be followed quite closely. Attendance is essential.
Policies:

- All relevant information about the course shall be posted on the DEN webpage (http://den.usc.edu/), including HW questions and solutions. Students are strongly encouraged to log-in regularly on the DEN webpage and check for updated information.

- Students are required to log-in and check also this course syllabus, that will be updated with relevant information about exam dates, locations, office hours etc ...

- **Final grades** are assigned according to the algorithm illustrated above, where the weighting is up to the discretion of the Instructor.

- **Make-up Exams:** No make-up exams will be given. If you cannot make the exam dates due to a class schedule conflict, you must notify me by February 1st, 2008 (last day to add/drop). If I cannot accommodate your schedule, you must drop the class. In the case of a required business trip or medical emergency, a signed letter form your doctor or supervisor is required. **This letter must include the telephone number of your doctor or supervisor.**

- **Attendance:** Lecture attendance is STRONGLY ENCOURAGED. Not attending classes might significantly impact your ability of understanding the course. Interaction with the instructor during class time and office hours is also strongly encouraged. Students are responsible for all material presented in lectures, whether or not this is contained in the textbook and whether or not the notation and the treatment follows the textbook. Presented material that is not in the textbook might be subject of HW and exams. The argument that “...this is not in the book...” **is not a valid excuse.**

- **Academic Integrity Policy:** As per university guidelines published in SCampus

**Textbooks (ordered):**


**Course contents.**

1. A short history of Information Theory, perspective and impact on current technology.

2. Information measures: Entropy, Divergence and Mutual Information.

3. Fundamental Inequalities: data processing inequality, Fano Inequality.

4. The Asymptotic Equipartition Property and its consequences.

5. Entropy rate of stochastic processes.

6. Data compression

7. Channel capacity and the channel coding theorem

8. Differential entropy and the Gaussian channel

9. Rate-distortion function and the source coding theorem

10. Time permitting: some advanced topics in information theory ....