

USC EE-599 – MULTI-USER INFORMATION THEORY AND  
COOPERATIVE COMMUNICATIONS – SPRING 2009

**Webpage:** TBD  
(login with your username and password)

**Instructor:** Gerhard Kramer  
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**Lecture:** Monday, Wednesday 2:00-3:20 PM in Room GFS107

**Office Hours:** Monday, Wednesday 3:30-5:00 PM in Room EEB536

**Pre-req:** Random Processes in Engineering (EE562a) or permission of the instructor

**Grading:** 25% Midterm Take-Home Exam (Date TBD)  
75% Research project: Participants shall review, hand in a report on, and give a short presentation on a recent research paper on multi-terminal information theory. The choice of paper shall be agreed upon together with the instructor.

**Textbooks:** The course is based on material in the booklets:

- “Topics in Multi-User Information Theory,” G. Kramer, Foundations and Trends in Communications and Information Theory, vol. 4, no. 4-5, pp. 265-444, 2007
- “Cooperative Communications,” G. Kramer, I. Marić, and R.D. Yates, Foundations and Trends in Networking, vol. 1, no. 3-4, pp. 271-425, 2006

and handouts provided during the course. The book *Elements of Information Theory* by T. Cover and J. Thomas is also recommended.

**Course contents.** This course develops concepts of multi-user information theory. Starting with typical sequences, the lectures build up knowledge on random coding, binning, superposition coding, and capacity converses by introducing progressively more sophisticated tools for a selection of source and channel models. The problems addressed include:

- Source Coding, Rate-Distortion, Multiple Descriptions
- Capacity-Cost
- The Slepian-Wolf, Wyner-Ziv, and Gelfand-Pinsker Problems
- Broadcast, Multiaccess, Relay, and Interference Channels
- Networks and Flows, Multicast and Network Coding