

## EE 520

# Topics in Communications: Multi-User Information Theory

- **Instructor:** Prof. Aditya Ramamoorthy (Coover 3222) and Prof. Zhengdao Wang (Coover 3134) , Email: {adityar, zhengdao}@iastate.edu
- **Course Website:** <http://www.ece.iastate.edu/~adityar/Teaching/EE520-Fall2008/ee520.html>
- **Class Time:** To be decided.
- **Prerequisite:** Knowledge of basic probability and information theory.
- **Textbook:** Gerhard Kramer, *Topics in Multi-User Information Theory*, Foundations and Trends in Communications and Information Theory, vol. 4, no. 4-5, pp. 265-444, 2007.

## Course Objectives and Outline

Network information theory is concerned with finding the fundamental limits on information transfer over communication networks. In this course we shall consider specific topics in network information theory such as multi-terminal source coding, broadcast channels, multiple-access channels etc. Information theory has by and large been quite successful in providing satisfactory answers to a number of questions over point to point channels. However the field of network information theory has a number of open issues that we will highlight during this course.

This course is aimed at students who have a good grasp of probability and have taken the course on information theory. Of course this is a graduate class and the main prerequisite is mathematical maturity. We shall start with a short refresher on the basics of information theory. A tentative list of topics is given below.

- Preliminaries - Properties of entropy, relative entropy and mutual information, typical and jointly-typical sequences and source coding
- Rate-Distortion
- Capacity under cost constraints
- Distributed Source Coding - Slepian-Wolf and Wyner-Ziv problems
- Coding for channels with state - Gelfand-Pinsker problem
- Broadcast channels
- Multiple-access channels
- Relay and multiple relay channels
- Issues pertaining to feedback

## Course Policies

There shall be no exams in this class. There might be at most one or two homework assignments. In addition there shall be a project that will typically be a survey of a particular area. A presentation and a well-written technical report shall be required. Depending on the number of students enrolled, we may allow students to do this in groups. Each student who takes this class is expected to scribe notes in LaTeX. I shall be putting up a template on the course website.

Your grade shall be primarily based on your presentation and report, the quality of the scribed notes and class participation.

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Please address any special needs or special accommodations with me at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from the Disability Resources (DR) office (phone 515-294-7220). DR is located on the main floor of the Student Services Building, Room 1076.

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