Synopsis: The main objectives are to derive the fundamental limits to the performance of the three principal communication tasks: lossless source coding (data compression), channel coding (error control coding), and lossy source coding (quantization). Typical sequence concepts are used extensively. Quantitative measures of information and uncertainty are introduced. Relationships between them and decision/estimation theory are explored. Elementary source and channel coding techniques are covered.

Time: MWF 9:30-10:30
Room: 3433 EECS
Credit hours: 3
Next offering: Winter 2002 is most likely.
Instructor: Prof. David L. Neuhoff, 4215 EECS, 764-6586, neuhoff@eecs.umich.edu
Office hours: To be determined. However, you can also make appointments at mutually convenient times. Contact me by phone, by email, or by coming to my office.
Prerequisite: EECS 501, Probability and Random Processes
Textbook: Information Theory, a manuscript by D.L. Neuhoff and G.D. Forney. This will be updated and distributed to the class chapter-by-chapter, as needed. The complete previous version from 1995 is available on the class website.
Reference Books: See attached list. Most are available from the Media Union Library.
Books on reserve: Asterisks mark the information theory textbooks in the reference list that have been placed on reserve in the Media Union.
Homework: Ordinarily, homework is assigned every week and is due in class one week later, BEFORE the lecture begins. (The idea is to not disturb or delay the lecture.)
Late policy: Late homework may be turned in to me before or after any lecture. Do not leave it in my mailbox. Late homework received before the next lecture begins will incur a 25% deduction. Homework received after that, but within one week of the due date, will incur a 50% deduction. No credit for homework that is more than one week late, except in extenuating circumstances.
Collaboration policy: Homework assignments are to be completed on your own. You are allowed to consult with other students during the conceptualization of a solution, but all written work, whether in scrap or final form, is to be generated by you, working alone. You are also not allowed to use, or in anyway derive advantage from, the existence of solutions prepared in prior years. Violation of this policy is an honor code violation. If you have any questions about this policy, please contact me.
Exams: Two Midterm Exams, probably in the evening.
Final Exam on Tues. Dec. 19, 1:30-3:30 PM.
Course Grade: 15% Homework, 25% Exam 1, 25% Exam 2, 35% Final Exam
Homework is important and counts enough that you take it seriously, but not so much that you cannot afford mistakes.
After each exam, the A-range and B-range for that exam will be announced. In computing the course score, the exam scores will be adjusted so as to match the grade ranges of the three exams.
Class email mailing list: Many important announcements (e.g. homework hints and corrections, exam schedules, changes to office hours etc.) will be emailed to the class. **YOU MUST REGISTER** for the class email list by sending email to eecs401-request@eecs.umich.edu with the word "subscribe" in the subject line. There will be one or more test emails, which will be announced in class. Let me know if you do not receive them.

Class web page: www.eecs.umich.edu/courses/eecs550. This will contain copies of homework assignments, solutions, other class handouts, the previous version of the text and important email announcements.

**Class Syllabus**

1. Introduction to information theory and the course.

2. Review of probability and random variables (Appendix A).

3. Almost lossless source codes (Chapter 2), typical sequences (Chapter 3), and strictly lossless source codes (Chapter 2).

4. Measures of information (Chapter 4): entropy, mutual information, divergence, conditional measures.

5. Estimation and decision theory, and relationships to information measures (Chapter 5).

6. Channel coding (Chapters 6 and 7), jointly typical sequences (Chapter 8), channel capacity (Chapter 9).

7. Lossless information transmission (Chapter 10).

8. Lossy source coding (time permitting)

9. Multiuser information theory (time permitting)