

ECE 516: Information Theory

3 credits, Tuesday & Thursday 9:30am ~ 10:45am, Engr. B4

Instructor: J. Rockey Luo **Office:** B118, Engineering Building
Phone: (301) 502-2203 **Email:** rockey@colostate.edu
Office Hours: Tuesday & Thursday 1:00 ~ 2:30 pm, or by appointment.

Prerequisites: ECE303/STAT303, ECE421

Textbook: Thomas M. Cover and Joy A Thomas, “Elements of Information Theory”, 2nd Edition, John Wiley & Sons, New Jersey, 2005. (ISBN 0-471-24195-4)

Course Goals:

This course develops a rigorous analytical framework for modeling and evaluating point-to-point communication systems. Students will:

- Understand the concepts of entropy, mutual information, and channel capacity.
- Relate fundamental information measures to practical algorithms in data compression and error control coding.
- Appreciate both the capabilities and limitations of information transmission systems.
- Gain mathematical tools applicable to a broad range of communication and data systems.

Course Outline:

1. Entropy, relative entropy and mutual information (Chapter 2)
2. The asymptotic equipartition property (Chapter 3)
3. Entropy rate of stochastic processes (Chapter 4)
4. Data compression (Chapter 5)
5. Channel capacity (Chapter 7)
6. Differential entropy (Chapter 8)
7. The Gaussian channel (Chapter 9)
8. Network information theory (Chapter 15)
9. Rate distortion theory (Chapter 10)

Grading:

- Homeworks (20%)
- Midterm Exam (30%), Tuesday, 9:30~10:45am, 10/21
- Final Exam (50%), Wednesday, 6:20~8:20pm, 12/17

Homework:

- Assigned weekly on Tuesday; due the following Thursday by 11:59 PM.

- Late submissions: 25% deduction per day late (strict unless university-approved documentation is provided).
- Skipped homework: counted as 50% of the lowest score among submitted assignments for that set.
- Collaboration is allowed, but final submissions must reflect your own understanding and differ in presentation. Identical solutions (as judged by the instructor) will be treated as skipped homework with an additional 50% penalty.

Exams:

- **In-class students:** Exams are closed book. Four pages (front and back) of notes on standard letter-size paper are allowed. Attendance is required; absences must be justified.
- **Online students:** Recorded lectures available via Canvas. Exams are closed book with the same note policy as above. Exams must be proctored via webcam on your own computer; appropriate equipment and environment are required.

Homework Submission

All assignments must be submitted through Canvas. Handwritten work may be scanned or photographed and compiled into a PDF for upload.