

**ECE 542 Information Theory and Coding
Syllabus
Rutgers University, Spring 2024**

Instructor: Salim El Rouayheb, Email: salim.elrouayheb@rutgers.edu

Topics: Noiseless channels and channel capacity; entropy, mutual information, Kullback-Leibler distance and other measures of information; typical sequences, asymptotic equipartition theorem; prefix codes, block codes, data compression, optimal codes, Huffman, Shannon-Fano-Elias, Arithmetic coding; memoryless channel capacity, coding theorem and converse; Hamming, BCH, cyclic codes; Gaussian channels and capacity; coding for channels with input constraint; introduction to source coding with a fidelity criterion.

Time& Place: official Tuesdays and Fridays 8:30-9:50AM SEC-206 (subject to change please follow the announcements)

Office Hours: Wednesdays 9-11 AM CORE 717

Textbook: T. Cover and J. Thomas, *Elements of Information Theory*, Wiley; 2nd edition, 2006.

References:

- D. J. C. Mackay, *Information Theory, Inference and Learning Algorithms*, Cambridge University Press, 2003. Free preprint available at <http://www.inference.phy.cam.ac.uk/itprnn/book.html>
- R. W. Yeung, *Information Theory and Network Coding*, Springer, 2008. Free preprint available at <http://iest2.ie.cuhk.edu.hk/whyueung/book2/>

Canvas: I will be using Canvas for posting class announcements, homework assignment and submission, grades, etc. Make sure to check the course webpage on Canvas.

Grading: The course grade will be split as follows:

- Homework: 10%
- Exams: $2 \times 30\%$
- Final project: 30%

Additional online references:

- Shannon's original 1948 paper: *A Mathematical Theory of Communication*
- Claude Shannon - Father of the Information Age:
https://www.youtube.com/watch?v=z2Whj_nL-x8
- Prof. R. Yeung Information Theory Coursera course:
<https://www.coursera.org/learn/information-theory>
- Recently submitted research paper on information theory: <http://arxiv.org/list/math.IT/recent>
- Information theory society: <http://www.itsoc.org/>