

Course and Faculty Information

Instructor: Oliver Kosut

Contact Info: email: okosut@asu.edu office: GWC 454

Lectures: Monday, Wednesday 1:30–2:45pm, WXLRA 203

Zoom room: <https://asu.zoom.us/j/4696272801> (simulcast lecture and office hours)

Office Hours: On Zoom, Monday 4pm–5pm, Tuesday 3pm–4pm, Wednesday 11am–12pm

Prerequisites: Random signal theory (EEE 554 or equivalent).

Textbook: T. M. Cover and J. A. Thomas, *Elements of Information Theory*, 2nd Ed, Wiley, 2006.

Course Overview: Information theory is concerned with the fundamental limits of communication systems. This course covers basic information theory include source coding (fundamental limits of data compression) and channel coding (fundamental limits of reliable transmission over noisy channels). Along the way, basic information quantities will be introduced, such as entropy, mutual information, and relative entropy. In addition to classical information theory concepts, the course will cover some more recent innovations, including polar codes and connections to machine learning.

Course Topics:

- Entropy, relative entropy, and mutual information (Chapter 2)
- Asymptotic equipartition property (Chapter 3)
- Data Compression / Source coding (Chapter 5)
- Channel capacity (Chapter 7)
- Differential entropy (Chapter 8)
- Gaussian channels (Chapter 9)
- Rate distortion theory (Chapter 10)
- As time permits:
 - Applications to machine learning
 - Network information theory: multiple-access channel, broadcast channel, distributed source coding, or as time permits (Chapter 15)

Assignments and Evaluation

Homework: There will be a homework assignment due roughly every other week.

Midterm Exam: In class, Wednesday September 29, Wednesday November 3

Final Exam: Friday, December 10, 2:30–4:20pm

Grading:	Homework	25%
	Midterm Exam	35% each
	Final Exam	40%

Letter grade policy: Final letter grades are determined from the numerical grade calculated from the above percentages. The thresholds for A/B/C/etc. are set by (i) instructor's judgement of how much you should know, and (ii) the distribution of the class.

Submitting Assignments

All assignments, unless otherwise announced, must be submitted to the designated area of Canvas. Do not submit an assignment via email.

Face Coverings

In accordance with ASU policy, face covers are required in locations where physical distancing is not possible, including classrooms. Class policy may change if ASU guidelines change over the course of the semester. More details on ASU's face covering policy is available [here](#).

Remote/Asynchronous Attendance

The primary mode of class activity is in-person, and so students are expected to attend class when possible. However, if you are sick, feeling ill, or have had a possible exposure to infectious disease, **DO NOT COME TO CLASS!** To participate remotely, join the zoom call at <https://asu.zoom.us/j/4696272801>. Recordings of all class sessions will also be posted in Canvas for all students to access, in case of a missed class.

Even in the case of an exam, if you are feeling ill, stay home. Email the instructor as soon as possible to arrange a make-up exam.

Late or Missed Assignments

Notify the instructor *before* an assignment is due if an urgent situation arises and you are unable to submit the assignment on time. Assignments submitted after the due date will be penalized 25% per day, unless prior arrangements have been made.

Late assignments will be allowed without penalty to the grade in the case of (1) a [university-sanction event](#), (2) [religious holidays](#), (3) [work performed in the line-of-duty](#), and (4) illness, quarantine, or self-isolation related to illness as documented by a health professional.

Canvas

Canvas can be accessed at <http://canvas.asu.edu>. Canvas will be used for most course functions, including:

- Course announcements
- Retrieving and submitting assignments
- Viewing grades

Slack

A Slack workspace for this class can be accessed by going to <http://asu.enterprise.slack.com>, and searching for the workspace "EEE 551: Information Theory (2022 Spring) 20447". Slack will be used for questions/answer/discussions about homework and other course-related topics. Students are encouraged to ask questions regarding course content or assignments on slack, rather than emailing the instructor. The instructor will monitor the slack regularly to answer questions, but students are also encouraged to answer each other's questions and discuss the course materials.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the syllabus but the possibility exists that unforeseen events will make changes necessary. Remember to check canvas often.

Academic Integrity

Academic honesty is expected of all students in all examinations, papers, and laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure

(indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see <http://provost.asu.edu/academicintegrity>

Student Accessibility

Students who need disability accommodations in this class but have not registered with Student Accessibility and Inclusive Learning Services (SAILS) should contact SAILS immediately. Information and instructions for requesting an accommodation are available at <https://eoss.asu.edu/accessibility>.

Policy Against Threatening Behavior

All incidents and allegations of violent or threatening conduct by an ASU student (whether on-or off campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances. For more information please visit <https://eoss.asu.edu/dos/srr/PoliciesAndProcedures> and <https://eoss.asu.edu/dos/safety/ThreateningBehavior>.

Reporting Title IX Violations

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

Policy on Sexual Discrimination

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits [discrimination](#), [harassment](#), and [retaliation](#) by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish discuss any concerns confidentially and privately.

Copyrighted Materials

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.