



Course EESC6341 Information Theory
Professor Aria Nosratinia
Term Fall 2020
Meetings Mon-Wed 1:00-2:15pm

Professor's Contact Information

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Office Hours By email appointment
Other Information I don't read WebCT mail

General Course Information

Pre-requisites, Co-requisites, & other restrictions Calculus, undergraduate probability

Information theory has been responsible for the key ideas behind cell phones, music CD's, portable music players like ipod, HDTV cable and satellite television, as well as high-capacity hard disks on computers and laptops. The data compression, communication, and storage that is key to the operation of all these devices started from ideas developed in information theory.

Course Description This course is designed for the beginning graduate student in the areas of communications or signal processing. It illuminates the underlying phenomena for many of the topics visited in other courses, and prepares the student for high-quality research. The background needed for this course is basic calculus and undergraduate-level probability theory.

Learning Outcomes

1. Ability to work with entropy, mutual information, and related concepts
2. Ability to work with typicality and AEP
4. Ability to calculate channel capacity
5. Ability to work with MAC, broadcast, and relay channels

Required Texts & Materials Cover and Thomas, "Elements of Information Theory, 2nd edition" John Wiley

Suggested Texts, Readings, & Materials El Gamal and Kim, "Network information theory," Cambridge
Csiszar and Korner, "Information Theory," Cambridge

Assignments & Academic Calendar

[Topics, Reading Assignments, Due Dates, Exam Dates]

Week 1	Background and review, entropy and mutual information
Week 2	Information Inequalities, typicality and AEP
Week 3	Entropy rate, Markov processes, Shannon's 1 st theorem (compression)
Week 4	Intro to channel capacity, capacity calculation
Week 5	Channel capacity theorem, feedback, source-channel separation
Week 6	Differential entropy, Gaussian channel capacity, converse
Week 7	Parallel channel, colored channel, feedback
Week 8	Wireless information theory, MISO/SIMO, freq. selective, OFDM, fading/outage
Week 9	Fast/slow fading, channel-state information, high/low SNR approximation
Week 10	Multi-antenna channels
Week 11	Network info theory preview, multivariate AEP, error theorems
Week 12	MAC capacity and converse, Gaussian MAC
Week 13	Slepian-Wolf coding, The broadcast channel
Week 14	The interference channel and relay channel
Week 15	Project Presentations

Insert Exam Date(s), Time(s) Two midterms, dates TBA

Course Policies

Instruction Mode	Remote/Virtual. Also see: https://www.utdallas.edu/fall-2020/fall-2020-registration-information/
Course Platform	Lectures on Microsoft Teams, all other materials on elearning
Grading (credit) Criteria	Midterm(s) 20%+20%, Course project 40%, Homework & Quizzes 10%, Class participation 10% <i>except for asynchronous students, see below.</i>
Asynchronous Learning Option	<p>UTD policies allow for a fully asynchronous learning as an option for this course. Students wishing to exercise this option must inform the instructor via email no later than the end of the first week of instruction and obtain an email replay from the instructor showing the receipt of their request. Students must retain this email receipt for future reference.</p> <p>Students exercising this option do not need to attend the lectures and also will have a window for delivering a homework/quiz, as well as for completing any exams.</p> <p>The 10% class participation credit is not meaningful for asynchronous students, so their grading is according to the following formula: Midterms 45%, course project 45%, HW and Quizzes, 10%.</p> <p>Furthermore, for asynchronous students, separate open-book exams will be administered which (by necessity) may have a very different flavor and composition compared with the timed exam administered to the other students. The window for each asynchronous exam will close BEFORE the corresponding timed exam.</p> <p>https://www.utdallas.edu/fall-2020/asynchronous-access-for-fall-2020/</p>
Make-up Exams	No makeup exams will be given. The credit for any missed exams (only with officially acceptable documentation) will roll over to the next exam or final project.
Extra Credit	N/A
Late Work	Assignments are expected to be returned on time.
Special Assignments	N/A
Class Attendance	Reflected in class participation credit (see above)
Classroom Citizenship	Reflected in class participation credit (see above)

The following material reflect UTD-wide policies and are not specific to our course, but we follow them meticulously.

COVID-19 Guidelines and Resources

The information contained in the following link lists the University's COVID-19 resources for students and instructors of record.

Please see <http://go.utdallas.edu/syllabus-policies>.

Class Participation

Regular class participation is expected regardless of course modality. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student Accessibility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

The instructor may record meetings of this course. Any recordings will be available to all students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student Accessibility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Materials

The Instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to

other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Technical Requirements

In addition to a confident level of computer and Internet literacy, certain minimum technical requirements must be met to enable a successful learning experience. Please review the important technical requirements on the Getting Started with eLearning webpage.

Course Access and Navigation

This course can be accessed using your UT Dallas NetID account on the eLearning website.

Please see the course access and navigation section of the Getting Started with eLearning webpage for more information.

To become familiar with the eLearning tool, please see the Student eLearning Tutorials webpage.

UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The eLearning Support Center includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.

Communication

This course utilizes online tools for interaction and communication. Some external communication tools such as regular email and a web conferencing tool may also be used during the semester. For more details, please visit the Student eLearning Tutorials webpage for video demonstrations on eLearning tools.

Student emails and discussion board messages will be answered within 3 working days under normal circumstances.

Distance Learning Student Resources

Online students have access to resources including the McDermott Library, Academic Advising, The Office of Student AccessAbility, and many others. Please see the eLearning Current Students webpage for more information.

Server Unavailability or Other Technical Difficulties

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online eLearning Help Desk. The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students.

Please go to [Academic Support Resources](#) webpage for these policies.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to [UT Dallas Syllabus Policies](#) webpage for these policies.

These descriptions and timelines are subject to change at the discretion of the Professor.