



ECE 303 – INTRODUCTION TO COMMUNICATIONS PRINCIPLES: PROBABILITY THEORY

INSTRUCTOR INFORMATION

Instructor: Diego Krapf

Email: diego.krapf@colostate.edu

Phone: 970-491-4255

Communication Policy: Responses to emails will be provided within 36 hours. Office hours will be held once a week via Zoom. Additional Zoom meeting times can be scheduled with the instructor as needed.

Teaching Assistant: Prajay Vora

Email: prajay.vora@colostate.edu

COURSE MEETING TIMES

Lectures will be posted on Canvas and students can watch them asynchronously.

Office hours with Prof. Krapf: Tuesdays, 4:00 pm via Zoom

Recitation with the Teaching Assistant: Thursdays, 4:00 – 5:00 pm via Zoom

PREREQUISITES FOR COURSE

MATH 340 (concurrent). Students should be familiar with multivariate calculus and would benefit from previous basic programming experience.

COURSE DESCRIPTION & OBJECTIVES

The purpose of the course is to gain a solid foundation in probability, which is required for many areas of study. Throughout the course, the concepts of probability, statistics, and random processes are described with an emphasis on electrical engineering applications.

Upon the completion of this course, students will be able to:

1. Conduct analyses using basic concepts of probability theory
2. Describe independence and conditional probability
3. Apply Bayes rule
4. Compute PMF, PDF, CDF and moments of random variables
5. Write joint PMF, PDF and CDF of multiple random variables
6. Compute PDF of functions of random variables



7. Compute moments of random variables
8. Explain Bernoulli, binomial, geometric, Poisson, exponential, and normal distributions
9. Apply transform methods to sums of independent random variables
10. Compute error probability for binary communications
11. Simulate samples and construct histograms
12. Use the central limit theorem
13. Describe Poisson process
14. Identify properties of white noise

The topics covered in the course are applicable in the following areas

- Biomedical Engineering
- Communication Systems
- Controls and Robotics
- Electronics and Solid-State Engineering
- Finance
- Lasers and Optics
- Physical Sciences
- Reliability and Operations Research
- Signal and Image Processing

TEXTBOOK / COURSE READINGS

Roy D. Yates and David G. Goodman, *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, 3rd Edition, Wiley 2014

Occasional handouts will also be provided by the instructor.

If you would like additional resources, here is a suggested textbook (not required): O. C. Ibe, *Fundamentals of Applied Probability and Random Processes*, 2nd Ed., Academic Press 2014

COURSE MATERIALS & EQUIPMENT

An education MATLAB license will be provided by CSU. Additional practice problems will be provided by the instructor. Sample exams will also be provided to help prepare for the exams.

Assignments, handouts, and grades will be posted on Canvas. Check this site regularly.



PARTICIPATION/BEHAVIORAL EXPECTATIONS

For successful completion of the course, it is expected that students spend on average 3 hours/week watching recorded lectures, 9 hours/week solving assignments, 4 hours/week reading the textbook or handouts, and 1 hour/week solving additional problems.

Please review the [core rules of netiquette](#) for some guidelines and expectations on how to behave in an online learning environment.

COURSE POLICIES

MATH FOUNDATION

Math foundation extra credit consists of two components: attending lectures and solving problems sets. The Math Foundation course is intended to prepare students for completing the mathematical procedures required in ECE problems

1% bonus extra credit for any student who attends at least seven math foundation lectures.

1% bonus extra credit for any student who receives an average grade of 85% or more on math foundation problem sets.

Here you can find the [syllabus for the Math Foundation](#).

Math foundation TA: Maxine Xiu, maxine.xiu@colostate.edu

KNOWLEDGE INTEGRATION (KI)

There will be two KI modules done in combination with ECE 202. KI grade consists of two components: pre-work and video presentation. Video presentations are peer-assessed. During the KI students must attend the ECE 202 lecture.

Pre-work is due a few days after the video review and will consist of a set of problems that students need to solve and will help them prepare for the project portion of the KI. These problems will be graded by the TA. Each KI will contain a Social Responsibility module designed to teach students about ethical questions in engineering. The Social Responsibility modules will include an article and a few questions. Students should answer the questions accordingly.

KI TA: Michael Greer, m.r.Greer@colostate.edu

ASSIGNMENTS

Each assignment will be due at midnight, a week from the posting date. Assignments are submitted in Canvas as a PDF file. Only your best 10 out of 12 assignments will count toward the final grade. Homework turned in after the due date requires prior approval from the instructor. The first week of class you will be given an additional assignment before the first traditional homework is posted. This additional assignment consists of reading the syllabus and posting an introduction of yourself to your classmates. This assignment is not part of the 12 assignments mentioned above and has 50% the weight of the other assignments.

Assignment guidelines:

1. On the first page in the upper right-hand corner, write your first and last name, homework number, and course number.
2. Your solutions to the problems must be in the correct order.
3. Solutions can be hand-written or typed. Answers should be boxed or highlighted. There should be a logical flow to your homework. Solutions must be clear, and you must include how you reach your results. Writing only the final solution is not acceptable.
4. Use a computer or a ruler when making drawings.
5. All supporting material to solve a problem such as MATLAB codes should be submitted with the homework.
6. Please be neat and write legibly. If the grader can't read it, we will have to assume it is incorrect.
7. Written solutions may be scanned into the computer and submitted as a pdf. Make sure document is readable before submitting. Adobe Scan is a free app that can be used to make a pdf from your smart phone.
8. Students **may not use** a solutions manual or copy any part of an assignment from another student, including those from previous years.

TEAM QUIZZES

All students in the course will sign up into teams of three or four students. To join a group (or see your group afterwards), click the People link in Canvas (on the left), then click the Team Quiz Groups tab, open the groups and you can join your group of choice. For additional information on groups, see [How do I join a group as a student?](#)

You will receive quizzes consisting of specific small problems to solve during a period of 72 hours. A single answer is submitted per team and one person within the team will be designated to submit the quiz. The quizzes carry a weight of 10% in your grade. Only your best 10 quizzes count

toward the final grade. Each problem will be specific to one concept taught. Submissions must consist of a single pdf file that includes, in the top, the names of all the members of the team. Along with the submission, *each team needs to state how they communicated with their peers* to solve the problem as a team, including the platform used and the time spent during these communications. Examples of possible communication platforms include (but are not limited to these ones):

- Zoom
- Microsoft Teams
- Face-to-face meetings
- Group discussions in Canvas

Include available documentation of the meeting (screen shot of Zoom meeting, picture of the meeting in person, available written communication, etc.). The same team will be maintained for five weeks and then you will be given the opportunity to sign up for a new team. No make-up quizzes are offered. It is your responsibility to be part of a team in order to be able to submit quizzes.

EXAMS

There will be six short midterms and one final exams. Each midterm is specific to a Learning Studio Module (LSM). Demonstrating **competency in each Learning Studio Module (LSM)** of the course is required. Competency is assessed through the midterm exams. Students who do not demonstrate competency in an LSM will be notified after the corresponding exam and will be given the opportunity to gain competency by completing remedial course-related work, assigned by the instructor. Completing the remedial work in a satisfactory fashion establishes the student's competency in the corresponding LSM, but does not affect the student's grade. However, if the remedial work is not completed in a satisfactory fashion the student will automatically receive the grade F in the course.

Exams are closed book, but you can prepare one hand-written sheet of notes (front and back). You should take to the exams a calculator, and your handwritten note sheet. The use of cell phones is not allowed.

Honorlock will proctor your exams this semester. Honorlock is an online proctoring service that allows you to take your exam from the comfort of your home. You **DO NOT** need to create an

account, download software or schedule an appointment in advance. Honorlock is available 24/7. To use Honorlock you will need a computer, a working webcam, and a stable Internet connection.

To get started, you will need Google Chrome and to download the Honorlock Chrome Extension. You can download the extension at www.honorlock.com/extension/install.

When you are ready to test, log into the LMS, go to your course, and click on your exam. Clicking **Launch Proctoring** will begin the Honorlock authentication process, where you will take a picture of yourself, show your ID, and complete a scan of your room. Honorlock will be recording your exam session by webcam as well as recording your screen.

Good luck! Honorlock support is available 24/7/365. If you encounter any issues, you may contact us by live chat, phone (**844-243-2500**), and/or email (support@honorlock.com).

If you encounter issues within the LMS, you may contact [Colorado State University Testing Center](#) at 970-491-5060.

GRADING POLICY

CSU does not use grades of C-, D+, or D-.

Grade	Range
A+	100% to 97%
A	<97% to 93%
A-	<93% to 90%
B+	<90% to 87%
B	<87% to 83%
B-	<83% to 80%
C+	<80% to 76%
C	<76% to 65%
D	<65% to 55%
F	<55% to 0.0%

As a student enrolled in this course, one of your responsibilities is to submit course work by the due dates listed in Canvas. With that said, I take my role as your instructor very seriously, and, in fact, I care about how well you do in this course and that you have a satisfying, rewarding experience.

To that end, it is my commitment to you to respond individually to the work you submit in this class and to return your work in a timely manner. Weekly assignments will be returned within 7 days and exams will be returned within 10 days.

ASSIGNMENT	GRADE PERCENTAGE
Written assignments	20 %
Team quizzes	8 %
Midterms (6)	48 % (each midterm 8 %)
KI	5 %
Math Foundation	2 %
Final Exam	19 %
Total:	102 %

*Keep a copy of all work created for the course, including work submitted through Canvas course learning management system.

CANVAS INFORMATION, TECHNICAL SUPPORT, & MATLAB ACCESS

Canvas is the where course content, grades, and communication will reside for this course.

- Login: canvas.colostate.edu
- Support: info.canvas.colostate.edu
- For passwords or any other computer-related technical support, contact the [Central IT Technical Support Help Desk](#).
 - (970) 491-7276
 - help@colostate.edu

The [Technical Requirements](#) page identifies the browsers, operating systems, and plugins that work best with Canvas. If you are new to Canvas quickly review [the Canvas Student Orientation](#) materials.

You can access Matlab on your home computer by going to this link:

<https://www.engr.colostate.edu/ets/matlab/> . This is probably the easiest option. If you prefer, you can alternatively access the Engineering Virtual Classroom by going to this link:

<https://www.engr.colostate.edu/ets/virtual-classroom/> where Matlab is already installed

ACADEMIC INTEGRITY & CSU HONOR PLEDGE

This course will adhere to the CSU [Academic Integrity/Misconduct](#) policy as found in the General Catalog and the [Student Conduct Code](#).

Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course.

Further information about Academic Integrity is available at CSU's [Academic Integrity - Student Resources](#).

UNIVERSAL DESIGN FOR LEARNING/ACCOMMODATION OF NEEDS

I am committed to the principle of universal learning. This means that our classroom, our virtual spaces, our practices, and our interactions be as inclusive as possible. Mutual respect, civility, and the ability to listen and observe others carefully are crucial to universal learning.

If you are a student who will need accommodations in this class, please contact me to discuss your individual needs. Any accommodation must be discussed in a timely manner. A verifying

memo from [The Student Disability Center](#) may be required before any accommodation is provided.

The Student Disability Center (SDC) has the authority to verify and confirm the eligibility of students with disabilities for the majority of accommodations. While some accommodations may be provided by other departments, a student is not automatically eligible for those accommodations unless their disability can be verified and the need for the accommodation confirmed, either through SDC or through acceptable means defined by the particular department. Faculty and staff may consult with the SDC staff whenever there is doubt as to the appropriateness of an accommodative request by a student with a disability.

The goal of SDC is to normalize disability as part of the culture of diversity at Colorado State University. The characteristic of having a disability simply provides the basis of the support that is available to students. The goal is to ensure students with disabilities have the opportunity to be as successful as they have the capability to be.

Support and services are offered to student with functional limitations due to visual, hearing, learning, or mobility disabilities as well as to students who have specific physical or mental health conditions due to epilepsy, diabetes, asthma, AIDS, psychiatric diagnoses, etc. Students who are temporarily disabled are also eligible for support and assistance.

Any student who is enrolled at CSU, and who self-identifies with SDC as having a disability, is eligible for support from SDC. Specific accommodations are determined individually for each student and must be supported by appropriate documentation and/or evaluation of needs consistent with a particular type of disability. SDC reserves the right to ask for any appropriate documentation of disability in order to determine a student's eligibility for accommodations as well as in support for specific accommodative requests. The accommodative process begins once a student meets with an accommodations specialist in the SDC.

THIRD-PARTY TOOLS/PRIVACY

Please note that this course may require you to use third-party tools (tools outside of the Canvas learning management system), such as Skype and others. Some of these tools may collect and share information about their users. Because your privacy is important, you are encouraged to consult the privacy policies for any third-party tools in this course so that you are aware of how your personal information is collected, used and shared.

COPYRIGHTED COURSE MATERIALS

Please do not share material from this course in online, print, or other media. Course material is the property of the instructor who developed the course. Materials authored by third parties and used in the course are also subject to copyright protections. Posting course materials on external sites (commercial or not) violates both copyright law and the CSU Student Conduct Code. Students who share course content without the instructor's express permission, including with online sites that post materials to sell to other students, could face appropriate disciplinary or legal action.

UNDOCUMENTED STUDENT SUPPORT

Any CSU student who faces challenges or hardships due to their legal status in the United States and believes that it may impact their academic performance in this course is encouraged to visit [Student Support Services for Undocumented, DACA & ASSET](#) for resources and support. Additionally, only if you feel comfortable, please notify your professor so they may pass along any additional resources they may possess.

TITLE IX/INTERPERSONAL VIOLENCE

For the full statement regarding role and responsibilities about reporting harassment, sexual harassment, sexual misconduct, domestic violence, dating violence, stalking, and the retaliation policy please go to: [Title IX – Sexual Assault, Sexual Violence, Sexual Harassment](#).

If you feel that your rights have been compromised at CSU, several resources are available to assist:

- Student Resolution Center, 200 Lory Student Center, 491-7165
- Office of Equal Opportunity, 101 Student Services, 491-5836

A note about interpersonal violence: If you or someone you know has experienced sexual assault, relationship violence and/or stalking, know that you are not alone. As instructors, we are required by law to notify university officials about disclosures related to interpersonal violence. Confidential victim advocates are available 24 hours a day, 365 days a year to provide support related to the emotional, physical, physiological and legal aftermath of interpersonal violence. Contact the Victim Assistance Team at: 970-492-4242.



RELIGIOUS OBSERVANCES

CSU does not discriminate on the basis of religion. Reasonable accommodation should be made to allow individuals to observe their established religious holidays. Students seeking an exemption from attending class or completing assigned course work for a religious holiday will need to fill out the [Religious Accommodation Request Form](#) and turn it in to the Division of Student Affairs, located on the second level of the Administration building.

Once turned in, the Division of Student Affairs will review the request and contact the student accordingly. If approved, the student will receive a memo from the Dean of Students to give to their professor or course instructor.

Students are asked to turn in the request forms as soon as the conflict is noticed. Similarly, unanticipated conflicts requiring a religious observance, such as a death in the family, can also be reviewed.

CSU PRINCIPLES OF COMMUNITY

Inclusion: We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents and contributions.

Integrity: We are accountable for our actions and will act ethically and honestly in all our interactions.

Respect: We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

Service: We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

Social Justice: We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.

DIVERSITY AND INCLUSION

The [Mission, Vision, and Focus](#) webpage of the Vice President for Diversity includes a comprehensive statement of CSU's commitment to diversity and inclusion.