

## MTH 421-01

Probability Theory, Elmhurst University  
1:00–2:40 Tu Th, Koplín Hall 010, Fall 2025

**Course Description:** Combinatorics, introduction to probability from a set-theoretic point of view, functions of random variables, expected value, generating functions, jointly distributed random variables and the Central Limit Theorem. Corequisite: MTH 251 Calculus III. Prerequisite: MTH 301 Discrete Mathematics or consent of instructor. Course credit: 1.0. One course credit (1.0) at Elmhurst University is equal to four (4.0) semester hours.

**Professor:** Dr. A. Rogers, he/him, Daniels Hall 218, [allenr@elmhurst.edu](mailto:allenr@elmhurst.edu)

**Office Hours:** Online or in person, send email to make appointment

**Text:** Hogg, Tanis, and Zimmerman, Probability and Statistical Inference, 10th ed., ISBN 9780135189399

**Calculators:** The following are approved for actuarial exams (*current models are in italics*).

Financial calculators: BA-35, *BAll Plus*, *BAll Plus Professional*.

Scientific calculators: *TI-30Xa*, *TI-30X IIS*, TI-30X IIB, *TI-30XS MultiView*, TI-30XB MultiView.

If you plan to take Exam P, then I recommend you obtain an approved scientific calculator and use it all the time (**TI-30XS MultiView** if you're buying a new one). You may bring more than one approved calculator to actuarial exams.

If you know you won't take Exam P, then any TI-83/84 will be OK (not approved for actuarial exams).

For exams in this class, you may not use a calculator with CAS (e.g., no TI-89, no TI-Nspire CAS).

**Using Your Laptop in Class:** In class, but not on exams, use whatever technology helps you learn.

**Delivery Mode:** Our class meets in person every day. I'll email you if there's a change: for example, if we meet remotely because of snow. The delivery mode of this course is subject to change based on county, state or federal guidelines, local conditions, or unforeseen circumstances.

**Names and Pronouns:** Feel free to tell me the name you use, including pronunciation, and the pronouns you use. Please correct me if I make a mistake. You can change your first name in Blackboard; this only changes how it displays in Blackboard. Contact the Office of Registration and Records to change your name with the University.

**Grading:** Letter grades are computed from six components, weighted as follows:

Presentations/Seminar/Practice Exam P	20%
Exam 1 (Thu, Sep 18)	20%
Exam 2 (Thu, Oct 16)	20%
Exam 3 (Thu, Nov 13)	20%
Final Exam (Tue, Dec 9, 1:00–3:00)	20%
(the final only covers the last few weeks)	
Total	100%

**Grading Scale:** A [92,  $\infty$ ), A- [90,92), B+ [88,90), B [82,88), B- [80,82), C+ [78,80), C [72,78), C- [70,72), D+ [68,70), D [60,68), F ( $-\infty$ , 60)

**Presentations:** Four oral homework problem presentations will be required. The presentation is a step-by-step explanation of how to do a homework problem. You choose the day, following this schedule.

<u>Presentation #</u>	<u>Give it on a class day, not an exam day</u>
1	before Exam 1
2	between Exam 1 and Exam 2
3	between Exam 2 and Exam 3
4	between Exam 3 and the Final

On the day you're giving a presentation, you choose a problem from the current homework assignment, and prepare in advance your presentation to give during class.

If you don't give your presentation during the time frame shown in the above table, no credit. The available time period is very lenient to accommodate any issues that may arise, including excused absences. Don't put off doing your presentation.

**Seminar:** Once the math seminars begin, they are usually on Wednesdays from 4 to 5. Some may be in person and some may be remote. You are required to attend one of the math seminars, write a one or two page summary paper for the seminar you attend, and submit your paper on Blackboard. The paper is worth the same as two presentations and is due Dec 9.

**Practice Exam P:** Sometime in December, before the fall term is over, you have take a practice Exam P. This is required even if you don't plan to take a real Exam P. I'll construct it and give it to you at a time to be determined. It's worth two presentations—full credit for taking it, no matter how many questions you answer correctly.

**Exams and Final Exam:** If you miss an exam, you need a good reason for me to excuse you and allow a makeup. You must notify me by email as soon as possible, and in advance when possible. For the exams, you have to be here in person.

**Student Learning Outcomes:**

- Understand the concepts of sample space, events, and probability set function;
- Compute probabilities and conditional probabilities of events;
- Use Bayes' Theorem to calculate conditional probabilities;
- Understand concepts of discrete and continuous random variables;
- Use common discrete and continuous probability distributions to solve applied problems;
- Calculate expected value, variance, and moment-generating functions of random variables;
- Calculate quantities associated with multivariate random variables, including the bivariate normal;
- Find distributions of functions of random variables using techniques such as transformations, moment-generating functions, and the Central Limit Theorem;
- Solve theoretical problems that are stated using the terminology and notation of abstract elementary probability theory;
- Write proofs of statements in elementary probability theory.

**Outline of Course Topics:**

- Ch 1: Probability
- Ch 2: Discrete Distributions
- Ch 3: Continuous Distributions
- Ch 4: Bivariate Distributions
- Ch 5: Distributions of Functions of Random Variables (Ch 5 is continued in MTH 422)

**Tentative Class Schedule:** (subject to change)

Aug 26	Ch 1	Aug 28	Ch 1
Sep 2	Ch 1	Sep 4	Ch 1
Sep 9	Ch 2	Sep 11	Ch 2
Sep 16	Review	Sep 18	Exam 1
Sep 23	Ch 2	Sep 25	Ch 2
Oct 30	Ch 3	Oct 2	Ch 3
Oct 7	Ch 3	Oct 9	Ch 4
Oct 14	Review	Oct 16	Exam 2
Oct 21	Ch 4	Oct 23	Ch 4
Oct 28	Ch 4	Oct 30	Ch 4
Nov 4	No Class	Nov 6	Ch 4
Nov 11	Review	Nov 13	Exam 3
Nov 18	Ch 5	Nov 20	Ch 5
Nov 25	Ch 5	Nov 27	No class
Dec 2	Ch 5	Dec 4	Review
Dec 9	Final 1:00–3:00		

**Different Instructors Have Different Policies:** Among your different classes, there will be different policies about homework resources, authorized materials, absences, due dates, emails, and so on. It is important to reexamine the syllabus for each class from time to time, to remind yourself requirements and expectations.

**Changes:** This syllabus is subject to reasonable change. I'll communicate any changes as soon as possible by email.

**Additional Academic Integrity Information for This Course:** You may use any resources for homework. Other courses may be different. Master the material so that you can do the problems alone.

On tests, however, intentionally obtaining or attempting to use unauthorized materials or information or unauthorized help from another person is considered cheating. The following comments are illustrative but not exhaustive.

Tests test how well the student has learned. Therefore, unless the professor specifies otherwise, all examinations are to be completed by the student alone, without extraneous assistance of any kind. That means no help is to be given to or received from other persons during the test; no books, notes, calculators, or other materials of any kind are to be consulted; and if a calculator or other hand-held electronic device is permitted to be used for mathematical calculations, no other information may be programmed into or retrieved from the device. Whenever the professor permits an exception to any part of these rules, the exception applies only as far as specified by the professor. Such exceptions must be expressly permitted and cannot be presumed from prior exceptions on other tests. (From *A Student's Guide to Academic Integrity at the University of Oklahoma*, Office of the Senior Vice President and Provost, University of Oklahoma, Norman Campus, <http://web.archive.org/web/20060824175857/http://www.ou.edu/provost/integrity/>, accessed August 23, 2006.)

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**Learning Center: Academic Support:** The Learning Center is the place to go for convenient, free access to academic support for all Elmhurst University students. We offer in-person and online peer tutoring, “after hours” and drop-in tutoring, study groups, academic workshops, and academic coaching on topics such as study strategies and time management. We can work with you to understand your assignment, get organized, explore your options, and use metacognitive, or self-reflective, strategies to grow and learn. It’s never too early to come work with a tutor! We have peer tutors in various disciplines, including math and writing, who can meet with you at any step in your learning process. To find out more, go to [elmhurst.edu/LC](http://elmhurst.edu/LC).

To sign up for tutoring, study groups, and academic workshops, go to My Tutoring, located on the portal. Contact Molly Rentscher, Director of the Learning Center, at [molly.rentsch@elmhurst.edu](mailto:molly.rentsch@elmhurst.edu), for more information.

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**Student Accessibility Services:** Elmhurst University is committed to creating an inclusive learning environment for its diverse student population. If you experience or anticipate any barriers to learning, please notify the instructor as soon as possible. If you are a student with a documented disability and would like accommodations to participate fully in your classes, contact Dr. Linda Harrell, SAS Director, at [accessibility.services@elmhurst.edu](mailto:accessibility.services@elmhurst.edu). For more information, visit [elmhurst.edu/SAS](http://elmhurst.edu/SAS). If you have previously received accommodations, please remember that they must be renewed each term.

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**Code of Academic Integrity:** Elmhurst University is a community of scholars. Such a community places the highest value on academic honesty and integrity. Therefore, Elmhurst University’s Code of Academic Integrity is designed to ensure:

1. A fair academic environment where students are evaluated on the scholarly merits of their work.
2. An academic environment where personal integrity is fostered.
3. An understanding of standard academic practices when formulating ideas, conducting research, and documenting sources.

There are general campus-wide definitions of academic honesty as well as departmental guidelines, which are articulated in individual course syllabi. Students are responsible for educating themselves on this matter since sanctions for academic dishonesty may be severe. Thus, Elmhurst University students are expected to act honestly in all academic work.

The entire Code of Academic Integrity may be found in the Student Handbook available on the Student Life section [elmhurst.edu/student-life](http://elmhurst.edu/student-life) of the University website.

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**Elmhurst University Civility Statement:** The Elmhurst University Civility Statement has been endorsed by many major bodies on campus (Faculty Council, Academic Council, President’s Cabinet, PACoDEI, Student Affairs Council).

In the spirit of our mission, vision, and core values, the Elmhurst University community aspires to create and maintain an environment of respect, integrity, courtesy, inclusivity, and human decency. This invites rigorous and respectful debate in which individuals are encouraged to participate in honest and open civil discourse. Honoring a tradition of social justice, Elmhurst University fosters a diverse, positive, and inclusive culture where members change and grow as they encounter new people and ideas.

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**Artificial Intelligence Tools:** The use of generative AI tools (e.g., ChatGPT) is permitted for the following activities:

- Brainstorming ideas, topics, and searching terms,
- Drafting outlines to organize your thoughts, and
- Checking grammar and APA style.

The use of generative AI tools is *not* permitted in this course for the following activities:

- Submitting any work for points, including quizzes, preparation assignments, drafts, and final assignments.
- Impersonating yourself in course communications (e.g., email) or online posts and peer feedback.
- Writing partial or entire sentences, paragraphs, or papers to complete assignments.

You are responsible for the information based on an AI query (e.g., if it violates intellectual property laws, contains misinformation, or unethical content). If you have questions about permitted use, ask the professor for clarification.

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**Non-Discrimination and Non-Harassment Policy:** The University's Non-Discrimination and Non-Harassment Policy may be found on the University website. [elmhurst.edu/TitleIX](https://www.elmhurst.edu/TitleIX)

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**Community Standards:** The Community Standards may be found in the Elmhurst University Student Handbook available on the University website. [elmhurst.edu/student-life](https://www.elmhurst.edu/student-life)

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**Support Resources and Supporting Fellow Students in Distress:** As members of the Elmhurst University community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or your own, we encourage you to refer this behavior to the Director of Student Support Services and Intervention in the Office of Student Affairs through the Student of Concern referral form on the University website at <https://www.elmhurst.edu/student-life/support-services/support-services-intervention/>. Based upon your report, staff in the Office of Student Affairs reach out to students to make sure they have the support they need to be healthy and safe.

Additionally, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the Director of Student Support Services and Intervention through [studentaffairs@elmhurst.edu](mailto:studentaffairs@elmhurst.edu) for support and referrals to campus and/or community resources. For any emergencies, call Public Safety at (630) 617-3000 or call 911.

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**Online Communication Guidelines:** To help create a respectful and engaging learning space, please keep the following in mind when interacting online (via discussion boards, email, chat, etc.):

- **Be respectful.** Our course includes people with diverse backgrounds and perspectives—listen generously and respond thoughtfully.
- **Use clear, professional language.** Avoid slang, excessive abbreviations, and all caps (which can seem like shouting).
- **Support your ideas.** Develop your thoughts, evaluate sources for credibility, and cite your sources following any guidelines provided by your instructor,
- **Stay on topic.** Focus on course content and contribute meaningfully to the conversation.
- **Pause before you post.** Review your message before hitting “send”—tone and clarity matter, especially without nonverbal cues.

In the absence of nonverbal communication, misunderstandings are more frequent. If something feels unclear or upsetting, contact your instructor privately rather than escalating in a public forum.

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**Discrimination and Retaliation:** As an employee of Elmhurst University, I am a Mandated Reporter of sexual harassment and retaliation that occurs toward students, faculty or staff. This means that if I receive notice of or specific information about an incident of sexual harassment, sexual assault, dating or domestic violence, stalking, or retaliation, I am obligated to share this with the University's Title IX Coordinator. This report to the Title IX Coordinator will enable the University to take appropriate action to ensure the safety of and to offer appropriate resources to those involved. For students, faculty, or staff not wishing to make an official report, confidential reporting options are available. Please see the University's Title IX webpage [elmhurst.edu/TitleIX](https://www.elmhurst.edu/TitleIX) for more resources or to file a report.

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