

MAT 351: PROBABILITY AND STATISTICS I (Spring 2024)

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COURSE ANNOUNCEMENT

CLASSES: MWF 11:50 - 12:45, at SH 1004.

TEXTBOOK: J. Devore, *Probability and Statistics for Engineering and the Sciences, 9th Ed.*

See back page for covered topics.

PREREQUISITES: MAT 211.

HOMEWORK: Regular homework assignments will be given. About once a week, problems typically chosen from the textbook.

CALCULATOR/SOFTWARE: For certain computations, having the graphing calculator (those that can do some statistics) or a computer software will be useful. In class, we will occasionally use Excel or R.

EXAMS: We plan to have two exams and a final exam. We will fix exact midterm exam dates later. The date for the final exam will be chosen by the University.

GRADING: Total (600) = HW (150) + Exams (2×100) + Participation (100) + Final exam (150)

ACADEMIC INTEGRITY: Academic integrity is the foundation of intellectual inquiry and growth. Demonstrating respect for intellectual work, whether one's own or others', fosters an atmosphere of trust and facilitates the free exchange of ideas, which is essential for learning. All members of the Canisius University community agree to exercise complete honesty in their academic work and accept responsibility for maintaining academic integrity.

Please note that Canisius University has a CODE OF ACADEMIC INTEGRITY, which can be found at <https://catalog.canisius.edu/undergraduate/academics/academic-policies/code-academic-integrity/>

It is expected that the work submitted is the result of your own endeavors. It is very much all right to ask for help in understanding the course material, but you should write up your homework on your own, using your own words.

OVERVIEW: MAT 351 introduces the mathematical aspects of modern probability theory. Topics include: probability axioms and rules, random variables, probability distribution functions, expected value, variance, moment generating functions, sampling distributions and convergence. This is the first part of the calculus-based course on probability and statistics. The sequence continues in MAT 352.

TOPICS: We will mostly follow Chapters 1 – 5 of the textbook ...

- Basic terminologies; Descriptive statistics
- Combinatorial analysis: counting principle, permutations, combinations
- Sample space and events; Axioms of probability; Properties
- Conditional probability; Independence
- Random variables (discrete, continuous)
- Discrete probability distributions: Bernoulli, Binomial, Negative binomial, Hypergeometric, Poisson
- Continuous probability distributions: Uniform, Normal, Exponential, ...
- Joint probability distributions
- Expectation of sums of random variables, Covariance, Variance of sums, Correlation
- Distribution of the sample mean; Central limit theorem
- ...

DEPARTMENTAL GOALS and OBJECTIVES: This class addresses several of the learning goals for the mathematics and statistics majors.

- [Reinforce Goal 4: Objective A: Written communication]

Goal 4: Mathematics majors will communicate mathematical ideas with precision and clarity.

Objective A: Present mathematical material in writing.

Description: The Department expects students to present mathematical knowledge in writing. Students should be able to convey written information clearly and coherently and to develop concepts in an organized and logical manner.

- [Reinforce Goal 4: Objective B: Oral communication]

Objective B: Present mathematical material orally.

Description: The Department expects students to present mathematical knowledge orally. Students should demonstrate that they understand audience and purpose and can frame their presentations to facilitate learning. Students should be able to convey information clearly and coherently and to develop concepts in an organized and logical manner.

- [Reinforce Goal 4: Objective C: Explanation of concepts]

Objective C: Explain mathematical material.

Description: The Department expects students to be able to explain mathematics clearly. Students should demonstrate that they understand audience and purpose and can frame their presentations to

facilitate learning. Students should be able to convey information clearly and coherently and to develop concepts in an organized and logical manner.

- [Emphasize Goal 2: Objective A: Basic skills]

Goal 2: Mathematics majors will know the content of the fundamental fields of mathematics and can perform tasks requiring complex reasoning.

Objective A: Students will use basic skills to manipulate expressions.

Description: The Department expects students to master basic mathematical manipulation techniques. These include substitutions, transformations, functions of functions, limits, and the concepts of the argument of a function and independent versus dependent variables.

- [Emphasize Goal 2: Objective B: Basic knowledge]

Objective B: Students will know the basic definitions and theorems of mathematics.

Description: The Department expects students to know the basic definitions and concepts of the main fields of mathematics. These include functions, relations, derivatives, and integrals. Students are also expected to know basic set theory and logic, through DeMorgan's laws. They should be able to negate a statement and find its converse and contrapositive. Depending on the track the student has chosen, they should also be familiar with the fundamental ideas in abstract algebra, real analysis, and/or probability and statistics.

- [Emphasize Goal 2: Objective C: Complex reasoning]

Objective C: Students will be able to perform tasks requiring complex reasoning.

Description: The Department expects students to be able to follow an argument that makes use of complex reasoning. Students should also be able to devise their own arguments and to carry out multi-step procedures in a precise and logical manner.

- [Emphasize Goal 3: Objective A: Information literacy]

Goal 3: Mathematics majors will advance their understanding and knowledge of mathematics and their ability to convey mathematical concepts through currently available technology.

Objective A: Students will use the internet and/or library resources to obtain relevant information concerning historical information or mathematical content in regards to a current course or project. Students will be expected to both look up sources and learn to search for their own sources.

Description: The department expects students to be able to look up mathematical concepts on the internet or using library sources. As a student gains experience, the burden of where to search will shift to the student. They will be given broad topics and be expected to search for their own sources.

ADDITIONAL INFORMATION:

- Last day to drop/add is 1/22.
- If you have any personal difficulties (illness or any emergency), please let me know so that we can make appropriate arrangements. In addition, in accordance with the University policy, if you have a documented disability and require accommodations to obtain equal access in this course, or any special health or personal circumstances, please contact a relevant university official at the beginning of the semester or when given an assignment for which an accommodation is required. You may also contact the Griff Center (OM 013), at 888-2170.