Catalog Description:
Discrete and continuous probability distributions, random variables, independence, expectation, variance.

Course Learning Outcomes:
By the end of this course, students should be able to:

- Understand the basic concepts in probability and statistics.
- Compute probabilities and statistics of discrete and continuous distributions.
- Comprehend the probabilistic methods needed to analyze and critically evaluate statistical models and arguments.
- Recognize the importance of statistical ideas.

Prerequisite:
C- or better in 2153, 2162.xx, 2173, 2177, 2182H, 4182H; or credit for 254.xx, 263.xx, 263.01H, or 264H.

Exclusions:
Not open to students with credit for any of 530, 5530H (531H), or Stat 4201 or 420.

Follow-up Courses:
Math 3589, Stat 4202.

Text:
Probability, by Pitman, published by Springer, ISBN: 9780387979748

Topics List:

I. Discrete probability.
1. First principles: outcome spaces, basic counting techniques, and partitions.
2. Venn diagrams and the inclusion-exclusion principle.
3. Conditional probability and independence; decision trees and Bayes' Theorem.
4. Discrete random variables; mass and generating functions; joint distributions.
5. Binomial, hypergeometric, geometric, negative binomial, and Poisson variables; applications and relationships.
6. Statistics on discrete variables.

II. Continuous probability
7. First principles: density functions, calculation of probabilities and statistics.
8. Moments and moment-generating functions.
9. Common distributions and their applications; exponential, gamma, uniform, normal.
10. The central limit theorem and normal approximation to the binomial distribution.
11. Relationships between the exponential, gamma, and Poisson distributions.
12. Hazard rates and survival functions.
13. Cumulative distribution functions, percentiles, and change of variables.
14. Joint distribution of continuous variables; independence and marginal distributions; density of a function of two variables

III. Statistics Material (using supplementary materials)
15. Chi-square distribution
16. t distribution
17. F distribution