Mathematics MTH 235
Probability & Statistics for Scientists and Engineers

Credits and contact hours: Credit hours: 3, Contact Hours: 44 (1 contact hour = 50 minutes)

Instructor: Dr. Aaron Montgomery


Specific course information
a. Catalog description: This course is a calculus-based introduction to basic probability and statistics. Major topics include discrete and continuous random variables, probability distributions, and an overview of inferential statistics. Statistical computing will be introduced through the use of the R software package.
b. Prerequisites: MTH-142 Calculus II or its equivalent.
c. Required/Elective:
   i. Computer Science– required
   ii. Software Engineering- required

Specific goals for the course
a. Specific outcomes of instruction
   i. Students will be able to set up random variables (both discrete and continuous) as models for probabilistic phenomena.
   ii. Students will be able to set up and compute integrals to exploit the connection between probability and integration.
   iii. Students will be able to set up and execute computations involving expected values, variances, and functions of random variables.
   iv. Students will be able to write integrals that represent joint probability distributions, particularly in the case where random variables are independent.
   v. Students will be able to use technology to approximate integrals that are difficult or impossible to execute by hand.
   vi. Students will be able to use the R software package to apply confidence intervals and hypothesis testing to answer statistical questions. In particular, students will be able to select the appropriate statistical methods to solve problems.
   vii. Students will be able to use the R software package to perform OLS regression analysis.
   viii. Students will apply statistical methods to some real-world problem of their own choosing from another discipline outside mathematics or statistics.
b. CAC Criterion 3 outcomes addressed by the course:
   a. An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline
i. An ability to use current techniques, skills, and tools necessary for computing practice.

c. EAC Criterion 3 outcomes addressed by the course:
   a. An ability to apply knowledge of mathematics, science, and engineering
   k. An ability to use the techniques, skills, and modern engineering tools
      necessary for engineering practice.

Brief list of topics to be covered
   a. Discrete and continuous random variables
   b. Probability and integration
   c. Expected value
   d. Variance
   e. Functions of random variables
   f. Joint probability distributions
   g. Inferential statistics
   h. Use of technology for computation of integrals
   i. R statistical software