



GOSHEN COLLEGE
MATHEMATICS DEPARTMENT
MATH 323 PROBABILITY & STATISTICS – SPRING 2018

Content	Observations, experiments, and simulations generate data. This course studies techniques for summarizing data with graphs and numbers and how data can be used to infer something about the phenomena from which the data were generated. These techniques depend upon an understanding of the probability of events arising from idealized populations. There will be a balance between how to use the techniques and the theoretical underpinnings of the techniques.
Learning Objectives	<p>The student will</p> <ol style="list-style-type: none">1. Identify and distinguish between population and sample, parameter and statistic, theoretical and empirical, quantitative and qualitative, variable and data, experiment and observation, random and convenience sample, random variable and sample space;2. Estimate, compute, and interpret descriptive statistics (e.g., mean, median, standard deviation, percentiles, correlation, best-fit linear model parameters);3. Construct and interpret graphical summaries of data (e.g., histogram, box plot, scatter plot, quantile-quantile plot);4. Use software for statistical computation and simulation;5. Describe and identify theoretical, empirical, and subjective forms of probability;6. Define and identify independent events and random variables;7. Compute unconditional and conditional probabilities using systematic enumeration, addition and multiplication rules, complements, permutations, combinations, Bayes' Theorem, and simulation;8. Use probability distributions (e.g., uniform, binomial and Poisson) and densities (e.g., uniform, normal, and gamma) to compute probabilities and expected values;9. Compute (via normal and simulation approximation) and interpret confidence intervals for simple parameters (e.g., mean and standard deviation);10. Compute and interpret simple hypotheses tests (e.g., mean, difference in means, and model fit);11. Derive formulas for use in linear best fit, probability distributions, random variable distributions, parametric confidence intervals, test statistic distributions12. Learn mathematics by reading, listening, exploring, and conversing in an effective manner;13. Explain mathematical reasoning through writing in a precise and articulate manner in both informal and formal settings; and14. Exhibit curiosity, playfulness, creativity, confidence, perseverance, interest in multiple perspectives, and a collaborative spirit.
Prerequisites	A grade of C or higher in Math 211 Calculus I and either Math 205 Discrete Mathematics or Math 211 Calculus II..
Activities	<p>The study of mathematics is not a spectator sport! Reading, listening, solving problems, writing explanations, reflecting upon ideas, and receiving feedback are essential to learning mathematics. Read with paper and pencil in hand, and take an anticipatory approach: try to obtain solutions, explanations, and proofs before reading what the author provides. Write down specific questions when you do not understand a portion of the text or a lecture. Try to recreate the key ideas, solve problems, and write proofs without looking at the book or notes.</p> <p>An average student can obtain an average grade with an average of twelve hours each week devoted to this course—adjust if you are not average or desire a grade that is not average.</p>

Instructor	David Housman, SC 117, dhousman@goshen.edu, 535-7405 (office), 612-7185 (cell) See office door or Moodle for availability.
Class Time	TR 9:30-10:45am in SC 006.
Textbook	There is no required text for this course; however, I will often refer to Johannes Ledolter and Robert V. Hogg, <i>Applied Statistics for Engineers and Physical Scientists</i> , 3 rd edition, Pearson Education, 2010, ISBN: 978-0-13-601798-1. A copy of this book and the student solutions manual will be available on the Good Library reserve shelf. I see that an electronic rental is available for \$23.99.
On-line	Moodle https://moodle.goshen.edu contains all course information. Announcements posted to the forum will be emailed to all students.
Software	Wolfram <i>Mathematica</i> and <i>Minitab</i> will be used for computation and is available from any campus networked computer. If desired, you can purchase or rent a student licenses of either.
Notebook	A three-ring binder with loose-leaf lined and graph paper is recommended so that you can keep a written record of problem solving attempts, questions, math discoveries, and skill assessments.
Grading	Grades will depend upon your performance on assignments (60%), one midterm exam (20%), and a final exam (20%). If beneficial, your final exam grade will replace your grade on the midterm exam. In order to receive a passing grade in this course, the weighted average of your exam scores must be 60% or higher—regardless of your non-exam scores. A semester average of at least 90%, 80%, 70%, and 60% will earn a grade of A-, B-, C-, and D, respectively. Some upward adjustment may be made based upon class participation and individual effort and progress.
Extra Credit	Receive extra credit toward your homework grade by doing one or more of the following: (1) find errors in the text or posted course materials and describe the error; (2) attend a quantitative presentation (e.g., Science Speakers) or participate in a quantitatively based activity and describe in writing some interesting mathematical aspect of the presentation or activity; or (3) participate in a Career Networks event and describe your most important discovery. Turn in to the instructor a single piece of paper containing your description.
Tutoring	If you would like to be part of a small study group led by a peer tutor, fill out the request form at http://tiny.cc/GCtutoring or drop by the Academic Success Center.
Disability Accommodation	Goshen College offers all students equal access to classes and programs. If you have a disability and wish to request accommodations, please contact Judy Weaver in the Academic Success Center (Good Library 113). You will be asked to provide documentation of your disability. All information will be held in the strictest confidence. Phone: 574-535-7560 ; Email: jweaver@goshen.edu . More information at: www.goshen.edu/campuslife/asc/disabilities-services/
Collaboration and Academic Integrity	<p>You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.</p> <p>For assignments, you may look at and discuss another student's work, but any written work developed during collaboration with another student should be destroyed before writing your own solutions. You should give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful. For exams, you may <i>not</i> use any resources unless a specific exception is stated by the instructor.</p> <p>Failure to observe the above rules will result in a zero on the assignment or exam. Any violation of academic integrity will be reported to the Academic Dean. Observation of the above rules will help you learn the material well and give you the satisfaction of knowing that you have earned your grade.</p>
Due Date Policy	Class participation, assignments, labs, and exams can only be excused, rescheduled, or made up if (1) there is a serious medical problem, a death in the immediate family, or an irreconcilable conflict with another official Goshen College activity; (2) there is written documentation signed by proper authorities; and (3) the instructor is notified prior to the due date or as soon as possible afterwards.