Professor: David McClendon (ASC 2046, phone x2574 (231-591-2574 off campus), hours M 10-11, T 10-11, W 3-4, R 1-2 or by appointment, email: DavidMcClendon@ferris.edu)

Web: http://mcclendonmath.com/414.html contains the lecture notes, old exams, useful handouts and information on Actuarial Exam P.

Lectures: 9:00-9:50 MTWR in STR 207.

Prerequisites: Single-variable calculus (MATH 220 & 230) are the most important prerequisites: you should be proficient at differentiating and integrating functions and have some recollection of material related to infinite series–if you're not, this will be reviewed with some homework assignments and in-class work. We'll also use a bit of multivariable calculus (MATH 320), statistics (MATH 251) and linear algebra (MATH 322) which will be reviewed as necessary.

Lecture notes: You will need my lecture notes, which can be obtained in either of two ways:

- as a course pack, available at the bookstore, or
- online, at my web page as a pdf file

You should bring the lecture notes to class every day as they contain the examples and notes from which I will teach the course. We will cover Chapters 1-6 in MATH 414.

Supplies: You should bring two or three colored pens or pencils to class each day to help you take good notes. Many problems we discuss are best attacked by use of color-coded pictures. (Calculators are prohibited on MATH 414 exams, but you will need a TI-30X calculator for the Actuarial Exam P.)

Textbook: None required; there are several I can recommend in case you need one.

Course material: MATH 414 is called "Statistics" but is really a course in probability theory. Essentially, probability is the branch of mathematics which tries to make predictions about data which will come from the repetition of some experiment which might have several different outcomes. In MATH 414, we will cover most of the "basics" of probability theory: combinatorics, discrete and continuous probability distributions, conditional probability and independence, joint distributions, expected value and variance, moment generating functions, laws of large numbers and the Central Limit Theorem. This corresponds roughly to the material on the Society of Actuaries' Exam P.

Probability theory is a really nice branch of mathematics that has applications to a wide range of real-world problems, most especially in economics and business but also in the hard-core sciences.

Learning outcomes: Upon completion of MATH 414, it is my hope and expectation that you will become proficient in probability theory. This includes the ability to:

1. Use the language of sample spaces and events to model probabilistic problems;
2. Solve elementary combinatorics problems;
3. Calculate probabilities of events and probabilities associated to discrete and continuous random variables;

4. Derive density and/or distribution functions for random variables defined as a transformation of other random variables;
5. Compute probabilities, marginals, conditional densities, etc. given a joint distribution, and determine whether or not random variables are independent;
6. Compute and interpret expected values, moments and generating functions, variance and covariance, conditional expectation and variance;
7. Write arguments mimicking the proof of the Central Limit Theorem;
8. Apply the Central Limit Theorem to solve problems associated to sums and averages of i.i.d. random variables.

Grading policy: Your homework and work done in class counts 25%; your worst midterm counts 10%; the other three midterms count 15% each; and the final exam counts 20%. Grades are curved at the end of the semester, but an average of 90% will receive at least A-, an average of 80% will receive at least B-, etc.

Attendance policy: I have no formal attendance policy. That said, **nothing** is more correlated with strong performance in my classes than attendance in lectures.

Homework: Homework problems can be found at the end of each chapter in my lecture notes. As we go along, I'll let you know what problems you should be working on and when they are due. I will grade a subset of the homework problems from each assignment for correctness; your work should be legible and easy to follow, and you should show all your work. Your homework can be given to me in person or put in the slot next to my office door marked "MATH 414".

Some (many) of the homework questions will be hard! It is normal not to know how to do some of the questions. Work with others and/or come ask me for help on the problems on which you are struggling.

In-class work: We will sometimes spend part or all of a class period working in groups on assignments. These vary in style (some review concepts from previous math courses; others review or reinforce ideas from MATH 414) and logistics. For each of these assignments, you will get a grade which combines the correctness of your work with your participation with the rest of your group and with the class.

Midterms: There are four midterms:

Exam 1 will be after we finish Chapter 2; somewhere around Thursday, September 22;
Exam 2 will be after we finish Chapter 4; somewhere around Wednesday, October 26;
Exam 3 will be after we finish Chapter 5; somewhere around Monday, November 21;
Exam 4 will be on Thursday, December 8, at which point we will hopefully be through Chapter 6.

To get an idea of what might be asked, you can look at my old exams which are available on my web page.

On each exam, you may use one $8.5'' \times 11''$ sheet of paper with anything you want written on it on both sides during the exams; you will not be permitted to use calculators or other study aids.

You may make up an exam that you miss (whether your absence is excused or not) but the makeup exams are considerably more difficult. If you miss an exam, contact the professor; you are to make up the exam at the *earliest possible time*.

Final exam: The final exam covers the whole semester. As with the midterms, you may use one $8.5'' \times 11''$ sheet of paper with anything you want written on it. If you miss the final, you can take a makeup but the makeup final will be significantly harder.

Office hours / Getting help: Whenever my office door is open, you can knock and enter. Feel free to ask me how to do any or all of the homework questions. You can also seek assistance from students who have taken 414/416 from me in the past. I can also meet with you over Zoom or Skype if needed; email me to set up an appointment.

Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements should register with the Disability and Accessibility Resource Center office (x3057, DARC@ferris.edu). While DARC will send me a letter outlining the accommodations to make for you, I would appreciate it if you could contact me immediately for assistance with any necessary classroom accommodations.

Academic dishonesty: Papers will be monitored for "magic answers". Issues with academic dishonesty are taken very seriously, will almost always result in an F for the class, and will be referred to the Office of Student Conduct.