Math 223: Calculus III

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Course Web Page: http://www.geneseo.edu/math/heap

Textbook: *Calculus Volume 3*, by Gilbert Strang and Edwin Herman.

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Course Info: This course is an advanced calculus course dealing primarily with the calculus of several variables. We will cover roughly chapters 2-6 of the textbook. We will cover various topics including vectors and vector-valued functions and their associated curves, functions of two and three variables and their associated surfaces, limits, continuity, partial differentiation, maximums and minimums, multiple integrals, and line integrals. Topics are subject to change depending on the progress of the class, and various topics may be skipped due to time constraints. **An accurate schedule will be posted on the website, and you should check it often.**
  Please note that we will work on developing your independent reading skills in Mathematics. You should read the sections of the textbook that correspond to the material covered during the lectures. It is in your best interest to stay ahead in your reading. If you read about a topic *before* it is discussed in class, it will enable you to answer my questions and ask your own focused questions during the lecture. Whether you choose to read a section before or after we cover it in class, the reading will help you to better understand the material.

  The natural location to study several variables is in the Euclidean plane $\mathbb{R}^2$, in the Euclidean space $\mathbb{R}^3$, or in higher dimensional Euclidean space $\mathbb{R}^n$. These spaces contain various natural subsets such as vectors, lines, planes, curves, surfaces, and solid regions. Studying the algebra of these spaces leads to an understanding of concepts like perpendicularity and parallelism. The shape of the objects we are studying sometimes makes it convenient to depart from the usual coordinate systems and to work with alternate coordinate systems such as polar coordinates, cylindrical coordinates, or spherical coordinates.

  As is the case with one variable calculus, calculus of several variables divides into two related parts, differentiation and integration. Differentiation is related to tangents, linear approximation, and to motion in the plane or in higher dimensional space. In the case of two variables, we study tangent planes similar to the notion of tangent lines of single variable calculus. Differentiation also leads to a theory of maxima and minima for functions of several variables. Integration in several variables is related to areas and volumes. Among the applications are the computations of masses, averages, and probabilities. The evaluation of these higher dimensional integrals reduces to the iteration of the one variable process of integration. Finally, many physical problems such as the computations of work and of various fluxes reduce to the study of differential and integral calculus of vectors.

  Upon successful completion of this course, a student will be able to:
- Represent vectors analytically and geometrically, and compute dot and cross products for presentations of lines and planes,
- Analyze vector functions to find derivatives, tangent lines, integrals, arc length, and curvature,
- Compute limits and derivatives of functions of 2 and 3 variables,
- Apply derivative concepts to find tangent lines to level curves and to solve optimization problems,
- Evaluate double and triple integrals for area and volume,
- Differentiate vector fields,
- Determine gradient vector fields and find potential functions,
- Evaluate line integrals directly and by the fundamental theorem, and
- Use technological tools such as computer algebra systems or graphing calculators for visualization and calculation of multivariable calculus concepts.

Grading: There will be regular homework assignments, three midterm exams, and a final exam. Your overall grade will be determined as shown below. **Exams** will be given during class, and are closed book, closed notes, closed friends, and open brain. Calculators, cell phones, iPods, and other electronic devices will NOT be permitted in exams. Unannounced **quizzes** may be given from time to time and will be based on material from homework and previous lectures. **Class participation** will be based on your willingness to **ASK and ANSWER questions** in class.

  In all written work, you must show your work neatly and legibly in order to receive credit. You should clearly show the process and reasoning you went through in order to solve the problem. The problems I work for you in class

will provide good examples of how your homework and exam problems should be written up. All assessment will be based on your ability to communicate a correct solution and explain your reasoning. It is your responsibility to write in a way that tells me that you understand the problem and its solution.

Homework, Quizzes, Class Participation ------------------------------ 16%			
Exam 1: --- 21%			
Exam 2: --- 21%			
Exam 3: --- 21%			
Final Exam: -- 21%			
See course website for exact exam dates.			

	B+…87-89	C+…77-79	D…60-69
A…93-100	B…83-86	C…73-76	F…Below 60
A-…90-92	B-…80-82	C-…70-72	

Homework: Most homework will be done through the internet-based homework system called WeBWorK. However, there may occasionally be problems you must write out and hand in to me. All assignments must be completed by the given due date. To receive credit, assignments must be completed on time. **WeBWorK extensions will NOT be given without a legitimate excuse.** Complete as much of the assignment as you can by the deadline to receive partial credit. If you have a legitimate conflict, you must tell me ahead of time.

Each student is responsible for completing his or her own WeBWorK assignment and any written assignments. However, **you are strongly encouraged to discuss the homework and to work together on the problems with your classmates.** Please be careful that you are actively participating in the process: many students find that they can understand a problem while they are watching a classmate work through it and explain it, and then conclude that they understand the material well enough. This leads to an unpleasant surprise at test time, when students who "thought they understood" the material find they are unable to work the problems on their own. Please be careful that you are able to work all of the problems on your own before the exam time arrives, with no coaching from a friend. Please use whatever resources aid you in learning the material, including computer assistance, office hours, other students, professors, other math books, etc.

Moreover, while it is not required that you complete a handwritten version of WeBWorK assignments, it is strongly encouraged. Writing a problem out by hand, showing all calculation steps, and keeping them collected in a notebook will greatly assist you as you prepare for exams.

Extra Help: There are many ways for you to get some help in this class. I am willing to spend a few minutes in class answering questions about homework problems. However, if you have a lot of questions, I recommend taking advantage of my office hours. I'll say it again…USE MY OFFICE HOURS! My job is to help you -- come to office hours even if you have just a small question. Don't wait until you get too far behind. If my office hours are not convenient for you, make an appointment by sending an email or asking after class. Please come see me as soon as you feel lost -- it is important that I know how you are doing so I can adjust the level of the class if necessary. I WANT to help you, and I WANT everyone to do well. There is also help available in the Math Learning Center (South Hall 332).

Don't let yourself get too far behind! I would be happy to see you if you feel you need some assistance. Come and get your questions cleared up right away.

Accommodations: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Students should contact Dean Buggie-Hunt in the Office of Disability Services (tbuggieh@geneseo.edu or 585-245-5112) and their faculty to discuss needed accommodations as early as possible in the semester.