Math 211 — Spring, 2015

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Hours: M 3:45–5:00; TuTh 6:15p–7:15p; F 3:45–5:00

Course Content: Mathematics 211 is the third semester of calculus. It revisits and adapts the concepts from first-year calculus in the setting of three-dimensional space. The main topics are coordinate geometry in space; vectors; functions of more than one variable including vector fields; the limits, differentiation, and integration of such functions, including Green's, Stokes' and Gauss' theorems; and applications.

Textbook and software: Colley, *Vector Calculus*, 4th ed., Prentice-Hall.
Mathematica for Students (http://www.wolfram.com/solutions/education/students/)

A free video
A Student's Introduction to Mathematica (http://www.wolfram.com/broadcast/video.php?v=269)
teaches basic commands of *Mathematica*. Other tutorials are found at
Wolfram Videos & Screencasts (http://www.wolfram.com/broadcast/)

Course Goals: After this course, you should be able to do the following: to sketch three-dimensional graphs, to understand how the calculus of single-variable functions generalizes to multivariable functions, to evaluate limits of multivariable functions, to differentiate multivariable functions and vector fields, to integrate multivariable functions and vector fields, to discuss the roles of these processes of multivariable calculus in solving problems, to understand better the material of first-year calculus.

Classes: You are responsible for work covered in class. Furthermore you are expected to have done the reading for each class. Your ability to get the most out of each class is greatly diminished by a failure to be prepared.

Evaluation: Grades will be based on the following written work:

Tests (3 @ 100 pts)	300 points
Quizzes (8 @ 25 pts)	200 points
Graphing portfolio	100 points
Final examination	200 points
Total	800 points

The plus/minus system will be used. A rough guide to grades: A: $\geq$ 720 pts. B: 640–720 pts. C: 560–640 pts. D: 480–560 pts. F: $<$ 480 pts.

Tests: There are three in-class, closed-book, timed tests, each worth 100 points.

Final Examination: There will be a cumulative final examination worth 200 points.

Quizzes: All quizzes are announced and in-class. Each quiz is worth 25 points. In total there will be 10 quizzes of which 8 will be counted. In each of the three testing units, at most one quiz will be dropped.

Graphing Project: Due Monday, April 13, 2015. Each student is to prepare a portfolio of at least 2 three-dimensional images created with *Mathematica*. The portfolio should exhibit all the types of graphs encountered in the course: Cartesian coordinates ($z = f(x, y)$), polar/cylindrical coordinates ($z = f(r, \theta)$), spherical coordinates ($\rho = f(\theta, \phi)$), parametrized curves ($(x, y, z) = \mathbf{r}(t)$), and parametrized surfaces ($(x, y, z) = \Phi(u, v)$). The portfolio will be worth 50 points.

There is a screencast that may be helpful:

3D Graphing (http://www.wolfram.com/broadcast/screencasts/abbybrown/3D_Graphing/)

There is a *Mathematica* notebook that contains an interface to make producing graphs easier. It is called "Graphing Project — Interface" on Blackboard (https://classes.emory.edu).

Final Examination: (250 points.) A cumulative final examination will be given at the time scheduled by the Registrar.

Homework: Exercises are assigned almost every day of class. These exercises usually will not be collected but are for the benefit of the student. Solving problems and practicing their solution is only good way to learn mathematics. Students may ask questions about the homework, and quizzes based on the homework may be given. The instructor may ask to see a student's homework.

Although the homework exercises are not graded, it is important for the success of the student that they be completed as soon after covering the material as possible. Calculators ought to be used when appropriate, but the student should keep in mind that they are not permitted on the tests. Collaboration is encouraged, but each student should be sure that he or she ultimately can **solve problems unaided by notes, the textbook, a calculator, or other people**. Use good style on your homework. In general you need to spend at least 6-8 good hours per week on study not counting the time spent taking quizzes and reviewing for tests.

Excuses: Excuses deemed legitimate by the instructor will be handled according to the individual circumstances and college policies.

The student is expected to take all tests and exams at the scheduled times. For legitimate excuses arrangements will be made to take a test **prior to** the testing time. Any student who needs special accommodations must provide documentation of the needed accommodation and make appropriate arrangements with the instructor several days in advance. There will be no make-up tests given after the testing time.

Written style: Thoughts are expressed by sentences: just so in mathematics. Pay attention to your textbook: it is written in sentences. **Your written work must be in complete sentences.** Note "$1 + 1 = 2$" is a complete sentence (it has a subject "$1 + 1$", verb "$=$" and predicate "2"). Use mathematical symbols wherever appropriate. Your work also needs to be neat and orderly to be intelligible. See the essay, "Clean Writing in Mathematics," from *Calculus: A Liberal Art*, by W.M. Priestley and the "Calculus Style Guide." Practice good style in all your work, including uncollected homework.

All questions answered: On the last day I will answer questions about anything except religion, politics, and the last test/problem set. Attendance is optional.

Honor Code: The Honor Code of Oxford College applies to all work submitted for credit in this course. To receive credit for work submitted you must place your name on it. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

Tentative Calendar: The calendar of topics below is subject to change. The expansion of contact hours presents several alternatives for using class time. The topics will not change, but the dates and class actvities may be adjusted to take advantage of class time.

Date	Topic	Section
Tue 13 Jan	Vectors in two and three dimensions	1.1
Wed 14 Jan	Vectors in two and three dimensions	1.2
Fri 16 Jan	The dot and cross products	1.3, 1.4
Mon 19 Jan	*Martin Luther King Jr. Holiday*	
Tue 20 Jan	**Quiz 1**/Applications	
Wed 21 Jan	Applications of the dot and cross products	
Fri 23 Jan	Vector geometry problems	1.5
Mon 26 Jan	Some n-dimensional geometry	1.6
Tue 27 Jan	**Quiz 2**/Applications	
Wed 28 Jan	New Coordinate Systems	1.7
Fri 30 Jan	Applications	
Mon 2 Feb	Functions of Several Variables; Graphing	2.1
Tue 3 Feb	**Quiz 3**/Applications	
Wed 4 Feb	Limits and Continuity	2.2
Fri 6 Feb	Limits and Continuity	2.2
Mon 9 Feb	The Derivative	2.3
Tue 10 Feb	**Test 1**	
Wed 11 Feb	The Derivative	2.3
Fri 13 Feb	Properties; Higher-Order Partial Derivatives	2.4
Mon 16 Feb	The Chain Rule	2.5
Tue 17 Feb	**Quiz 4**/Applications	
Wed 18 Feb	The Chain Rule	2.5
Fri 20 Feb	Directional Derivatives and the Gradient	2.6
Mon 23 Feb	Parametrized Curves	3.1
Tue 24 Feb	**Quiz 5**/Applications	
Wed 25 Feb	Arclength and Differential Geometry	3.2
Fri 27 Feb	Vector Fields	3.3
Mon 2 Mar	Gradient, Divergence, Curl	3.4
Tue 3 Mar	**Quiz 6**/Applications	
Wed 4 Mar	Differentials and Taylor's Theorem	4.1
Fri 6 Mar	Extrema of Functions	4.2
Mon 9 Mar	*Spring Break*	
Tue 10 Mar	*Spring Break*	
Wed 11 Mar	*Spring Break*	
Fri 13 Mar	*Spring Break*	
Mon 16 Mar	Lagrange Multipliers	4.3
Tue 17 Mar	**Quiz 7**/Applications	
Wed 18 Mar	Some Applications of Extrema	4.4

Fri 20 Mar	Integration: Areas and Volumes	5.1
Mon 23 Mar	Double Integrals	5.2
Tue 24 Mar	**Test 2**	
Wed 25 Mar	Changing the Order of Integration	5.3
Fri 27 Mar	Triple Integrals	5.4
Mon 30 Mar	Change of Variables	5.5
Tue 31 Mar	**Quiz 8**/Applications	
Wed 1 Apr	Applications of Integration	5.6
Fri 3 Apr	Further applications	
Mon 6 Apr	Scalar and Vector Line Integrals	6.1
Tue 7 Apr	**Quiz 9**/Applications	
Wed 8 Apr	Green's Theorem	6.2
Fri 10 Apr	Conservative Vector Fields	6.3
Mon 13 Apr	Parametrized Surfaces	7.1
Tue 14 Apr	**Quiz 10**/Applications	
Wed 15 Apr	Surface Integrals	7.2
Fri 17 Apr	Stokes' Theorem	7.3
Mon 20 Apr	Gauss's Theorems	7.3
Tue 21 Apr	Further Vector Analysis	7.4
Wed 22 Apr	Applications	
Fri 24 Apr	**Test 3**	
Mon 27 Apr	All questions answered	