APMA E2000: MULTIVARIABLE CALCULUS FOR ENGINEERS
SYLLABUS - FALL 2017

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Office: S.W. Mudd Rm. 287E

Office Hours: M 1100–1300

Lecture:

Section	Day/Time	Location
001	TR 8:40am–9:55am	310 Fayerweather Hall
002	TR 1:10pm–2:25pm	602 Hamilton Hall

Recitation: In addition to the lectures, you must also register for one of the recitation sections below.

Section	Day/Time	Location
R01	R 2:40pm-3:30pm	TBA
R02	R 4:10pm-5:00pm	558 EXT Schermerhorn Hall
R03	F 10:10am-11:00am	608 Schermerhorn Hall
R04	F 10:10am-11:00am	602 Northwest Corner Building
R05	F 11:40am-12:30pm	TBA
R06	F 2:40pm-3:30pm	602 Northwest Corner Building

Course description: Multivariable Calculus is a third semester calculus course for students who have previously been introduced to the basic ideas of differential and integral calculus.

In this course we will take the concepts of single-variable calculus (Calc I and II) and look at their generalizations to functions of two or three variables. Topics include:

- Vectors and curves in space
- Functions of several variables, partial derivatives, gradients
- Multiple integrals, different coordinate systems
- Vector calculus, theorems of Stokes, Gauss, and Green

The material we take up in this course has applications in physics, chemistry, biology, environmental science, astronomy, economics, statistics, and just about everything else. We want you to leave the course not only with computational ability, but with the ability to use these notions in their natural scientific contexts, and with an appreciation of their mathematical beauty and power.

Textbook:

- Stewart, J. *Calculus: Early Transcendentals.* 8th Edition w/ WebAssign.

Note: Access to the electronic version of this text is available by following the WebAssign link from Canvas. A print copy is not required.

Important Dates:

- Friday, 1/26: last day for change of program
- Thursday, 2/22, first midterm
- Thursday, 3/22: last day to drop or P/F
- Thursday, 3/29, second midterm
- Monday, 4/30: last day of classes
- Tuesday, 5/8*: final exam (*predicted)

Policy on out-of-sequence exams and missed quizzes

We are only able to accommodate a limited number of out-of-sequence exams due to limited availability of rooms and proctors. For this reason, we may approve out-of-sequence exams in the following cases:

(1) A documented medical excuse.

(2) A university-sponsored event such as an athletic tournament, a play, or a musical performance. Athletic practices and rehearsals do not fall into this category. Please have your coach, conductor, or other faculty advisor contact your instructor.

(3) A religious holiday.

(4) Extreme hardship such as a family emergency.

We will not be able to accommodate out-of-sequence exams, quizzes, and finals for purposes of more convenient travel, including already purchased tickets. Please note again the date of the final and plan your winter break travel accordingly.

Scheduled out-of-sequence exams and quizzes (those not arising from emergencies) must be taken before the actual exam. Makeups must occur within one week of the regularly scheduled exam or quiz, otherwise a zero score will be given.

Grading: The final grade will be computed with the following weights. for each category. Percentage will be converted to a letter according to the "college standard" chart at right. These cutoffs may be adjusted downward—they will never be made more strict—but not significantly.

Category	Weight
Homework	15%
Quizzes/Recitation	20%
Midterm Exams	35%
Final Exam	30%

Grade	Minimum %
A+	99
A	93
A-	90
B+	87
B	83
B-	80
C+	75
C	70
C-	60
D	50
F	0

A note on grades.

Please refer the SEAS Bulletin for policy regarding the assignment of W, UW, and INC grades.

Canvas: The chief means of communication for this course will be the course Canvas (aka Courseworks) site, accessed through https://courseworks2.columbia.edu/. Students are expected to check this for up-to-date assignments—including material separate from the text—and announcements.

Piazza: Piazza is an online bulletin board reached through Canvas. This is the place to start with any questions about the course—content, logistics or otherwise—as it will likely produce the quickest reply.

Homework: Homework assignments come in two flavors:

WebAssign: WebAssign is a system of online exercise coordinated with the text designed to hone skills and enhance understanding of basic concepts. The problem are organized by section and while they will not be graded for credit, are recommended for practice and study for written assessments. Instructions for access will be posted to Canvas.

Written: In addition, weekly problem sets with a mix of exercises from the text and supplementary problems will be collected. These include more in-depth problems requiring greater abstraction, understanding and/or synthesis of various concepts. In many ways, these constitute the heart of the course; rigor in their completion often yields the greatest understanding.

GradeScope: This semester, we will be employing an online grading system called Gradescope https://gradescope.com/. This should expedite the grading process and keep all assignments well-organized. You will be automatically enrolled, and the link can be accessed through Canvas.

Recitation/Quizzes: It is required that each student register for and attend a weekly recitation section. This is a venue for getting more individual help with content, to work more intricate

problems, and take a weekly quiz. The quiz topic will always be the previously submitted homework set. The teaching assistant (TA) may also give an additional score for attendance and participation.

When calculating the homework and quiz grades for the semester, the lowest grades in each of these areas will be dropped. **N.B.** It is advised that students reserve these "passes" for unexpected absences. In fairness to all students and TAs, **late homework will not be accepted nor will make-ups be offered**.

Technology: Technology can play an important role in the learning of mathematics, and as such, graphing, scientific calculators, and computer algebra systems (CAS) are permitted for class and homework, though they will not be required. Calculators will not be permitted on tests and quizzes, and thus it is emphasized that students learn not to rely on them. If time permits, some examples using computational techniques will be presented.

Academic Honesty: Guidelines regarding cheating and plagiarism are laid out in the SEAS Bulletin and will be adhered to strictly. Collaboration is permitted, in fact encouraged, for home and class assignments; however, all submitted assignments must be written up independently and represent the student's own words and understanding.

Below is a proposed schedule for covering topics and assignments during the semester. All are subject to change as the semester progresses. Please refer to CourseWorks for all official dates.

	T/Th	Sections	Topic	Due	Note
1	1/16/2018	§12.1–2	Coordinate systems, vectors		
2	1/18/2018	§12.3–4	Dot Product/Cross product		HW0 due Fri 1/19
3	1/23/2018	§12.5	Equations of lines and planes	HW1	
4	1/25/2018	§12.6/§13.1	Quadric surfaces and space curves		
5	1/30/2018	§13.2–3	Claculus of space curves, arc length	HW2	
6	2/1/2018	§13.3–4	Curvature, velocity and acceleration		
7	2/6/2018	§14.1–2	Functions of several variables, continuity	HW3	
8	2/8/2018	§14.3	Partial derivatives		
9	2/13/2018	§14.4	Tangent planes and linear approximations	HW4	
10	2/15/2018	§14.5	The chain rule		
11	2/20/2018	§14.6	Directional derivatives and the gradient vector	HW5	Review for Midterm 1
12	2/22/2018		MIDTERM EXAM 1 (through 14.5)		
13	2/27/2018	§14.7	Max/min values	HW6	
14	3/1/2018	§11.8	Lagrange multipliers		
15	3/6/2018	§15.1–3	Double integrals/Polar coordinates	HW7	
16	3/8/2018	§15.4–5	Applications/ Triple Integrals		
17	3/20/2018	§15.6-7	Cylindrical/spherical coordinates	HW8	
18	3/22/2018	§16.1–2	Vector fields and line integrals		
19	3/27/2018	§16.2	More line integrals	HW9	Review for Midterm 2
20	3/29/2018		MIDTERM EXAM 2 (through 15)		
21	4/3/2018	§16.3	Fundamental Theorem of Line Integrals	HW10	Last day for drop or pass/fail
22	4/5/2018	§16.4	Green's Theorem		
23	4/10/2018	§16.5	Curl and divergence	HW11	
24	4/12/2018	§16.6	Parametric surfaces and their areas		
25	4/17/2018	§16.7	Surface integrals	HW12	
26	4/19/2018	§16.8	Stokes' Theorem		
27	4/24/2018	§16.9	The Divergence Theorem	HW13	
28	4/26/2018		Review/Flex Time		
	5/8/18		FINAL EXAM		*Projected