Math 321: Vector Calculus **2017**

Calculus, Smith & Minton 4th edition, Chapters 12-14

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Course Objectives: *Continue to learn how to do mathematics!* Mathematics is a problem-solving discipline, and we all have room to improve. To develop as problem-solvers, we must focus on technique and not on memorization. In this course, we develop an understanding of the theory and elementary applications of functions of several variables, multiple integration, line integrals, and integral theorems of vector calculus. Living in a 3-spatial-dimensional world, it is clearly necessary to use such functions if we are to realistically model the world. Unfortunately, the graphical cues that are so helpful for functions of one variable are not as easy to visualize in 3 or more dimensions. The calculations are sometimes more difficult, requiring us to extend our notion of integration. The different types of integrals are beautifully connected at the end of the course in a series of fundamental theorems.

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply techniques of differentiation and integration to solve problems involving functions of two or more variables and vector functions
- Understand the role of vector calculus in modern mathematics
- Determine when different coordinate systems are appropriate
- Distinguish among various types of integrals, and determine when to use each type

Attendance Policy: Regular attendance is expected. You are responsible for everything done in class, through your attendance and sharing class notes with classmates. If you miss a class, you must e-mail or call me before class is over and explain why. **If you have two unexplained absences, you will be dropped from the course.**

Equipment: We will use Mathematica in class, on homework assignments and on tests. You are encouraged to get a copy installed on a laptop or desktop.

Academic Integrity: The college policy is fully supported. Tests are closed notes, closed book unless noted. Electronic devices other than calculators are not allowed in test situations.

Tests: Mastery-based testing on the topics on the following page. Test questions will be graded on a mastery/no mastery basis. You will have multiple chances to demonstrate mastery of a topic. Once you do so, you will not be further tested on that topic. So, if you do not achieve mastery of a topic on one test, new problems on that topic will be given on subsequent tests. My judgment of mastery will be based on you demonstrating that you fully understand the question; your arithmetic and algebra do not have to be perfect, but there should be no flaws in your approach to the problem. While this style of grading has the downside of no partial credit, the upsides include the ability to completely make up for early deficiencies. You always have the possibility of demonstrating mastery on 100% of the topics for the semester. The point is not to allow you to delay learning topics to the end of the course, but to encourage you to fully understand the early topics so that later topics can make sense. The exam is Friday, April 28, 8:30-11:30 and will consist of all 16 content areas.

I expect you to spend at least 12 hours of work each week inside and outside of class.

Content Areas

1. Surfaces in Space / Parametric Surfaces
2. Gradients
3. Extrema of Functions
4. Lagrange Multipliers

5. Double Integrals
6. Area, Volume, Center of Mass
7. Double Integrals in Polar
8. Triple Integrals

9. Cylindrical Coordinates
10. Vector Fields
11. Line Integrals
12. Independence of Path

13. Green's Theorem
14. Curl & Divergence
15. Surface Integrals
16. Surface Integral Theorems: Divergence and Stokes

Grading Scale

16/16 = 100	**10/16 = 76**	**5/16 = 50**
15/16 = 96	**9/16 = 72**	**4/16 = 40**
14/16 = 92	**8/16 = 68**	**3/16 = 30**
13/16 = 88	**7/16 = 64**	**2/16 = 20**
12/16 = 84	**6/16 = 60**	**1/16 = 10**
11/16 = 80		