

Math 327 – Advanced Calculus

Fall 2006 Syllabus

Class Meetings: Reeves 212, MWF 10:10-11:20am

Text: *Advanced Calculus: A Differential Forms Approach*, by H. Edwards

Website: <http://math.moravian.edu/hartshorn/math327>

Instructor: Kevin Hartshorn

Office Hours: PPHAC 215, MW 9-10am, WTh 1-2pm, *or by appointment*

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Advanced calculus, in the context of this course, refers to a deeper examination of the differential and integral calculus of scalar and vector functions. In particular, we will take special note of differential forms – the idea behind the dx so ubiquitous in calculus. To a great degree, this course picks up where Math 211 (Calculus III) leaves off by studying some of the rich geometry and topology that comes from calculus in \mathbb{R}^n .

Learning in this class will be largely self-driven. Rather than many small exercises to drill you in techniques, this course will have a smaller number of exercises meant to explore the topics more deeply. While few of the problems will actually be collected (see section ?? below), I strongly advise you to work through *all* of the problems in the text. As with any other mathematics course, you can only learn by doing.

1 Goals and Objectives

- **Modelling and Problem-solving**

- Develop ability to solve problems in the geometry and analysis using in differential forms,
- Develop capacity to both *prove* results and *solve* problems,

- **Knowledge**

- Develop skills as a critical judge of mathematical arguments,
- Recognize the place of differential calculus in mathematics and the greater realm of scientific thought,

- **Communication**

- Develop facility in reading and analyzing mathematical text,
- Present clear solutions (not just answers) both written and orally.

2 Course Format

2.1 Class Engagement

You are expected to read the relevant section of the text *before* coming to class. For each reading, a reading guide will be provided. You will be expected to complete a journal entry for each reading, based on questions or observations in the reading guide. I will check in class whether you have responded to the questions. In addition, you are strongly encouraged to e-mail me questions or ask questions in class about the reading. Your questions will help guide the course of the class discussions.

In addition, there may be articles that I will ask you to read through the semester. For each article, you will be asked to write a short summary and devise several questions to help explore the contents of the article. Details on the article readings will be provided as the semester progresses.

You are expected to attend and actively participate in each class meeting. By active participation, I am looking for:

- evidence that you have been reading and keeping up with the homework (this does *not* mean that you understand everything that’s happening in the course!),
- questions when you do not understand or when you think an idea has not been fully explained,
- polite, but honest, feedback to presentations given both by myself and by classmates.

Class discussion is meant to ensure that everyone is on the same page. If you think that something has not been explained well or that there was a mistake in a presentation, you need to speak up.

For each day of class, you will get a 0, $\sqrt{-}$, $\sqrt{}$, or $\sqrt{+}$ for both your journal entry and your class participation (if you have an excused absence, you will not get any mark). By default, you can expect a $\sqrt{}$ for each, reflecting that you have essentially met expectations. Loosely speaking, these marks translate to:

$\sqrt{+}$	100%
$\sqrt{}$	75%
$\sqrt{-}$	50%
0	0%

Your class engagement grade will be based on an average of these scores.

2.2 Oral presentations

Everyone will be required to present some number of problems in class. These presentations need to be both clear and concise. Further, the rest of the class is responsible for monitoring the presentation for accuracy. Details regarding the oral presentations will be provided on a separate handout.

Note that you are responsible for all problems in the text, as well as any additional problems that I provide over the course of the semester. Generally speaking, the exams given through the semester will be modeled very closely on the problems assigned – note that all exams are *closed book* exams. Thus it is everyone’s responsibility to ensure that presentations are both *complete* and *accurate*.

2.3 Homework problems

I will regularly ask for a complete solution to a particular homework problem to be submitted. Your solution will be graded based on accuracy, exposition and neatness. You are more than welcome to type your response, though a (neatly) hand-written response is also acceptable. All solutions should be written in complete sentences and clearly indicate both the problem and the logical structure of the solution.

2.4 Culture Points

To help expose you to the nature of “real mathematics,” everyone will submit write-ups of participation in “mathematical culture.” Essentially this is to document your engagement with mathematics outside the classroom.

Details on the culture points activity are provided on a separate handout.

2.5 Exams

There will be three in-class exams as well as a final exam for this course. The exams will be on **Wednesday, September 27, Friday, October 27** and **Monday, November 20**. The time and place for the final exam will be published near the mid-point of the semester.

The exams will be based on homework problems as well as the readings from the text. Details on the format of the exams will be provided at a later date.

3 Grading and Assessment

Your course grade will be computed based on a raw percentage score, broken down as shown in the table below. Generally speaking, your final course grade translates to a letter grade loosely based on the standard 4-point system: generally 85% marks the difference between an “A” and a “B”, 70% marks the difference between a “B” and a “C”, 55% marks the difference between a “C” and a “D”, and any score below 40% is considered failing.

10%	Class Engagement (journal entries and class discussion)
10%	Oral presentations
10%	Written homework submissions
5%	Culture Points
35%	Exams (3 over the course of the semester)
30%	Final Exam
100%	Total

4 Attendance and other Issues

4.1 Attendance

There are 42 class meetings this semester. While I expect you to attend every session, unavoidable situations will arise during the semester. Thus I will allow each student up to 3 absences, excuses or unexcused. In addition, you may miss as many as 3 additional classes with an appropriate excuse. Absences beyond this are subject to a penalty on your course grade (typically a 5% deduction from your final course percentage).

Excused absences include those due to illness or family emergency (with appropriate documentation). You may also be excused for competitions or field trips *if I am notified properly in advance of the date of absence*. I reserve the right to decide whether an absence qualifies as “excused.”

In all cases, you are responsible for any missed work.

4.2 Academic Honesty

Everyone is expected to adhere to Moravian College’s Academic Honesty policy, as described in pages 54–59 of the Student Handbook. Two issues of particular note for this course are:

- **Readings and journals:** You are welcome to discuss the readings with classmates, including questions posed on the reading guides. However, the *journal responses* to the readings must be your own. Each reflection on the reading should be an individual effort.
- **Preparing problems:** Your preparation of problems for presentation must be on your own. You may collaborate with other students on homework problems on *after* they have been discussed in class. Submission of written homework problems must also be done on an individual basis.

4.3 Final reminders and disclaimers

- *Visit my office!* I would love to help address individual issues or answer questions you have about the course. I would love to hear feedback about which aspects of the course are or are not going well. You have a great deal of power to determine the path this class takes – take advantage of it.
You can also communicate with me via e-mail (hartshorn@moravian.edu). Drop me a line and let me know how the course is going.
- This syllabus is subject to change through the semester. The most recent version of the syllabus can be found at <http://www.math.moravian.edu/hartshorn/math327/>.
- Final determination of your course grade is subject to my discretion as professor of the course.