

Math 4023: Introduction to Analysis

Professor: Paul Fili

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Lecture: MWF 10:30-11:20 in HSCI 303

Office: 532 Mathematical Sciences Building

Office Hours: TBD

Website: We will primarily use the Online Classroom (D2L) at <https://online.okstate.edu/>.

Prerequisite: Math 2163 and Math 3613 or consent of instructor

Textbook: [Analysis with an Introduction to Proof](#), by Steven Lay, 5th edition.

About this course: This course will provide an introduction to the theorems and proofs of one-variable calculus. ‘Analysis’ refers in general to the branch of mathematics which contains calculus as well as the study of more general functions and spaces. The central concept of analysis is that of a limit: what does a limit mean, and why and when does one exist? This question might sound trivial to someone who has already taken calculus, but when calculus was first being developed by Newton and Leibniz, a proper notion of limit did not even exist, and ϵ - δ proofs would not be introduced until Cauchy’s *Cours d’Analyse* published almost 100 years after Isaac Newton had died! Indeed, the existence of limits – limits of real numbers, limits of points, as well as limits of functions – is in general far from trivial. Sometimes in analysis, even knowing that a solution to, say, a differential equation like the famous Navier-Stokes equations in fluid mechanics exists at all is a nontrivial question. (In fact, that problem is so fundamental and well-known that it is [one of Harvard’s Clay Institute Million Dollar problems](#) in mathematics.)

Our main goal in this course will be to learn the basic approach and key ideas we use in studying these problems. Analysis in practice can be an art form, as one struggles to find inequalities between changing quantities in order to prove results. Our course this semester will focus on covering the basics of set theory, the real numbers, metric spaces, sequences and limits, and continuity of functions.

Homework: There will be weekly homework in this course. ***You should expect the homework to take a significant amount of time each week.*** As some of the questions assigned might be rather difficult, I expect each of you to e-mail me, come to my office hours, and talk with each other in order to complete the homework. You are allowed (and encouraged) to collaborate on homework so long as you do not copy each other’s work (i.e., you can discuss the ideas and work together to find a solution, but you must write your own solutions without looking at other students’ write-ups). *Direct copying of other students’ work is an academic integrity violation may result in an F! grade for the course, so be sure to write up your own solutions.*

Students are encouraged to use LaTeX to typeset their homework. **A 5% bonus will be given on each typeset homework.** Templates will be provided to ease learning of LaTeX, and you can easily find answers to many basic LaTeX questions on the web. For more information on typesetting software, visit the LaTeX project at <http://www.latex-project.org>. You will need to download and install first a “distribution” and then download a typesetting front-end which will use that distribution. Common choices for a front-end include Texmaker (cross-platform), Kile (Linux – my personal favorite), and LyX (Mac and Linux, Windows under cygwin). LyX in particular is a WYSIWYG editor so it might be easier for first time users.

Exams: There will be two midterm exams and a final exam. The date of the final exam is fixed by the registrar’s office.

Grading: The grading for this course will be as follows:

Two midterm exams	15% each (x 2 = 30%)
Final exam	20%
Homework, quizzes, any other misc. classwork	50%

Graduate credit: You may take this course for graduate credit. You will be required to do projects (akin to special homework assignments) which will be assigned during the semester and will be part of your homework grade.

Attendance: *Attendance is required for this course.* I will sometimes discuss material that is not included in the textbook. If you will be unable to attend lecture for any reason, you must contact me privately to discuss your situation. Repeated absences from lecture without excuse will receive 2% off their final grade for each of those recorded absences (thus, for example, a student with 6 recorded absences without excuse would receive 12% off their final grade).

Policy on missed work: Students will be offered reasonable accommodation in the event of a missed major assessment activity for a valid and documented reason. You will be required to notify me and provide me documentation of this reason as soon as is possible.

Syllabus Attachment: Please read the OSU syllabus attachment on the web, linked at <http://academicaffairs.okstate.edu/current-students>. This has a lot of important information, including instructions about disability accommodations. Please contact me privately during the first week of the course if you need accommodations as the result of a disability.