Course Description

This course is a rigorous study of the ideas underlying calculus and an introduction to the real numbers. Rather than the computational focus of your previous calculus classes, our class will be devoted almost entirely to theory. We'll study the foundations of the real numbers, sequences and series of real numbers and the concept of a limit, continuity, derivatives, the Riemann integral considered rigorously, and sequences and series of functions.

Essential Information

Professor:	David Maxwell
Office:	Chapman 308C
Phone:	474-1196
Email:	david.maxwell@uaf.edu
Web:	http://www.math.uaf.edu/~maxwell

Prerequisites	ENGL 111X; ENGL 211X or ENGL 213X; MATH 215 and 202X; or my permission

Course Texts

The required text is: **Understanding Analysis**, Stephen Abbott, Springer-Verlag

There are lots of other nice texts out there. There are two older classics that I recommend in particular.

Calculus, by Michael Spivak, is a lovely calculus text with a mathematical viewpoint. It has lots of nice problems, a clear exposition, and covers material similar to that of Abbott as well as some more sophisticated topics (e.g. π is irrational).

Principles of Mathematical Analysis, by Walter Rudin, is a classic text. It's harder book than our course text, and has a more general approach via metric spaces. But it has very clean tidy proofs and is a joy to read. If you end up finding you like analysis, you might enjoy using this text for self study.

Class Time

There will be three hours of class lecture each week and a one hour recitation. Class time will be spent on traditional mathematics lectures, whereas the recitation will be devoted to problem solving and working on homework solutions.

We will decide on the recitation time on the first day of class.

Lecture Times

MWF	1:00–2:00 45 Gruening 410

Office Hours

I will schedule 3 hours a week of formal office hours upon consultation with my students. My office hours will always be posted on my web site and on my office door. I have an open door policy; if I'm in my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email.

Homework

There will be a homework assignment due every Friday at 4:30pm in my box. Homework will be listed on my web page, and will be assigned on as we progress through each day's lectures. Your first homework has been posted.

The course web page will also contain solutions to the less routine problems for each week's homework. If you are interested in the solution of a problem that is not listed on the web site, please come by office hours.

Regarding late homework, I will accept from each student a single late homework with no questions asked. You must notify me no later than the time the homework is due that you intend to take advantage of this opportunity, and you must hand in the homework no later than one week after it was due. Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

Most of your homework will be graded by our TA, Victor Mikhaylov. Some of the problems you will hand in to me, and generally one problem a week to hand in to me will be a (W) problem. (See the section below **On Proofs**). The homework handed in to me will be worth 20% of your homework grade, and the homework handed in to Victor will be worth 80%.

Midterms

There will be two midterm exams. They are tentatively scheduled to be held on Friday, October 17 and Monday, November 17. There will be two components to each midterm – a take-home exam that focusses on harder proofs, and an in-class exam with an emphasis on definitions, statements of theorems, and shorter proofs.

Final Exam

The final exam will have a take home and in-class component. Both will be comprehensive. The written portion will be to be held on Monday, December 15, 1:00–3:00.

On Proofs

You will be expected to write proofs on every homework and on every exam. Lots of them. Unlike the proofs class you have taken, the main focus of our course is not how to write a proof – we have new mathematical ideas to learn! Nevertheless, this is a writing intensive (W) class, and one of the goals of the class is to give you experience in writing proofs and more broadly in clear mathematical exposition. All of your homework and exams will be graded for both mathematical content and exposition.

Roughly one problem a week will be labeled a (W) problem, and the emphasis on grading that problem will be on exposition. These problems are intended to give you a chance to focus on mathematical writing. Try to make your proof sound as professional as you can, the kind of proof you might find in our text. To help you learn my expectations for mathematical writing, for the first three assignments I will let you resubmit a (W) problem after it has been graded. Resubmissions are due with the following week's homework.

Evaluation

Course grades will be determined as follows:

Homework	35%
Midterms	35%
Final	30 %

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A+	97–100%	C+	77–79%	F	≤ 59
A	93–96%	C	70–76%		
A-	90–92%	C-	not given%		
B+	87–89%	D+	67–69%		
B	83–86%	D	63–66%		
B-	80–82%	D-	60–62%		

Tentative Schedule

The following is a tentative list of the topics to be covered in this class. As we proceed in the course, the course web page will list specific sections to be read for each week.

Week	Topics and Events
9/5	Rationals and Reals
9/8 – 9/12	Completeness and its consequences. Countability.
9/15 – 9/19	More on countability. Start sequences and series.
9/22 – 9/26	Sequences and series continued. Bolzano-Weierstrass Theorem.
9/29 – 10/3	Cauchy Criterion. Properties of Series.
10/6 – 10/10	Topology of $\mathbb{R}$. Compact sets.
10/13 – 10/17	Limits of Functions. Continuity. Friday: Midterm
10/20 – 10/24	Intermediate Value Theorem
10/27 – 10/31	Differentiation Friday: Last day to withdraw with a W
11/3 – 11/7	More on differentiation.
11/10 – 11/14	Sequences and series of functions. Uniform convergence.
11/17 – 11/21	Power series. Taylor series. Monday: Midterm
11/24 – 11/28	Start Riemann integral Thursday: Thanksgiving
12/1 – 12/5	Riemann integral
12/8 – 12/12	Catch-up and review

Rules and Policies

Collaboration
You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams
You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance
Attendance is not included directly as part of your grade. Despite this fact, it is in your best interest to attend every class.

Cell Phones
Turn off your cell phone before you come to class.

Disabilities Services
I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade
Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals
A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty
Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.