SYLLABUS
Math 414
Analysis I
Summer 2013

Meeting Times: MTWRF 11:00am – 12:00pm, 0190 Carver

Instructor: Paul Tokorcheck
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Office Hours: MW 2 – 3pm, or by appointment.

Grader: Anna Lischke
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Office Location: 461 Carver
Office Hours: TR 1 – 2pm.

Reading Materials:
Murray Protter, Basic Elements of Real Analysis (Required)
Jiří Lebl, Basic Analysis: Introduction to Real Analysis (Free Download)

Classics:
Walter Rudin, Principles of Mathematical Analysis
Hermann Weyl, The Continuum
Bernard R. Gelbaum, John M.H. Olmsted, Counterexamples in Analysis
David Berlinsky, A Tour of the Calculus

Prerequisites: A grade of C- or better in both Math 201 and Math 265.

Grading: Your grade for the course will be calculated as follows:

- Homework: 30%
- Participation: 20%
- Exam 1: 25%
- Exam 2: 25%

Last Updated: May 21, 2013
**Homework**: Homework will be due each Monday, at the **beginning** of lecture. Anything submitted after this deadline will receive half-credit, regardless of circumstances.

**Problem Sessions**: Once a week, we will meet to discuss homework exercises and present some proofs. We’ll discuss basic proofwriting techniques, such as Induction, and also issues of style and format. To “participate”, you should be showing up, and adding your constructive and polite opinions to the discussion. You should also have a few proofs prepared that you’re willing to share with the class. Every student should present at least one proof over the course of the eight weeks, preferably more than one.

**Exams**: There will be exactly two exams, occurring on the Fridays of the fourth and eighth weeks. If you cannot be there on the date of an exam, you must contact me before the exam date to make other arrangements. If you no-show for an exam and attempt to contact me afterward, you should not expect to be allowed a make-up exam.

**Policy on academic dishonesty**: I encourage you to make friends, talk to each other, and exchange ideas about the proofs that we see in class and in the homeworks. However, the work you turn in should be your own. That is, the work that you turn in should be written by you, by yourself. If you talk to someone about a problem, hear a good idea, and go home to write it up, that’s collaboration. If you find yourself writing a proof while holding someone else’s work, that’s cheating. You may also want to review the University’s policies on plagiarism and academic dishonesty at [http://www.public.iastate.edu/~catalog/2009-2011/geninfo/dishonesty.html](http://www.public.iastate.edu/~catalog/2009-2011/geninfo/dishonesty.html)

**Policy on disabilities**: Please address any special needs or special accommodations with me at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from the Student Disability Resource (SDR) office (phone 515-294-7220). SDR is located on the main floor of the Student Services Building, Room 1076. Please also review the Mathematics Department Student Disability Accommodation Policy at [http://www.math.iastate.edu/Undergrad/AccommodationPol.html](http://www.math.iastate.edu/Undergrad/AccommodationPol.html)
Course Calendar: The following is a rough outline of topics.

**Week One:** The construction Real Numbers, in at least two different ways. Order, intervals, and inequalities. The Field Axioms. Basic topological facts, such as the Cauchy-Schwarz and Triangle Inequalities. Cauchy Sequences. Various notions of Completeness. (Sections 1.1, 1.2, 1.3, 1.4. Sections 6.1, 6.2)

**Week Two:** Continuity of functions. Limits of functions and “epsilon/delta” proofs. Simple convergence of functions and sequences. The Squeeze Theorem. (Sections 2.1, 2.2, 2.3, 2.4, 2.5)

**Week Three:** More Topology of $\mathbb{R}$. The Intermediate Value Theorem, and Boundedness. The Bolzano-Weierstrass Theorem. Extreme Value Theorem. Uniform Continuity. The Cauchy Criterion. (Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6)

**Week Four:** Compactness, and the Heine-Borel Theorem. The definition of the Derivative, and the Derivative Rules. The Inverse Function Theorem for Derivatives. **EXAM 1 ON FRIDAY** (Section 3.7 and Section 6.4. Sections 4.1, 4.2)

**Week Five:** Integration. The Darboux and Riemann Integrals. The Fundamental Theorem of Calculus. Integrals of Logarithmic and Exponential Functions. (Sections 5.1, 5.2, 5.3)

**Week Six:** Infinite Series. Convergence Tests for various types of series. The Limit Supremum and Limit Infimum. (Sections 8.1, 8.2)

**Week Seven:** Sequences of functions, and Uniform convergence. Uniform convergence for Series. The Weierstrass $M$-Test. Taylor Series. (Sections 8.3, 8.4)

**Week Eight:** Any unfinished business, Review, and the Final Exam. **EXAM 2 ON FRIDAY**