Calculus I - Math 251.
Syllabus 2013-2014
Syllabus written by Hal Sadofsky.

Text: *Calculus, Concepts and Contexts, 4th edition*, Stewart. We will cover roughly Chapter 2, 3 and 4. Students should read Chapter 1 on their own and it should be review for them.

Chapter 2 is on limits and derivatives. Limits should not be overemphasized. Their importance is to understanding derivatives and to understanding asymptotic behavior of functions.

Chapter 3 is on techniques of differentiation with a couple later sections devoted to application.

Chapter 4 is on applications of derivatives and should be the heart of the course, with the most important applications being optimization (Chapter 4.6). Because of this, it is essential to cover Chapter 4.6 by week 9 at the very latest (new material covered in the last week of class is very rarely retained). Note also that in Fall week 9 is short.

Instructor: Put your name and contact information and office hours in.

Exams: I've written a schedule for two midterms and a final. One midterm is also acceptable, but two is probably better since the students in this course need more feedback rather than less.

Bear in mind that there are calculators available that can do symbolic limits and differentiation and can find extrema of functions. If you allow calculators on the midterms, then you will need to write problems that don't give students who possess such calculators an unfair advantage. To simplify the situation on the final, we will *not* allow calculators on the final.

The final exam will be a common final exam. The place and time are not yet listed by the registrar, but the time should be on your syllabus. It will be the evening of Tuesday December 10.

Students should bring their UO ID to all exams.

Prerequisite: C- or better in Math 112 or satisfactory placement exam score. Note that we have no enforcement mechanism in place for this prerequisite, so that there is no guarantee that the students enrolled in your class have met the prerequisite.

Workload: There will be homework due every week, as well as reading and class attendance. An average well-prepared student should expect to spend about 12 hours per week on this class, but there will be a lot of variation depending on background and ability.

Course Learning Goals: The students in Math 251 are mostly science majors of some kind. They need to understand how to model problems that can be solved with calculus and then use calculus to solve those problems. (Only a very small percentage of students in Math 251 are math majors, and thus mathematical proof is not a reasonable emphasis for the course.)

A successful student in this course **should be able to model and solve a wide class of optimization problems that are accessible to differential calculus.** Much of the other material covered in this course is necessary for that objective. So subgoals include:

(1) Learning how to differentiate - this is necessary if you wish to use calculus to solve optimization problems.
(2) Learning how to sketch graphs of functions - this is necessary to help identify where to search for local/global extrema when trying to optimize.
(3) Understanding some basic facts about limits - this is needed for two reasons: to incorporate an understanding of the geometric interpretation of the derivative as the slope of the tangent line of a graph, and also to aid in sketching graphs of functions exhibiting asymptotic or discontinuous behavior.

    It is not important for students to understand the ϵ-δ definition of limit in this course.

Other goals include other applications of the derivative. I choose at least two of the following (listed in the order of my priority):

(1) Students should be able to solve related rates problems. These are less central than optimization, but can be introduced early as a source for problems that require students to practice modeling.
(2) Students should be able to use Newton's method to approximate solutions to equations that they cannot solve explicitly.
(3) Students should be able to find the linear approximation to a function at a specific value of the variable, graph the linear approximation and the function on the same pair of axes, and use the linear approximation to find approximations to values of the function near the point at which the approximation is taken.

Learing Environment: The University of Oregon strives for inclusive learning environments. Please notify me if the instruction or design of this course results in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Academic Conduct: The code of student conduct and community standards is at conduct.uoregon.edu. In this course, it is appropriate to help each other on homework as long as the work you are submitting is your own and you understand it. It is not appropriate to help each other on exams, to look at other students exams, or to bring unauthorized material to exams.

Approximate Schedule

Week 1	2.1-2.4	Week 6	4.1, 4.2.
Week 2	2.5-2.7	Week 7	4.2, 4.3.
Week 3	2.8-3.2	Week 8	4.5, 4.6 (exam 2).
Week 4	3.3-3.5 (exam 1).	Week 9	4.6
Week 5	3.7-3.9	Week 10	4.7, review.

Notes:

(1) This does not include a section explicitly on the derivatives of inverse functions. The specific examples that arise (logarithm and inverse trig functions) can be handled by using the chain rule together with the fact that $(f \circ f^{-1})(x) = x$. Of course the general rule can also be handled that way if you are motivated to teach the general rule.
(2) Section 4.5 is L'Hospital's rule. If you are short on time (and this is an agressive schedule so you might be) you can put off Section 4.5 until Week 10.
(3) I usually use WeBWorK when teaching this course. If you are not going to do that, you can consult Chris Sinclair's syllabus from 2012-2013 to see suggested homework assignments from the text itself.

The current set of default assignments (setWeek1 to setWeek10) cover as follows:

Week1. Sections 2.1-2.5 about limits.
Week2. Section 2.6: The difference quotient, definition of derivative, secant lines, average and instantaneous velocity.
Week3. Section 2.7-3.1: Derivatives using the power rule, exponential functions. Also tangent lines and the derivative as a functions. Velocity and acceleration. Exponential growth (this last topic involves no calculus, but is a convenient way to remind them how to model with exponential functions).
Week4. Sections 3.2, 3.3. Product rule, quotient rule, trig functions.
Week5. Sections 3.4, 3.5: Chain rule, implicit differentiation.
Week6. Sections 3.4, 3.5, 3.7, 3.9, 4.1: Chain rule, related rates, linear approximation, implicit differentiation.
Week7. Sections 4.2, 4.3: Concavity, curve sketching, function optimization.
Week8. Sections 4.3, 4.5, 4.6: l'Hospital, improper limits, optimizations problems requiring modeling, curve sketching.
Week9. Section 4.6, 4.7: Optimization, Newton's method.
Week10. Review.

The intention is that assignments WeekN be given after week N of term, though depending on precisely how fast material is covered, you may want to alter that. You may also want to alter the assignments or create your own.

If you wish to give a short assignment early in the first week, you could use the CandC-4E-1-1 WeBWorK assignment which reviews a few relevant Math 111 topics. Or you may want to break up the Week1 assignment.