Math 247 Instructor Syllabus 2012-2013

Text: *Modeling the Dynamics of Life: Calculus and Probability for Life Scientists, 3rd ed, by Frederick Adler*
(students may have a custom paperback, abbreviated version of the book)

Calculator: At least a scientific calculator is helpful for getting numerical answers. I don't mind students having more sophisticated calculators instead, but I'm careful to have them show me some process if so.

Course Goals: A student successfully completing the course should, in a general sense, have…
- ✓ facility with the computation of antiderivatives and the interpretation thereof,
- ✓ an understanding of the Fundamental Theorem of Calculus and its interpretation
- ✓ familiarity with the construction and solving of one or two differential equations
- ✓ repeated exposure to applications in population, reproduction, drug concentration, selection, neuronal potential, and predation using all the learning outcomes.

The student can model the mathematical topics described among the learning outcomes in words, then solve or simplify the relevant equations and/or expressions, and finally write a summary statement of the solution.

Learning Outcomes: A successful student can…
- ✓ find the family of antiderivatives (if possible) for a continuous function,
- ✓ approximate definite integrals using Riemann sums,
- ✓ use substitution and integration by parts to compute indefinite and definite integrals,
- ✓ compute and interpret definite integrals with finite and infinite limits of integration,
- ✓ set up single and coupled differential equations based on written descriptions or modifications of templates including predator/prey models, population ecology, competitive selection, and chemical exchange across a membrane,
- ✓ solve certain pure-time, autonomous, and non-autonomous differential equations using integration and separation of variables,
- ✓ find and determine the stability of equilibria in autonomous differential equations; draw relevant phase-line diagrams
- ✓ sketch solutions to single and coupled differential equations from an initial condition,
- ✓ verify solutions to, and use Euler's method with, differential equations in two dependent variables,
- ✓ use nullclines and find equilibria of systems of differential equations in two dependent variables,
- ✓ sketch phase-plane trajectories for systems of differential equations.

Instructor Notes:

- The course deals with both continuous and discrete functions, something our regular calculus sequence does not. It also has a strong focus on differential equations and their applications. After chapter 4, this course consequently differs significantly in content from math 252.

- Students in this course are exclusively human physiology, biology, geological science, and environmental science majors. The fact that there are applications to biology included in homework and on tests is critical to the success of this course. It's worth letting them know while you aren't a mathematical biologist (or are you?), you are there as a facilitator of mathematical applications that hopefully have relevance for them.

- Consider a hybrid assignment of homework: Some WebWork problems and some hand-in problems. Paper markers are available to grade the hand-in work.

- Lecture handouts available from Mike Price by request.

WEEK	SECTIONS TO COVER	Notes
1	4.1, 4.2	The motivation for almost everything in chapter 4 is solving differential equations
2	4.3, 4.4	**4.3:** Parts and substitution are generally two sections in other textbooks, avoid the temptation to rush through **4.4:** Move as quickly as possible to definite integration and use approximation by rectangles,
3	4.5, 4.6	**4.6:** Area between curves is hard to apply, except in biological variations of 'net profitability' like comparing growth of two populations
(Winter) *Martin Luther King Jr. Day Monday*		
4	4.7 *Review for Midterm* *Midterm 1 (Chapter 4)*	**4.7:** The most useful improper integrals from an application perspective are of the form int(f(t), t, 0, inf); integrals across domain errors are less useful
5	5.1, 5.2	**5.1:** Contains a lot of familiar material from 4.1, but one renewed focus is on writing a differential equation from a written description
6	5.3, 5.4	**5.4:** Consider carefully whether you want to discuss partial fraction decomposition in order to solve, for instance, the logistic model
7	5.5 *Review for Midterm*, *Midterm 2*	**5.5:** Like 5.1, the focus here is on setting up *systems* of differential equations from written descriptions and learning about a handful of key models (e.g. predator/prey)
8	5.6, 5.7	**5.7:** Consider using in-class demonstrations of phase-plane trajectories to illustrate the use computational power in approximating solutions (there are some decent phase-plane plotters online)
9	5.8	**5.8:** This is may be an unfamiliar topic, but can be very interesting and coincides nicely with content in the primary biologysequence
10		This week is most responsibly dedicated to (1) finishing up course content, if necessary and then (2) doing targeted in-class review.

Catch-up, review

(Spring) *Memorial Day holiday Monday*

Course Coordinator: Mike Price (Ext. 0991)

11 Final exam during scheduled time

(**http://registrar.uoregon.edu/calendars/final_exam#2013-2014**)

Other Important Dates (http://registrar.uoregon.edu/calendars/academic#winter2013):

Monday of 2nd week	Last day to drop without a "W" (but only 75% tuition refund)
Wednesday of 2nd week	Last day to add a class
Sunday after 7th week	Last day to drop --- period!