

SPRING 2007

MTH U151 Calculus & DiffEq for Biology I

Instructor: Marcus Fries

Phone: 2706

Office: 521 Lake Hall

E-mail: fries.m@neu.edu

Office Hours: 3:30-5:00 M & W

“Text”: Calculus and Its Applications 10<sup>th</sup> edition, Goldstein, Lay & Schneider.

**COURSE DESCRIPTION:** MTH U151 is the first part of the two semester Calculus Sequence for Biology Majors. The course will cover the first four or five chapters of the “text” roughly (and I do mean roughly) as a (re)introduction to Differential Calculus, in order to get quickly into differential equations commonly used by biologists, which form the the goal of the course. This is a totally innovative “Mathematics for Biologists” course, which explains the use of quotes around the word text. There is no book yet doing what we want to do at the level we need. Goldstein *et al* is mainly there as a security blanket.

**PREREQUISITES:** YOU MUST KNOW HIGH SCHOOL ALGEBRA COLD!!! If you are weak in this area you’ll be better off in MTH U121. If you have had no calculus at all and feel unsure about your math skills you’ll be better off in MTH U141.

**GRADING:**

**Breakdown**

Quizzes 60%

Final 40%

**Grading Scale**

100-95 A

94-90 A-

89-87 B+

86-84 B

83-80 B-

79-77 C+

76-74 C

73-70 C-

69-67 D+

66-64 D

63-60 D-

59-0 F

**HOMEWORK:** Doing the homework is required. Homework is **not** optional. You are responsible for having done the problems from the section discussed in the previous class. Discussion of homework will form the first part of class, if you do not have questions for me, then I will have questions for you! I will not be collecting/grading your work; however, I advise that you save your homework, for your own review purposes, but also in case I need proof that you’ve done it.

**CLASS PARTICIPATION:** You are required to attend class, and encouraged to participate. All cell-phones must be turned off; and if you are late, try not to disrupt the class. If, for some reason, you must leave early, let me know beforehand.

**QUIZZES:** Expect a quiz each week, most likely at the end of Thursday’s class. Quizzes will be based on the previous week’s homework. There will be no make-ups. Excuses are only for documented, severe medical problems. **Any excuse given once you have already missed the quiz is a weak one.**

**NOTES ON GRADED WORK:** All Work MUST Be Done Using A Pencil. Anything that is to be graded which is not written in pencil will be given a zero.

**OFFICE HOURS:** Office hours are scheduled for 3:30-5:00 Monday and Wednesday. I am also available by appointment, call (x2706) or e-mail(fries.m@neu.edu) to set up a meeting. I am frequently in my office during the day, feel free to stop by with any questions you may have.

**FINAL EXAM:** All students will take the final exam at the scheduled time, **Wednesday, April 25 10:30 am**. Do NOT make travel plans that conflict with the final exam.

**COURSE COORDINATOR:** If you have a concern about the course or the instructor that is not or cannot be resolved by speaking with the instructor, you may contact Professor Martsinkovsky, alexmart@neu.edu.

**UNIVERSITY POLICY ON GRADES:** It is University policy that no grade, including an incomplete, can be changed after one year. Exceptions must be authorized by the Academic Standing Committee.

**CLOSING REMARKS:** Please do not fall behind, come to class. See me for help early on, and/or go to 540 Nightingale Hall for free math-tutoring, no appointment required!

## Semester Outline

### • Differential Calculus

- *Infinity and Beyond*
- *Standard Parts*
- *Smooth Graphs*
- *The Derivative*
- Rules of Differentiation
- Second Derivatives
- Curve Plotting
- The Function That is Its Own Derivative
- Exponential and Logarithms

### • Pharmacokinetics

- *How to use semilog graph paper*
- *Zero-order and first-order processes*
- *Processes tending toward equilibrium*
- *\*Bi-exponential processes*
- *\*“Peeling” Data*
- *Biological Half-life*

### • Differential Equations

- *First Steps*
- *Homogeneous Linear Equations with Constant Coefficients*
- *Non-homogeneous Linear Equations with Constant Coefficients I*
- *Non-homogeneous Linear Equations with Constant Coefficients II*
- *Deeper into non-homogeneous equations*
- *Systems of differential equations*

### • Compartmental Problems

- *Non-zero initial concentration*
- *Two compartment series dilution*
- *Diffusion between compartments*

### • Trigonometric Functions

- Radian Measure
- Sine and Cosine Functions
- Calculus of Trigonometric Functions

### • More Differential Equations

- *Complex Numbers*
- *Complex Roots of Characteristic Polynomials*
- *Nonhomogeneous Differential Equations with Trigonometric Right Hand Side*

Key: \* denotes if time permits, *italics* denotes not in the textbook

## Problems From Text

Chapter	Section	Problems
0	All	Take a look, make sure you know how to do all of these.
1	1	3,4,7,9,15,17,19,21,23,25,31,37,39
	2	1-19 odd, 26,
	3	1-35 odd
	6	1-37 odd, 41,49
	7	1-29 odd, 33
	8	1-13 odd
2	1	1-12 all, 19,21,35-40 all
	2	1-6 all, 7-21 odd, 39,41
	3	1-31 odd
	4	1-33 odd
3	1	1-27 odd, 35, 37, 45, 51, 53
	2	1, 4, 11-25 odd, 29, 37, 41, 47, 50, 55
	3	1-27 odd, 37, 43, 45
4	1	1, 5, 9, 13, 17, 23, 27, 31, 33, 35
	2	2, 3, 9, 11, 13, 19-31 odd
	3	1-37 odd
	4	1-33 odd
	5	1-25 odd, 29
	6	1-27 odd, 29-35 odd
5	1	3, 5, 7, 9, 13, 15, 21,23, 29
	4	1, 3, 4, 8, 9, 10, 13, 14
10	1	1-11, 14, 18, 20, 21, 25
	4	15, 16, 17, 18, 19, 20, 25, 26
	5	7, 9, 11, 15, 16, 19, 23, 27, 35, 37
	6	9, 10, 11, 12, 13, 21, 22, 23, 25, 26
8	1	5-17
	2	1-11 odd, 21, 23, 25
	3	1-27 odd, 33
11	1	1-9, 13, 17, 21, 25
	2	1-5, 11, 19
	3	1-7, 11, 29, 31