

SPRING 2005

MTH U151 Calculus & DiffEq for Biology I

Instructor: Marcus Fries

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Office Hours: 2:30-4:00 M, 10:00-11:30 W

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

COURSE DESCRIPTION: MTH U 151 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 U121.

GRADING:

| | |
|---|-------|
| Quizzes | 30% |
| Midterm | 30% |
| Final | 40% |
| Class Participation, Homework, Neatness, Brownie Points etc | ~ 10% |

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: You’re old enough to do this without my collecting it and checking up on you. You are responsible for having done the problems at the end of the section discussed in last class, even if I don’t specifically assign them. Discussion of the homework will form the first part of the class.

CLASS PARTICIPATION: Encouraged but not required. Don’t feel bad about coming in late, just try not to disrupt the class. If for some reason you must leave early, see me

before class, no other early departures will be tolerated with the exception of severe (=life-threatening) medical problems.

The university thoughtfully provides wastebaskets in the classroom for you to use **before** and **after** class, not during.

QUIZZES: There will be no make-ups. Excuses only for documented, severe (see definition above) medical problems. Quizzes will be every week or so and will be on one sheet of paper. (A typical sheet of paper has two sides: the “front” and the “back” and four edges: “top”, “bottom”, “left” and “right”. You are responsible for checking whether there are questions on the back - there will be no questions on the edges).

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 2:30-4:00pm on Monday and 10:00-11:30 on Wednesday. I am also available by appointment, call (x2706) or e-mail(fries.m@neu.edu) to set up a meeting.

FINAL EXAM All students will take the final exam at the scheduled time, **Monday April 18, 10:30am**. 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, the next step is to speak with the course coordinator Professor Hajian, 537 LA, x5645, hajian@neu.edu. If the course coordinator does not settle the matter please contact Professor D. King(the vice chair), 447LA, x5679, donking@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: Don't fall behind. If you do you're roadkill.

Semester Outline

Differential Calculus

Infinity and Infinitesimals
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
First Order Linear Non-homogeneous Differential 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

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 | 1-21 odd | |
| | 4 | 1-13 odd | |
| 10 | 1 | 1-19 odd | |
| | 4 | 1-11 odd, 15, 19 | |
| | 5 | 1-13 odd, 23-31 odd, 37 | |
| | 6 | 9, 11, 13, 17, 21, 23 | |
| 8 | 1 | 5-17 | |
| | 2 | 1-11 odd, 21, 23, 25 | |
| | 3 | 1-27 odd, 33 | |