

# MTH U151: Calculus & Differential Equations for Biology 1

## Fall 2006, Section: 6, Sequence: 1, Key #: 42201

**Instructor:** Ihsan Mohd Salleh (please call me Sean).

**Email:** imohdsal@yahoo.com (it's the best way to contact me; I check it 5 times a day).

**Office:** 541 Nightingale Hall. **Phone:** 617 373 5534. **Study hours:** Tu: 2pm-4pm, Fr: 1:30pm-2:30pm

**Materials:** *Calculus and Its Applications* (10th ed.), by Goldstein, Lay, and Schneider and handouts.

**Class time:** M, W, Th from 8:00 a.m. to 9:05 a.m. **Classroom:** 102 Kariotis Hall.

**Prerequisites:** knowledge of the material in MTH U121 (Precalculus) or its equivalent.

**Course description:** This course is the first semester of the two-semester Calculus and Differential Equations Sequence for Biology majors. The course will roughly cover the first 4 or 5 chapters of the "text" as a (re)introduction to Differential Calculus in order to get into Differential Equations commonly used by biologists, which form the main body of the course. This is an innovative "Mathematics for Biologists" course; there is currently no standard book covering what we want to cover at the level we need, which is why the text is supplemented with handouts.

**Grading:** Quizzes: 60%, Final: 40%, Perceived Class Effort/Participation: 5 percentage points.

**Homework:** Homework is not optional. You are responsible for having done the problems from the section(s) 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 or grading your homework. I advise that you save your homework for your own review purposes but also in case I need verification that you've done it.

**Quizzes:** Expect a quiz each week, most likely at the beginning of Monday's class. There will be no make-ups except for documented severe medical problems. Any excuse given once you have already missed a quiz will not be considered meaningful. The purpose of the quizzes is to augment homework material as well as to motivate your learning the material.

**Class participation:** You are required to attend class; be on time! I encourage you to participate in class discussions or inquiry. All cell-phones must be turned off. If you are late, try not to disrupt the class. I will often seek your participation because I want your feedback.

**Note:** Cheating is not tolerated. See me for help or go to Cahner Hall for **FREE** math tutoring (no appointment required); you can also go to the Mathematics Department's tutoring center in 540B Nightingale Hall. If I am unavailable or cannot resolve a problem, you can meet with Professor Sandy Blank in the Mathematics Department for assistance. It is university policy that no grade, including an incomplete, can be changed after one year; the Academic Standing Committee must authorize exceptions. All students without legitimate conflicts will take the final exam at the scheduled time.

**Final exam date:** Tuesday, December 12 at 3:30 p.m. **Location:**

**Other possibly important dates:** new season of Grey's Anatomy on 9/21, last day to drop a class without a "W" is 9/22, Career Fair in Cabot Cage from 10 a.m. to 2 p.m. on 10/4, Columbus Day (no school) on 10/9, Borat film in theaters on 11/3, registration for Spring classes on 11/6, Veteran's Day (no school) on 11/11, last day to drop with a "W" is 11/17, Thanksgiving break at 11:35 a.m. on 11/22, classes resume on 11/27, classes end on 12/6.

## Tentative Course Outline

(Subtopics in *italics* are not in textbook and \* denotes if time permits. Although many subtopics are not in the text, we will be using the text for many problems.)

<b>Topic</b>	<b>Subtopic</b>
Differential Calculus	<i>Infinity and Infinitesimals</i> <i>The derivative</i> <i>The Rules of Differentiation</i> Second Derivatives <i>Curve Plotting</i> <i>The Function That is Its Own Derivative</i>
Pharmacokinetics	Exponentials and Logarithms <i>How to use semilog graph paper</i> <i>Zero-order and first-order processes</i> <i>Processes tending toward equilibrium</i> <i>*Bi-exponential processes</i> <i>*"Peeling" Data</i> <i>Biological Half-life</i>
Differential Equations	<i>First steps</i> <i>Homogeneous Linear Equations with Constant Coefficients</i> <i>First Order Linear Non-homogeneous Differential Equations with Constant Coefficients</i> <i>Non-homogeneous Linear Equations with Constant Coefficients I (particular solutions)</i> <i>Non-homogeneous Linear Equations with Constant Coefficients II (general solution)</i> <i>Deeper into non-homogeneous equations</i> <i>Systems of differential equations</i>
Compartmental Problems	<i>Non-zero initial concentration</i> <i>Two compartment series dilution</i> <i>Diffusion between compartments</i>
*Tracer Experiments	<i>Quantification of radioactivity</i> <i>Inflow and outflow through cell membranes</i>
Trigonometric Functions	Radian Measure Sine and Cosine Calculus of trig functions
More Differential Equations	<i>Complex Numbers</i> <i>Complex Roots of Characteristic Polynomials</i> <i>Nonhomogeneous Diff. Eq with Trigonometric Right Hand Side</i>
Linear Algebra	<i>Matrix, Matrices</i> <i>Inverses of Matrices</i> <i>Determinants</i> <i>Eigenvalues</i>