MATH 37A: Differential Equations – Summer 2017

Instructor: Yiting Li
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Office hours: 1-2 pm on Monday, Tuesday, Wednesday and Thursday

Time and Location:
Time: M, T, W, Th 11:00 AM-12:50 PM. Location: to be announced.

Text:

Prerequisites:
Students should be familiar with the knowledge of single variable calculus, multi-variable calculus and linear algebra.

Exams:
There will be two midterm exams and a final exam.

- Exam 1: to be announced
- Exam 2: to be announced
- Final Exam: July 6th (Tentative).

Midterm exams will be held in class. If you have an academic conflict (such as a class, lab, or another exam) with the final exam, inform the instructor at least one week before the exam. If the conflict can’t be resolved, we will offer you a make-up exam.

Grades:
Students should expect to complete three hours of work for every class contact hour. Your grade in the course will be based on the following:

- Homework (10% of your grade).
  - Homework assignments will be collected once or twice a week.
  - No late homeworks will be accepted, but your two lowest homework grades will be dropped.
  - We encourage you to discuss homework problems with your classmates, but you must write up your own solutions. You may not use any solution manuals.

- Quizzes (10% of your grade).
  - Short quizzes will be given once a week.
  - No make-up quizzes will be given. Missed quizzes count as zeroes. However, the lowest 25% of your quiz grades will be dropped.

- Two midterm exams (each 25% of your grade).

- Final exam (30% of your grade).
Calculators:
Calculators are not allowed during exams or quizzes.

LATTE:
All course materials for Math 37A will be available online on LATTE.
Log in at http://latte.brandeis.edu using your Unet username and password.

Students with disabilities:
If you are a student who needs academic accommodations because of a documented disability, please contact me and present your letter of accommodation as soon as possible.

Academic Integrity:
You are expected to be familiar with and to follow the Universitys policies on academic integrity (see http://www.brandeis.edu/studentlife/srcs/index.html).
Instances of alleged dishonesty will be forwarded to the Department of Student Development and Conduct for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about how these policies apply to your conduct in this course, please ask.

Learning Goals for Math 15A:
The course places emphasis on both qualitative and quantitative methods.
We first study the first order differential equations. We will study modeling using differential equations, separation of variables, slope fields and Euler's numerical method. The existence and uniqueness theorem and its implications will be discussed. Also equilibria and phase lines will be introduced, along with bifurcation theory. Finally linear equations and integrating factors will be studied.
We then with the above insights, go on to first order systems, and study modeling using systems. We study the geometry of systems and in particular the damped harmonic oscillator and generalize the methods of the above paragraph to first order systems and finally study the Lorenz equations to illustrate the so-called butterfly effect.
We then study linear systems using linear algebra. This includes the superposition principle, straight line solutions, phase portraits for linear systems with real eigenvalues and finally complex eigenvalues. Then repeated and zero eigenvalue cases are studied and then higher differential equations are viewed as first order systems.
Then we go into three dimensions systematically. We briefly study nonlinear systems and how the above techniques are applied. In particular, we will study equalibria and qualitative tools and linear analysis are used as well as numerical methods.
Finally we study forcing and resonance, via the forced harmonic oscillator and sinusoidal forcing. We study undamped forcing and resonance and amplitude and the steady state. We end with the Tacoma Bridge collapse, on a high note.
If time is not enough, we may skip some of the material mentioned above.