Syllabus APMA 0340

Lectures: M Tu W Th 1:00-3:00pm

Instructor: Veronica Ciocanel and Eirini Kilikian

- Office:
  - Eirini – 307, 3rd floor, 333 Brook Street
  - Veronica – 306, 3rd floor, 333 Brook Street
- E-mail: veronica_ciocanel@brown.edu, eirini@brown.edu
- Canvas Homepage: TBD
- Office Hours: TBD (2 hours for each instructor weekly), and by appointment

Recitation/small group problem session:

One day each week will be designated as a problem session, where students will be divided into small groups and will work on practice problems related to the concepts introduced that week.

Required Textbook:

Elementary Differential Equations and Boundary Value Problems [10th edition]

Goals of Course:

By the end of the course, students will be able to

- Perform basic matrix algebra
- Identify and solve systems of linear algebraic and first-order differential equations
- Analyze and construct phase portraits for systems of ordinary differential equations
- Linearize and analyze stability of systems of ordinary differential equations
- Apply the above concepts to applications in biology and physics
- Perform Fourier series expansions
- Use Fourier series and separation of variables to solve certain fundamental partial differential equations

Assessment:

<table>
<thead>
<tr>
<th>Graded work</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm exam 1</td>
<td>25%</td>
</tr>
<tr>
<td>Midterm exam 2</td>
<td>25%</td>
</tr>
<tr>
<td>Final examination</td>
<td>30%</td>
</tr>
</tbody>
</table>
The grading scale above is subject to adjustment, especially in borderline cases; adjustments may take into account class participation and improvements in performance over the semester. Minimum percentages for grade cut-offs will be approximately as (and no higher than) in the tentative scale above.

There will be two midterms testing separate units of material, and a final cumulative examination.

Homework:
- Homework assignments will be available online on Canvas, and we will add problems every day. Homework posted Monday and Tuesday will be due Friday morning at 9am, and homework posted Wednesday and Thursday will be due Monday morning at 9am.
- Late homework assignments will not be accepted, as they cause considerable inconvenience for the instructors. No credit will be given for late work unless you have a legitimate excuse (illness/emergency), together with verification.
- Students can collaborate on homework assignments: however, assignments must be written up separately and individually.

Exams will not be given for individuals at times other than the scheduled slots, except in cases of illness, emergency or some other crisis; documentation verifying the excuse will be required, such as a note from your doctor. You must contact me as soon as you can, before the exam whenever possible, if a serious conflict arises.

Brown University does not discriminate on the basis of sex, race, color, religion, age, disability, status as a veteran, national or ethnic origin, sexual orientation, gender identity, or gender expression in the administration of its educational policies, admission policies, scholarship and loan programs, or other school administered programs.

Additional Resources:
- [Student and Employee Accessibility Services (SEAS)](https://www.brown.edu/student/seas)

Course content (chapter numbers refer to textbook)

*Systems of First Order Linear Equations*

7.1 Introduction to Systems of First Order Linear Equations and applications
7.2 Review of Matrices
7.3 Linear Algebraic Equations; Linear Independence, Eigenvalues, Eigenvectors
7.4 Basic theory of Systems of First Order Linear Equations
7.5 Homogeneous Linear Systems with Constant Coefficients
7.6 Complex Eigenvalues
7.7 Fundamental Matrices
7.8 Repeated Eigenvalues

Midterm exam 1

Nonlinear Differential Equations and Stability

9.1 The Phase Plane: Linear Systems
9.2 Autonomous Systems and Stability
9.3 Locally linear Systems
9.4 Competing Species
9.5 Predator-Prey equations
9.6 Liapunov’s Second Method
9.8 The Lorenz Equations

Midterm exam 2

Partial Differential Equations and Fourier Series:

10.1 Two-Point Boundary Value Problems
10.2 Fourier Series
10.4 Even and odd functions
10.5 Separation of Variables; Heat Conduction in a Rod
10.6 Other Heat Conduction Problems
10.7 The Wave Equation
10.8 Laplace’s Equation

Final exam